RIT

Preparing you for an **outstanding educational experience**

Graduate Catalog and Course Descriptions
2025-26

Rochester Institute of Technology 2024–25 Academic Calendar

† The Add/Drop period is the first seven class days of the fall, spring, and full summer terms, excluding Sundays and holidays.

* Tentative spring semester and summer term schedule. RIT reserves the right to update the spring and summer schedule.

RIT does not discriminate. RIT's Nondiscrimination Notice can be found here: **rit.edu/nondiscrimination**

Any person with a concern about the university's handling of a particular matter related to sex or gender-based discrimination or harassment should contact:

Stacy DeRooy, Director of Title IX and Clery Compliance, Title IX Coordinator, 171 Lomb Memorial Drive, Rochester, NY 14623, 585-475-7158, Stacy.DeRooy@rit.edu, www.rit.edu/titleix

Fall Semester (2241)

August 26, 2024
Day, evening, and online classes begin
First day of Add/Drop period †

August 31
Saturday classes begin

September 2
Labor Day – No Classes

September 3
Last day of Add/Drop period †

September 4
First day to drop from classes with a grade of "W"

October 14, 15
Fall Break – No Classes

November 8
Last day to drop from classes with a grade of "W"

November 27
No Classes
University closes at 2pm

November 28, 29
Thanksgiving Holiday
University closed

December 9
Last day, evening, and online classes

December 10
Reading Day

December 11, 12, 13, 16, 17, 18
Final Exams

December 20
Final Grades Due

December 21–January 12
Break between fall and spring semesters

Spring Semester (2245)

January 13, 2025
Day, evening, and online classes begin
First day of Add/Drop period †

January 18
Saturday classes begin

January 20
Martin Luther King Jr. Day – No Classes

January 21
Last day of Add/Drop period †

January 22
First day to drop from classes with a grade of "W"

March 9, 10, 11, 12, 13, 14, 15, 16
Spring Break – No Classes

April 4
Last day to drop from classes with a grade of "W"

April 28
Last day, evening, and online classes

April 29
Reading Day

April 30, May 1, 2, 5, 6, 7
Final Exams

May 9
Final grades due

May 9, 10
Convocation and Commencement Ceremonies

May 11-13
Break between spring semester and summer term

12-week Summer Term (2248)

May 14, 2025
Day, evening, and online classes begin
First day of Add/Drop period †

May 17
Saturday classes begin

May 21
Last day to Add/Drop classes †

May 22
First day to drop from classes with a grade of "W"

May 26
Memorial Day observed – No Classes
University closed

June 19
Juneteenth observed – No Classes

July 4
Independence Day observed
University closed

July 23
Last day to drop from classes with a grade of "W"

August 6
Last day, evening, and online classes

August 7
Reading Day

August 8, 11, 12
Final exams

August 14
Final grades due

August 15-24
Break between summer term and fall semester

Short Session 1 Summer Term (2248)

May 14, 2025
Day, evening, and online classes begin
First day of Add/Drop period †

May 19
Last day to Add/Drop classes †

May 20
First day to drop from classes with a grade of "W"

May 26
Memorial Day observed – No Classes
University closed

June 19
Juneteenth observed – No Classes

June 20
Last day to drop from classes with a grade of "W"

June 25
Last day of classes

June 26, 27
Final exams

June 30
Final grades due

Short Session 2 Summer Term (2248)

June 30, 2025
Day, evening, and online classes begin
First day of Add/Drop period †

July 4
Independence Day observed – No Classes
University closed

July 7
Last day to Add/Drop classes †

July 8
First day to drop from classes with a grade of "W"

July 30
Last day to drop from classes with a grade of "W"

August 6
Last day, evening, and online classes

August 7
Reading Day

August 8, 11, 12
Final exams

August 14
Final grades due

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UNIVERSITY CALENDAR

Rochester Institute of Technology

2025-26 Academic Calendar

Fall Semester (2251)

August 25, 2025
Day, evening, and online classes begin
First day of Add/Drop period[1]

August 30
Saturday classes begin

September 1
Labor Day – No Classes

September 2
Last day of Add/Drop period[1]

September 3
First day to drop from classes with a grade of "W"

October 13-14
Fall Break – No Classes

November 7
Last day to drop from classes with a grade of "W"

November 26
No Classes
University closes at 2pm

November 27-28
Thanksgiving Holiday
University closed

December 8
Last day, evening, and online classes

December 9
Reading Day

December 10, 11, 12, 15, 16, 17
Final Exams

December 19
Final Grades Due

December 20–January 11
Break between fall and spring semesters

1 The Add/Drop period is the first seven class days of the fall, spring, and full summer terms, excluding Sundays and holidays.

Spring Semester (2255)

January 12, 2026
Day, evening, and online classes begin
First day of Add/Drop period[1]

January 17
Saturday classes begin

January 19
Martin Luther King Jr. Day – No Classes

January 20
Last day of Add/Drop period[1]

January 21
First day to drop from classes with a grade of "W"

March 8-15
Spring Break – No Classes

April 3
Last day to drop from classes with a grade of "W"

April 27
Last day, evening, and online classes

April 28
Reading Day

April 29, 30, May 1, 4, 5, 6
Final Exams

May 8
Final grades due

May 8, 9
Convocation and Commencement Ceremonies

May 10-12
Break between spring semester and summer term

1 The Add/Drop period is the first seven class days of the fall, spring, and full summer terms, excluding Sundays and holidays.

12-Week Summer Term (2258)

May 13, 2026
Day, evening, and online classes begin
First day of Add/Drop period[1]

May 16
Saturday classes begin

May 20
Last day to Add/Drop classes[1]

May 21
First day to drop from classes with a grade of "W"

May 25
Memorial Day – University closed

June 19
Juneteenth – University closed

July 3
Independence Day observed – University closed

July 22
Last day to drop from classes with a grade of "W"

August 5
Last day, evening, and online classes

August 6
Reading Day

August 7, 10, 11

Final exams

August 13
Final grades due

August 14-23
Break between summer term and fall semester

[1] The Add/Drop period is the first seven class days of the fall, spring, and full summer terms, excluding Sundays and holidays.

Short Session 1
Summer 2026

May 13, 2026
Day, evening, and online classes begin
First day of Add/Drop period[1]

May 18
Last day to Add/Drop classes[1]

May 19
First day to drop from classes with a grade of "W"

May 25
Memorial Day – University closed

June 18
Last day to drop from classes with a grade of "W"

June 19
Juneteenth – University closed

June 24
Last day, evening, and online classes

June 25, 26
Final exams

June 29
Final grades due

[1] The Add/Drop period is the first seven class days of the fall, spring, and full summer terms, excluding Sundays and holidays.

Short Session 2
Summer 2026

June 29, 2026
Day, evening, and online classes begin
First day of Add/Drop period[1]

July 3
Independence Day observed – University closed

July 6
Last day to Add/Drop classes[1]

July 7
First day to drop from classes with a grade of "W"

July 29
Last day to drop from classes with a grade of "W"

August 5
Last day, evening, and online classes

August 6
Reading Day

August 7, 10, 11
Final exams

August 13
Final grades due

[1] The Add/Drop period is the first seven class days of the fall, spring, and full summer terms, excluding Sundays and holidays.

* Tentative spring semester and summer term schedule. RIT reserves the right to update the spring and summer schedule.

GRADUATE CATALOG

About This Catalog

This Graduate Catalog does not constitute a contract between the university and its students on either a collective or individual basis. It represents RIT's best academic, social, and financial planning at the time of publication. Course and curriculum changes, modifications of tuition, fees, dormitory, meal, and other charges, plus unforeseen changes in other aspects of RIT life, sometimes occur after the Graduate Catalog has been printed but before the changes can be incorporated in a later edition of the same publication. Because of this, Rochester Institute of Technology does not assume a contractual obligation with its students for the contents of this Graduate Catalog.

Online Study Restrictions for Some International Students:
Certain countries are subject to comprehensive embargoes under U.S. export control laws, which prohibit nearly all exports, imports, and other transactions without a license or specific authorization from the U.S. government. As a result, individuals located in, or who are nationals or residents of, Cuba, North Korea, Iran, or the Crimea, Donetsk, or Luhansk regions of Ukraine are not permitted to register for RIT online courses. Additionally, individuals listed on the U.S. Treasury Department's Specially Designated Nationals (SDN) list or the U.S. Commerce Department's Denied Persons List are also prohibited from enrolling. By registering for RIT online courses, you represent and warrant that you are not located in, under the control of, or a national or resident of any such country or region, and that you are not identified on any such restricted party lists.

Produced by the Division of Academic Affairs and the Division of Marketing and Communications

Rochester Institute of Technology
One Lomb Memorial Drive
Rochester, NY 14623
585-475-6631
gradinfo@rit.edu | www.rit.edu/admissions (https://www.rit.edu/admissions/)
Graduate Catalog 2025-26
www.rit.edu (https://www.rit.edu/)

ABOUT THE UNIVERSITY

An Introduction to Rochester Institute of Technology

Respected internationally as a world leader in career-oriented, technological education, Rochester Institute of Technology has been setting an innovative pace since 1829, when Colonel Nathaniel Rochester became the first president of the Rochester Athenaeum. In 1891, the Athenaeum merged with Mechanics Institute, which had been founded by a group of businessmen to instruct in “drawing and such other branches of studies as are most important for industrial pursuits.”

In 1944, recognizing the increasingly specialized professional nature of its programs, the university adopted the name it holds today. A private, coeducational university in upstate New York, RIT offers academic programs that combine outstanding teaching, a strong foundation in the liberal arts and sciences, modern classroom facilities, and work experience gained through the university’s cooperative education program, internships, and other opportunities.

Few universities provide RIT’s variety of career-oriented studies. Our 11 colleges and degree-granting entities offer outstanding programs in business, engineering, art and design, science and mathematics, the liberal arts, photography, computing, hospitality management, and many other areas. More than 200 programs—including such distinctive offerings as microelectronic and software engineering, imaging science, film and animation, biotechnology and molecular bioscience, physician assistant, new media, international business, telecommunications, and the programs of RIT’s School for American Crafts and National Technical Institute for the Deaf (NTID)—draw students from all 50 states and more than 100 countries.

As a major university, RIT offers academic opportunities that extend far beyond science and technology, including more liberal arts courses and faculty than are found at most liberal arts colleges. With a strong foundation in the humanities and social sciences, RIT graduates understand both technological developments and the larger philosophical and ethical issues presented by technology.

Approximately 17,528 undergraduate students and 3,042 graduate students attend RIT. More than 150,000 alumni can be found around the globe.

RIT is a top 100 national research university. We offer the following degrees: doctoral (Ph.D.) programs in astrophysical sciences and technology, biomedical and chemical engineering, business administration, cognitive science, color science, computing and information sciences, electrical and computer engineering, imaging science, mathematical modeling, mechanical and industrial engineering, microsystems engineering, physics, and sustainability; master’s degree programs: master of architecture (M.Arch.), master of business administration (MBA), master of engineering (ME), master of fine arts (MFA), master of science (MS), and master of science for teachers (MST); bachelor’s degree programs: bachelor of fine arts (BFA) and bachelor of science (BS); and associate degree programs: AS, AOS, AAS.

RIT’s cooperative education program is the fourth-oldest and one of the largest in the world. More than 4,000 students complete co-op positions with approximately 3,500 employers every year. In addition, more than 600 companies visit RIT to conduct employment interviews on campus.

The world in which RIT graduates live and work is composed of people from many backgrounds, lifestyles, and cultures. Therefore, RIT encourages the appreciation of diversity through a variety of liberal arts courses, campus events, and special programs, including the annual International Banquet, Black History Month, Martin Luther King Jr. celebration, and Hispanic Heritage Week.

RIT has been recognized by U.S. News & World Report magazine as one of the nation’s leading comprehensive universities and one of America’s Best College Values. Many college guidebooks have ranked RIT among the nation’s top schools, including “Kaplan’s Unbiased Guide to the 320 Most Interesting Colleges” and *The Princeton Review’s Best 379 Colleges*.

RIT's Colleges and Degree-Granting Units

Nondiscrimination Statement

RIT will not discriminate in terms and conditions of employment, admission, and participation in programs or residential life. It prohibits discrimination, harassment, and retaliation of all types on campus, or at any RIT activities off campus, by its administrators, faculty, staff, students and student organizations, and external organizations and individuals in their operations with RIT. For more information, please visit rit.edu/nondiscrimination (https://www.rit.edu/nondiscrimination/).

The Title IX Coordinator has overall responsibility for the university’s institutional compliance with Title IX and oversees all concerns related to sex discrimination. Any person with a concern about the university’s handling of a particular matter related to sex or gender-based discrimination or harassment should contact:

Stacy DeRooy, Executive Director of Title IX and Clery Compliance, Title IX Coordinator
171 Lomb Memorial Drive
Rochester, NY 14623
585-475-7158
Stacy.DeRooy@rit.edu
www.rit.edu/titleix (https://www.rit.edu/fa/compliance/title-ix-home/)

Accreditation

Rochester Institute of Technology is accredited by the Middle States Commission on Higher Education (MSCHE). The MSCHE is a regional accrediting body recognized by the United States Department of Education and the Council for Higher Education Accreditation.

Middle States Commission on Higher Education
1007 North Orange Street
4th Floor, MB #166
Wilmington, DE 19801
www.msche.org (http://www.msche.org)

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GRADUATE EDUCATION AT RIT

RIT, founded in 1829, is a privately endowed university in suburban Rochester, NY. It is comprised of nine colleges and two degree-granting units:

For additional information, contact us at:
Rochester Institute of Technology
Office of Graduate Enrollment Services
58 Lomb Memorial Drive
Rochester, NY 14623-5604
(585) 475-2229
gradinfo@rit.edu | rit.edu/grad (https://www.rit.edu/admissions/graduate/)

A Message From Diane C. Slusarski, Ph.D., Associate Provost and Dean, RIT Graduate School

The RIT Graduate School acts as a central hub, enhancing the academic journey for graduate students by cultivating a vibrant scholarly community and offering robust professional development programs. This supportive environment, backed by dedicated faculty and staff, empowers students to excel in their research, scholarship, and creative endeavors. The Graduate School works closely with all academic units to support graduate students and strengthen the intellectual community. Together with the colleges, it helps ensure the highest quality of graduate education at RIT.

The programs themselves are centered in fields that combine both theoretical knowledge and practical applications, especially those which can provide the graduate student with a unique niche in the global marketplace. Research topics often relate directly to situational concerns, rather than theoretical discourse. Many programs require a dissertation, thesis, or project, and encourage other avenues for professional experience, such as cooperative education and internships in government and industry. Graduate students often have the valuable opportunity to gain experience and financial support through teaching or research assistantships or traineeships. Whether a dissertation, thesis, project, or professional portfolio is required, our students are encouraged to incorporate both independent study and experiential learning into their programs.

Specialized and Interdisciplinary Programs

At RIT, our mission is to shape the future and improve the world through creativity and innovation. As an engaged, intellectually curious, and socially conscious community, we leverage the power of technology, the arts, and design for the greater good. RIT's international reputation as an applied technological university with a unique connection to the arts and humanities gives graduate students the advantage of working with sophisticated technology and in laboratories found on and off campus.

Over the past six decades, graduate education at RIT has grown from a few niche programs to more than 100 professional and research-oriented degrees and advanced certificates. This unique scholarly portfolio spans the visual arts, humanities, business, and STEM disciplines. RIT's strong tradition of undergraduate education has laid the groundwork for the university's graduate education programming, preparing graduates to excel as creative, skilled, and highly desired professionals. Regardless of the program, RIT fosters a culture of forward-thinking innovation—equipping graduates to drive change and shape the future.

Today, RIT has more than 3,000 graduate students actively enrolled in a range of programs including master's and Ph.D. degree programs, as well as terminal master's degrees such as Master of Fine Arts (MFA), Master of Business Administration (MBA) and Master of Architecture (M.Arch). Many programs offer the opportunity for students to combine undergraduate and graduate studies in a seamless, accelerated experience through RIT's Combined Accelerated Bachelor's/Master's programs. The Graduate School welcomes and supports Accelerated Scholars through this unique academic experience. Graduates from these disciplines continue to push the frontiers of research, entrepreneurship, and innovation with a focus on the emerging needs of the business, industrial, and scholarly communities.

To support RIT's continuing endeavor to provide education in emerging fields and a culture of robust and student-centered research, the university offers doctoral programs in the fields of astrophysical sciences and technology, biomedical and chemical engineering, business administration, cognitive science, color science, computing and information sciences, electrical and computer engineering, imaging science, mathematical modeling, mechanical and industrial engineering, microsystems engineering, physics, and sustainability.

While technology is integral to all graduate programs, the essence of RIT graduate education is rooted in the diversity of programs, course offerings, and learning options. Our reputation as an advanced university is matched by our close ties to industry leaders and commitment to offering programs designed to meet the current demands of employers. Enriched by the perspective provided by the National Technical Institute for the Deaf, one of RIT's colleges, we offer full access to deaf and hard-of-hearing students seeking graduate-level academic programs.

The university continues to receive international recognition for the quality of its graduate programs. In a recent ranking of national graduate programs, several of our graduate degrees were ranked in the top 20 by a range of industry-leading organizations. U.S. News & World Report ranked our MFA in photography and related media #6 and the online MBA ranked #9. The Princeton Review ranked our MS degree in game design and development #4.

Research at RIT

Opportunities for graduate students to engage in innovative research in collaboration with faculty are vital and integral components of the RIT graduate experience. Sponsored research projects enhance the university's academic programs, broaden resources, provide opportunities for student participation, strengthen university-industrial partnerships, and serve the wider community.

Grants and contracts bolster resources and provide new opportunities for faculty, staff, and students. External funding comes from federal and state agencies, private foundations, and corporations.

RIT's major sponsors include the National Science Foundation, the National Institutes of Health, the U.S. Department of Education, the Department of Defense, the National Aeronautics and Space Administration, and New York State. Additional information is available through the Office of Sponsored Research Services at research@rit.edu or on their website at rit.edu/research (https://www.rit.edu/research/).

The Graduate Catalog provides comprehensive information on all graduate programs at RIT. I encourage you to explore its contents to find the educational and research opportunities you seek. I look forward to welcoming you to our campus, and wish you success in your chosen program of study.

Diane C. Slusarski, Ph.D.
Associate Provost and Dean, RIT Graduate School

DOCTORAL STUDY AT RIT

Doctoral programs at RIT are multidisciplinary, cutting-edge, and unique. Our long history of providing education focused on emerging technologies has led to the development of doctorate level programs that draw upon our expertise and experience in many dynamic disciplines of study. Our doctorate programs focus on the discovery and application of technology to solve problems in society. The interdisciplinary nature of the programs means students will work alongside more than 100 Ph.D. faculty members who are experts in a wide range of fields that are influenced by science, technology, and design.

Doctoral Programs of Study

RIT offers doctoral degrees in areas where RIT shares national and international recognition.

Astrophysical Sciences and Technology

Students in the astrophysical sciences and technology program experience a comprehensive curriculum and a broad range of research opportunities that span forefront topics, such as cosmology and large scale structure, detectors and instrumentation, galaxy structure and evolution, gravitational waves, star and planet formation, supermassive black holes, and numerical general relativity. This program not only focuses on discovery and analysis, but also on the development of the technologies—including the instruments, analysis, and modeling techniques—that will enable the next major strides in astrophysics

Biomedical and Chemical Engineering

The biomedical and chemical engineering Ph.D. program provides students with the knowledge, training, and expertise to address important problems in industry, academia, government, and health care. Graduates are well prepared to be highly skilled researchers and future leaders in the next generation of engineers who will tackle the complex challenges facing society.

Business Administration

The Ph.D. in business administration is designed to inspire and train scholars to identify, investigate, and solve novel business challenges that influence business and society, particularly, those that are triggered by technological changes. Our program has a sharp emphasis on the effects of technological innovation on discipline-based theories and research. Our faculty adopt an apprenticeship model in working with students to become independent scholars, cutting-edge researchers, and well-trained educators at research-oriented universities.

Cognitive Science

Students in the cognitive science Ph.D. program conduct research on human perception, cognition, action, and language, with a focus on the representation and processing of information within biological and computational frameworks. The doctorate prepares students for careers in academia or industry and develops abilities to analyze data, grasp complex concepts, and interpret and communicate concepts for a wider audience. Faculty advisors come from across the RIT campus to create a thriving, interdisciplinary community that supports students on their path to becoming independent scholars.

Color Science

Color science is the understanding and quantification of color and its perception. It involves the study of human color vision, including adaptation and cognition, with applications in materials and digital systems. Color science is essential in the design and production of most man-made materials including textiles, paints, and plastics, and to specify the properties of diverse natural materials such as skin, plants, and soil. It also provides the scientific foundation for color imaging and has enabled advances in digital photography, color printing, and display systems including Augmented and Virtual Reality. The degree program revolves around the activities of the Munsell Color Science Laboratory, the preeminent academic laboratory in the U.S. devoted to the study of color science, and one of only a handful of such facilities worldwide. For more than 40 years its faculty and staff have educated students and conducted cutting-edge research in the field. Since the inception of the program, graduates have been in high demand and enjoy a 100 percent placement rate in industrial and academic positions

Computing and Information Sciences

This use-inspired basic research degree is designed to produce independent scholars, cutting-edge researchers, and well-prepared educators. Our students conduct both foundational and applied research to address diverse and important sociotechnical challenges, and they benefit from diverse academic offerings and first-class facilities across the entire field of computing and beyond. Current research focuses range from artificial intelligence, cybersecurity, games and media, human-computer interaction, networks and systems, software engineering, to theory and programming languages. Most of the students have had summer research internships in academic research labs or industry R&D centers. Overall, half of our graduates have secured regular faculty positions in research universities around the world, with the other half working in industry R&D positions.

Electrical and Computer Engineering

The 21st century has witnessed such advances as the Smart Grid, ubiquitous fast internet access through wireless networks, artificial intelligence and machine learning technologies that rival humans in performance, the Internet-of-Things, cloud computing, fiber-optic networks capable of transmitting trillions of bits per second, new computing paradigms such as quantum or neuromorphic computing, and many more. None of these advances would have happened without the dedication of researchers in electrical and computer engineering. Students in the Ph.D. in electrical and computer engineering are explorers of the information age who transform the world by leading trailblazing research that expands and creates knowledge.

Imaging Science

Imaging was named one of the top twenty engineering achievements of the 20th Century by the National Academies. Imaging has transformed our ability to see and understand a range of phenomena, keeping us healthy, protecting our security, monitoring the earth, exploring the universe, uncovering and preserving our heritage, enhancing communication, and facilitating our everyday lives. The imaging science doctoral program is designed to provide a fundamental understanding of the physical, electro-optical, mathematical, computational, perceptual and statistical foundations of imaging science that are necessary to create, optimize, and apply imaging systems.

Mathematical Modeling

Mathematical modeling is the process of developing mathematical descriptions of real-world systems that are used to understand and predict phenomena. Many current problems in science and technology are of such size and complexity that their solutions require sophisticated techniques drawn from computational and applied mathematics as well as the participation of mathematicians on the interdisciplinary teams of scientists that address them. This pioneering interdisciplinary program provides students the education they need to become experts in formulating complex problems mathematically, integrating data with models, devising and implementing algorithms and interpreting solutions, and communicating effectively with experts in various fields.

Mechanical and Industrial Engineering

The mechanical and industrial engineering doctoral program produces graduates with a depth of knowledge in mechanical or industrial engineering, while allowing students to engage in cutting-edge, cross-disciplinary research. The flexible curriculum encourages students to gain domain-specific knowledge from courses offered throughout the college's portfolio of engineering programs. The curriculum, coupled with depth of knowledge in mechanical or industrial engineering disciplines, creates graduates who are ready to tackle the world's most pressing societal and industrial challenges. The program develops world-class researchers who can capitalize on the most promising discoveries and innovations to develop interdisciplinary solutions for real-world challenges.

Microsystems Engineering

The integration of entire systems into micron-scale devices and the sensing technology to interface these devices to the real world is the core emphasis of the microsystems engineering doctoral program. These systems are at the core of the next generation of technology. Within the past decade, microsystems (micro-optical, micro-electrical, and micro-mechanical systems) have emerged as a critical technology worldwide and this dynamic field is positioned for outstanding growth in the future.

Occupational Therapy

The occupational therapy doctorate enables students to study at the intersection of health care and technology. The program blends a traditional occupational therapy curriculum with technological innovations to create a clinical doctoral degree that prepares you to leverage technology for your future practice, fostering creative problem-solving and forward-thinking approaches. A significant portion of the occupational therapy doctorate program is dedicated to clinical education and practice. You will participate in multiple fieldwork experiences in various care settings, such as hospitals, outpatient clinics, rehabilitation centers, schools, community agencies, and skilled nursing facilities.

Physics

Playing a crucial role in advancing various scientific and technological fields, RIT's physics doctoral degree strives to unravel the mysteries of the universe and contribute to the advancement of scientific knowledge. Through experimentation, observation, and mathematical analysis, the physics Ph.D. program fosters a creative and innovative approach to physics education and knowledge expertise.

Sustainability

The first program in the world to focus on sustainable production, the doctorate in sustainability focuses on sustainable production systems—systems that create goods and services using processes that are non-polluting; conserving of energy and natural resources; economically viable; and safe and healthful for workers, communities, and consumers. This program also serves to advance research and education in alternative-energy development, sustainable design, green product development, industrial ecology, and pollution prevention.

Leaders in Research

Research is a driving force in the university, engaging students in hands-on research opportunities in each of our colleges. These opportunities combine classroom learning with laboratory discovery, which enhances each student's education and builds powerful skills that are applicable in a wide range of career paths.

At the core of our doctoral programs is a focus on research, which is intensive and demanding. It is this successful resolution of societal problems that leads to deep professional and personal fulfillment as new discoveries are made and applications are developed. Ph.D. students from a range of academic backgrounds work with world-renowned faculty who are leaders in their fields of study. A focus on teamwork, research, and the intersection of the disciplines gives students the opportunity to collaborate with others, share ideas, and develop innovative solutions using emerging technologies.

We build on our strengths when creating doctoral programs, emphasize research across disciplines, and rely on our interdisciplinary faculty to produce the next generation of educators and researchers with the ability to develop solutions to real world problems.

RIT Research Centers and Organizations

RIT is home to more than 50 interdisciplinary research centers, institutes, and organizations that bring together faculty and students from across the university. These entities explore a wide range of topics and cover everything from business and entrepreneurship to biomedical sciences, nanolithography, printing, social computing, remanufacturing, microsystems fabrication, environmental sustainability, and visual perception. Learn more about RIT's key research centers and institutes online at rit.edu/research/centers-and-institutes (https://www.rit.edu/research/centers-and-institutes/).

COLLEGE OF ART AND DESIGN

Overview

The College of Art and Design offers the most comprehensive graduate imaging programs in the world, encompassing design, science, technology, engineering, management, crafts, fine arts, and art education. Six of our visual arts programs are among the top 12 in the nation. The college is a diverse, world-class collaboration of five schools: American Crafts, Art, Design, Film and Animation, and Photographic Arts and Sciences. Its scope gives students a perspective that can be found nowhere else—a place where some students create fine art using centuries-old methods while others push the edges of digital creativity. At no other university can students explore so many different aspects of the imaging fields to a high level of professional excellence. In addition, the college offers expertise in the professional operations of running a studio or gallery.

Please visit the college's website–**www.rit.edu/artdesign (https://www.rit.edu/artdesign/)**–for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Admission to graduate programs in the College of Art and Design requires a combination of academic performance and creative visual skills that are evaluated via a portfolio review.

Faculty review each student's portfolio to evaluate creative visual skills as well as the potential for success in the student's selected program.

Portfolio requirements: The following MFA programs require the submission of a portfolio that is used to assess applicants' performance and academic capabilities: ceramics, film and animation, fine arts studio, glass, industrial design, metals and jewelry design, furniture design, photography and related media, and visual communication design. The MST in art education also requires a portfolio.

For the most up-to-date information on portfolio requirements, including requirements by program and submission information, please visit https://www.rit.edu/artdesign/portfolio-requirements (https://www.rit.edu/artdesign/portfolio-requirements/).

Financial Aid and Scholarships

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Accreditation

The National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/), accredits the following graduate programs in the College of Art and Design:

- MFA programs: Ceramics, Fine Arts Studio, Furniture Design, Glass, Metals and Jewelry Design, Film and Animation, Industrial Design, Medical Illustration, Photography and Related Media, and Visual and Communication Design
- MS Integrative Design
- MST Visual Arts - All Grades

The MST Visual Arts - All Grades program maintains Initial Program accreditation from the Council for the Accreditation of Educator Preparation (CAEP), www.caepnet.org (https://caepnet.org/).

Graduate Programs

Master's Degrees

Ceramics MFA

Plan Code: CCER-MFA | **HEGIS:** 1009.00

Program Overview

The MFA in ceramics develops your intellectual and artistic thinking through an extensive curriculum that rigorously examines the work of historical and contemporary artists and craftspeople as you expand your knowledge of the techniques within the ceramics field. In-depth critiques give you a deep understanding of your own work as well as that of your your peers—all as a means to enhance your artistic expression and personal voice. Graduate studio courses, seminar courses, and in-depth critiques, in conjunction with thesis planning and implementation, provide students with a deep understanding of not only their own work but the work of other students and their peers. Students examine the creativity, perceptions, aesthetics, and criticism of the work of contemporary artists and craftspeople in courses and discussions. Thesis reviews track students' progress towards the final thesis presentation.

Cooperative education, internships, and other experiential learning opportunities are strongly encouraged for graduate students in the MFA in ceramics.

Accreditation

The master of fine arts program in ceramics is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CCER-601	Ceramic Practice [1]	3
CCER-611	Ceramic Processes [1]	3
STAR-701	Technology in the Studio	3
STAR-714	Ideation and Series	3
Open Elective		3
	Hours	**15**
Spring		
CCER-601	Ceramic Practice [1]	3
CCER-611	Ceramic Processes [1]	3
STAR-702	Studio Art Research	3
Professional Elective [2]		3
Open Elective		3
	Hours	**15**
Second Year		
Fall		
CCER-601	Ceramic Practice [1]	3
CCER-611	Ceramic Processes [1]	3
STAR-706	Business Practices for Studio Artists	3
STAR-790	Research and Thesis	3
Open Elective		3
	Hours	**15**
Spring		
CCER-601	Ceramic Practice [1]	3
CCER-611	Ceramic Processes [1]	3
STAR-718	Research Methods and Publication	3
STAR-890	Thesis	6
	Hours	**15**
	Total Hours	**60**

1 The graduate studio courses (CCER-601 Ceramic Practice and CCER-611 Ceramic Processes) are repetitive, 24-credit hour requirements. Course content is not sequential but continually builds on previous experiences. By retaking these courses four times, students develop their creative and technical skills in the particular focus.

2 Students must select one Professional Elective from the list below (p. 14).

Professional Electives

Code	Title	Hours
ARTH-6xx	Any ARTH-600 level course or above	3
IDEA-705	Thinking About Making: The Practice of Art in a Global Society	3
IDEA-776	College Teaching and Learning	3
STAR-635	Curating and Managing Art Spaces	3
STAR-645	Art Exhibition Critique	3
STAR-758	Studio Art Critique	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Ceramics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None

- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. View the general cost of attendance (https://www.rit.edu/admissions/tuition-and-fees/) or estimate the cost of your graduate degree (https://www.rit.edu/admissions/graduate/estimate-education-costs/).

A combination of sources can help fund your graduate degree. Learn how to fund your degree (https://www.rit.edu/admissions/financial-aid/graduate-funding-sources/)

Crafts Scholarships

Students applying to the MFA programs in ceramics, glass, furniture design, and metals and jewelry design may apply for a competitive, full-tuition scholarship. Learn more about the crafts scholarships (https://www.rit.edu/artdesign/crafts-scholarships/), including eligibility, application requirements, and deadlines to apply.

Film and Animation MFA

Plan Code: FILMAN-MFA | **HEGIS:** 1010.00

Program Overview

The film and animation MFA is supported by highly specialized faculty from RIT's photography, imaging science, computer science, information technology, and design programs. This collaborative program is offered by the School of Film and Animation which houses state-of-the-art facilities, including full production facilities like MAGIC Spell Studios, and offers you industry and commercial experience as you pursue your degree. Graduates of RIT's film and animation MFA work as artists, filmmakers, and storytellers at the world's leading animation and live-action studios.

Cooperative education, internships, and other experiential learning opportunities are optional but strongly encouraged for graduate students in the MFA in film and animation.

Accreditation

The master of fine arts program in film and animation is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Film and Animation (2D animation option),MFA degree, typical course sequence

Subplan Code: ANIMA-GR

First Year		
Fall		**Hours**
SOFA-610	Graduate Seminar	2
SOFA-603	2D Animation I: Fundamentals	3
SOFA-605	Basic Sound Recording	3
SOFA-627	Pre-Production for Animators	3
SOFA-630	Animation Film Language	2
Select one of the following:		3
SOFA-615	3D Animation Fundamentals	
SOFA-617	Stop Motion Puppet Fundamentals	
	Hours	**16**
Spring		
SOFA-611	History and Aesthetics of Animation	3
SOFA-622	30 Second Film	3
SOFA-676	After Effects for Animators	3
Professional Elective [1]		3
Select one of the following:		3
SOFA-623	Stop Motion Master Class	
SOFA-748	Concept and Character Design	
	Hours	**15**
Second Year		
Fall		
SOFA-618	Business and Careers in Animation	3
SOFA-717	Animation Workshop	4
Professional Elective [1]		3
Open Elective		3
	Hours	**13**

Spring		
SOFA-625	Animated Acting Principles	3
SOFA-780	Thesis Preparation Seminar	1
Professional Elective [1]		3
Open Elective		3
Select one of the following:		3
SOFA-604	2D Animation II: Mechanics	
SOFA-652	Alternative Frame by Frame	
	Hours	**13**
Third Year		
Fall		
SOFA-790	Research and Thesis I	4
	Hours	**4**
Spring		
SOFA-890	Research and Thesis II	4
	Hours	**4**
	Total Hours	**65**

[1] Students must select three (3) Professional Electives from the list below (p. 16).

Professional Electives

Code	Title	Hours
SOFA-604	2D Animation II: Mechanics	3
SOFA-613	Graduate Screenwriting	3
SOFA-615	3D Animation Fundamentals	3
SOFA-616	Virtual Production I	3
SOFA-617	Stop Motion Puppet Fundamentals	3
SOFA-619	2D Effects Animation	3
SOFA-620	3D Modeling Mastery	3
SOFA-623	Stop Motion Master Class	3
SOFA-629	Experimental Animation	3
SOFA-634	Virtual Production II	3
SOFA-637	Radical Cinema Workshop	4
SOFA-638	Complete 3D Character Creation	3
SOFA-652	Alternative Frame by Frame	3
SOFA-681	Particle Effects and Dynamics	3
SOFA-684	Animation Gesture	3
SOFA-748	Concept and Character Design	3

Film and Animation (3D animation option), MFA degree, typical course sequence

Subplan Code: 3DANIMA-GR

First Year		
Fall		**Hours**
SOFA-605	Basic Sound Recording	3
SOFA-610	Graduate Seminar	2
SOFA-615	3D Animation Fundamentals	3
SOFA-627	Pre-Production for Animators	3
SOFA-630	Animation Film Language	2
Select one of the following:		3
SOFA-603	2D Animation I: Fundamentals	
SOFA-617	Stop Motion Puppet Fundamentals	
	Hours	**16**
Spring		
SOFA-611	History and Aesthetics of Animation	3
SOFA-622	30 Second Film	3
SOFA-676	After Effects for Animators	3
SOFA-695	Advanced 3D Animation	3
Professional Elective [1]		3
	Hours	**15**
Second Year		
Fall		
SOFA-618	Business and Careers in Animation	3
SOFA-717	Animation Workshop	4
Professional Elective [1]		3
Open Elective		3
	Hours	**13**
Spring		
SOFA-625	Animated Acting Principles	3
SOFA-780	Thesis Preparation Seminar	1
Professional Elective [1]		3
Open Elective		3
Select one of the following:		3
SOFA-652	Alternative Frame by Frame	
SOFA-675	3D Lighting and Texturing	
	Hours	**13**
Third Year		
Fall		
SOFA-790	Research and Thesis I	4
	Hours	**4**
Spring		
SOFA-890	Research and Thesis II	4
	Hours	**4**
	Total Hours	**65**

[1] Students must select three (3) Professional Electives from the list below (p. 16).

Professional Electives

Code	Title	Hours
SOFA-603	2D Animation I: Fundamentals	3
SOFA-609	3D Animation III	3
SOFA-613	Graduate Screenwriting	3
SOFA-616	Virtual Production I	3
SOFA-617	Stop Motion Puppet Fundamentals	3
SOFA-619	2D Effects Animation	3
SOFA-620	3D Modeling Mastery	3
SOFA-629	Experimental Animation	3
SOFA-634	Virtual Production II	3
SOFA-637	Radical Cinema Workshop	4
SOFA-638	Complete 3D Character Creation	3
SOFA-652	Alternative Frame by Frame	3
SOFA-675	3D Lighting and Texturing	3
SOFA-681	Particle Effects and Dynamics	3
SOFA-684	Animation Gesture	3

Film and Animation (production option), MFA degree, typical course sequence

Subplan Code: PRODTN-GR

First Year		
Fall		**Hours**
SOFA-602	Production Processes	6
SOFA-605	Basic Sound Recording	3
SOFA-607	Advanced Directing	3
SOFA-610	Graduate Seminar	2
SOFA-613	Graduate Screenwriting	3
	Hours	**17**
Spring		
SOFA-621	Spring Film	3
SOFA-626	Writing the Short	3
Professional Elective [1]		3
History and Aesthetics Elective [2]		3
	Hours	**12**
Second Year		
Fall		
SOFA-614	Business and Careers in Film	3
SOFA-678	Cinematography and Lighting I	3
SOFA-721	Fall Film	3
Professional Elective [1]		3
Open Elective		3
	Hours	**15**
Spring		
SOFA-733	Hybrid Forms: Theory and Practice	3
SOFA-780	Thesis Preparation Seminar	1
Professional Elective [1]		3
History and Aesthetics Elective [2]		3
Open Elective		3
	Hours	**13**
Third Year		
Fall		
SOFA-790	Research and Thesis I	4
	Hours	**4**
Spring		
SOFA-890	Research and Thesis II	4
	Hours	**4**
	Total Hours	**65**

1. Students must select three (3) Professional Electives from the list below (p. 17).
2. Students must select two (2) History and Aesthetics Electives from the list below (p. 17).

Professional Electives

Code	Title	Hours
SOFA-616	Virtual Production I	3
SOFA-634	Virtual Production II	3
SOFA-635	Acting for Film	3
SOFA-637	Radical Cinema Workshop	4
SOFA-641	Advanced Sound Recording	3
SOFA-652	Alternative Frame by Frame	3
SOFA-655	Film Practice:	3
SOFA-657	Digital Color Correction	3
SOFA-671	Advanced Production Immersion	3
SOFA-672	Mixing and Sound Design	3
SOFA-678	Cinematography and Lighting I	3
SOFA-682	Underwater Cinematography	3
SOFA-683	Advanced Editing	3
SOFA-689	Cinematography and Lighting II	3

History and Aesthetics Electives

Code	Title	Hours
ARTH-6xx Any ARTH-600 level course or above		3
PHGR-701	Histories and Aesthetics of Photography I	3
PHGR-702	Histories and Aesthetics of Photography II	3
SOFA-642	History and Aesthetics: Animation Stories	3
SOFA-660	Documentary Film History	3
SOFA-661	New Documentary Issues	3
SOFA-662	Film History	3
SOFA-691	Film Sound Theory: Music	4
SOFA-692	Film Sound Theory: Effects	4
SOFA-693	Film Sound Theory: Voice	4

Film and Animation (screenwriting option), MFA degree, typical course sequence

Subplan Code: SCRPTWT-GR

First Year		
Fall		**Hours**
SOFA-602	Production Processes	6
SOFA-605	Basic Sound Recording	3
SOFA-607	Advanced Directing	3
SOFA-610	Graduate Seminar	2
SOFA-613	Graduate Screenwriting	3
	Hours	**17**
Spring		
SOFA-621	Spring Film	3
SOFA-626	Writing the Short	3
Professional Elective [1]		3
History and Aesthetics Elective [2]		3
	Hours	**12**
Second Year		
Fall		
SOFA-614	Business and Careers in Film	3
SOFA-663	Writing the Feature	3
SOFA-721	Fall Film	3
History and Aesthetics Elective [2]		3
Open Elective		3
	Hours	**15**
Spring		
SOFA-664	Writing the Series	3
SOFA-733	Hybrid Forms: Theory and Practice	3
SOFA-780	Thesis Preparation Seminar	1
History and Aesthetics Elective [2]		3
Open Elective		3
	Hours	**13**
Third Year		
Fall		
SOFA-790	Research and Thesis I	4
	Hours	**4**
Spring		
SOFA-890	Research and Thesis II	4
	Hours	**4**
	Total Hours	**65**

[1] Students must select one (1) Professional Elective from the list below (p. 18).
[2] Students must select three (3) History and Aesthetics Electives from the list below. (p. 18)

Professional Electives

Code	Title	Hours
SOFA-616	Virtual Production I	3
SOFA-634	Virtual Production II	3
SOFA-635	Acting for Film	3
SOFA-637	Radical Cinema Workshop	4
SOFA-641	Advanced Sound Recording	3
SOFA-652	Alternative Frame by Frame	3
SOFA-655	Film Practice:	3
SOFA-657	Digital Color Correction	3
SOFA-671	Advanced Production Immersion	3
SOFA-672	Mixing and Sound Design	3
SOFA-678	Cinematography and Lighting I	3
SOFA-682	Underwater Cinematography	3
SOFA-683	Advanced Editing	3
SOFA-689	Cinematography and Lighting II	3

History and Aesthetics Electives

Code	Title	Hours
ARTH-6xx Any ARTH-600 level course or above		3
PHGR-701	Histories and Aesthetics of Photography I	3
PHGR-702	Histories and Aesthetics of Photography II	3
SOFA-642	History and Aesthetics: Animation Stories	3
SOFA-660	Documentary Film History	3
SOFA-661	New Documentary Issues	3
SOFA-662	Film History	3
SOFA-691	Film Sound Theory: Music	4
SOFA-692	Film Sound Theory: Effects	4
SOFA-693	Film Sound Theory: Voice	4

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Film and Animation program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Fine Arts Studio MFA

Plan Code: FNAS-MFA | **HEGIS:** 1002.00

Program Overview

The fine arts studio MFA explores the role of contemporary art through painting, printmaking, sculpture, and expanded forms. The program is committed to collaboration and interdisciplinary approaches both within the four major fine arts areas of study (painting, printmaking, sculpture, or expanded forms) and the entire College of Art and Design. The curriculum is a rigorous two-year program comprised of major studio courses, studio electives (such as glass, ceramics, film, and photography), theory and research seminars, and thesis credits. The program's structure allows for personal growth, experimentation, collaboration, and unique, non-discipline-specific results to occur in the thesis, which is a public exhibition of the student's work. Courses are meant to concentrate on creative visual work coupled with consideration to making and sustaining a dialogue.

Cooperative education, internships, and other experiential learning opportunities are strongly encouraged for graduate students in the MFA in fine arts studio.

Accreditation

The master of fine arts program in fine arts studio is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
STAR-701	Technology in the Studio	3
STAR-714	Ideation and Series	3
Major Studio [1]		3
Major Studio [1]		3
Open Elective		3
	Hours	**15**
Spring		
STAR-702	Studio Art Research	3
Major Studio [1]		3
Major Studio [1]		3
Professional Elective [2]		3
Open Elective		3
	Hours	**15**
Second Year		
Fall		
STAR-706	Business Practices for Studio Artists	3
STAR-790	Research and Thesis	3
Major Studio [1]		3
Major Studio [1]		3
Open Elective		3
	Hours	**15**
Spring		
STAR-718	Research Methods and Publication	3
STAR-890	Thesis	6
Major Studio [1]		3
Major Studio [1]		3
	Hours	**15**
	Total Hours	**60**

1 To meet the 24-credit course requirements, any of the four major studio courses listed below (p. 19) can be retaken 4 times (12-credit hours). The major studio courses are designed to develop the individual student's creative and technical abilities in the particular focus of the course selected. Course content is not sequential but continually build on previous experience.

2 Students must select one (1) Professional Elective from the list below (p. 19).

Major Studio Courses

Graduate students in the Fine Arts Studio program may choose any combination of Major Studio courses:

Code	Title	Hours
PAIT-601	Painting	3
PRNT-601	Printmaking	3
SCUL-601	Sculpture	3
SCUL-611	Expanded Forms	3

Professional Electives

Code	Title	Hours
ARTH-6xx	Any ARTH-600 level course or above	3
IDEA-705	Thinking About Making: The Practice of Art in a Global Society	3
IDEA-776	College Teaching and Learning	3
STAR-635	Curating and Managing Art Spaces	3
STAR-645	Art Exhibition Critque	3
STAR-758	Studio Art Critique	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Fine Arts Studio program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.

- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Furniture Design MFA

Plan Code: WOOD-MFA | **HEGIS:** 1009.00

Program Overview

RIT's MFA in furniture design is structured to support your individual interests and aesthetic development. While engaging in the design and construction of a range of furniture objects, you will be challenged to advance your aesthetic, conceptual, and design sensibilities while simultaneously strengthening your furniture building techniques and construction strategies. You will be exposed to a broad range of contemporary practices and creative approaches to design and art-making in support of experimentation and critical reflection. The first year of the program exposes you to a broad range of critical issues related to the conception and production of art, and serves to inspire and provoke your critical reflection, as well as facilitates the development of your preliminary thesis topic. You will spend ample time creating work, while you strengthen your woodworking techniques, design fundamentals, and your sense of personal creative expression. In the second year, you will continue to refine your work aesthetic as you propose and fully engage in a thesis project. You will work with RIT's gallery coordinators and curators to install and exhibit a final body of work.

Cooperative education, internships, and other experiential learning opportunities are optional but strongly encouraged for graduate students in the MFA in furniture design.

Accreditation

The master of fine arts program in furniture design is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CWFD-601	Furniture Design Graduate Studio [1]	6
STAR-701	Technology in the Studio	3
STAR-714	Ideation and Series	3
Open Elective		3
	Hours	**15**
Spring		
CWFD-601	Furniture Design Graduate Studio [1]	6
STAR-702	Studio Art Research	3
Professional Elective [2]		3
Open Elective		3
	Hours	**15**
Second Year		
Fall		
CWFD-601	Furniture Design Graduate Studio [1]	6
STAR-706	Business Practices for Studio Artists	3
STAR-790	Research and Thesis	3
Open Elective		3
	Hours	**15**
Spring		
CWFD-601	Furniture Design Graduate Studio [1]	6
STAR-718	Research Methods and Publication	3

STAR-890	Thesis	6
	Hours	**15**
	Total Hours	**60**

[1] The graduate studio course (CWFD-601 Furniture Design Graduate Studio) is a repetitive, 24-credit hour requirement. Course content is not sequential but continually builds on previous experiences. By retaking this course four times, students develop their creative and technical skills in the particular focus.

[2] Students must select one (1) Professional Elective from the list below (p. 21).

Professional Electives

Code	Title	Hours
ARTH-6xx Any ARTH-600 level course or above		3
IDEA-705	Thinking About Making: The Practice of Art in a Global Society	3
IDEA-776	College Teaching and Learning	3
STAR-635	Curating and Managing Art Spaces	3
STAR-645	Art Exhibition Critque	3
STAR-758	Studio Art Critique	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Furniture Design program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. View the general cost of attendance (https://www.rit.edu/admissions/tuition-and-fees/) or estimate the cost of your graduate degree (https://www.rit.edu/admissions/graduate/estimate-education-costs/).

A combination of sources can help fund your graduate degree. Learn how to fund your degree (https://www.rit.edu/admissions/financial-aid/graduate-funding-sources/)

Crafts Scholarships

Students applying to the MFA programs in ceramics, glass, furniture design, and metals and jewelry design may apply for a competitive, full-tuition scholarship. Learn more about the crafts scholarships (https://www.rit.edu/artdesign/crafts-scholarships/), including eligibility, application requirements, and deadlines to apply.

Glass MFA

Plan Code: GLASS-MFA | **HEGIS:** 1009.00

Program Overview

The MFA in glass develops your personal creative voice through intensive research, discussion, critique, and experimentation in glass. While working on your advanced degree in glassblowing, you will be given full access to a complete glass facility and individual studio space. Graduate studio courses, seminar courses, and in-depth critiques give you a deeper understanding of the craft of glass as you design pieces that flourish your personal expression. In addition to course work and creative production, you will be exposed to a broad range of critical issues related to the conception and production of art that will inspire and provoke critical reflection and facilitate the development of a thesis exhibition and supporting documentation. During the two-year program you will spend time creating in a range of top facilities designed for you to explore, learn, and develop your glassblowing and flameworking techniques. You will also have access to an individual studio space that will strengthen your techniques and provide practice in designing glass artwork that reflects your personal expression of the medium.

Cooperative education, internships, and other experiential learning opportunities are strongly encouraged for graduate students in the MFA in glass.

Accreditation

The master of fine arts program in glass is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CGLS-601	Glass Graduate Studio: Concepts [1]	3
CGLS-602	Glass Graduate Studio: Practice [1]	3
STAR-701	Technology in the Studio	3
STAR-714	Ideation and Series	3
Open Elective		3
	Hours	**15**
Spring		
CGLS-601	Glass Graduate Studio: Concepts [1]	3
CGLS-602	Glass Graduate Studio: Practice [1]	3
STAR-702	Studio Art Research	3
Professional Elective [2]		3
Open Elective		3
	Hours	**15**
Second Year		
Fall		
CGLS-601	Glass Graduate Studio: Concepts [1]	3
CGLS-602	Glass Graduate Studio: Practice [1]	3
STAR-706	Business Practices for Studio Artists	3
STAR-790	Research and Thesis	3
Open Elective		3
	Hours	**15**
Spring		
CGLS-601	Glass Graduate Studio: Concepts [1]	3
CGLS-602	Glass Graduate Studio: Practice [1]	3
STAR-718	Research Methods and Publication	3
STAR-890	Thesis	6
	Hours	**15**
	Total Hours	**60**

1 The graduate studio courses (CGLS-601 Glass Graduate Studio: Concepts and CGLS-602 Glass Graduate Studio: Practice) are repeatable, 24-credit hour requirements. Course content is not sequential but continually builds on previous experiences.

2 Students must select one (1) Professional Elective from the list below (p. 22).

Professional Electives

Code	Title	Hours
ARTH-6xx Any ARTH-600 level course or above		3
IDEA-705	Thinking About Making: The Practice of Art in a Global Society	3
IDEA-776	College Teaching and Learning	3
STAR-635	Curating and Managing Art Spaces	3
STAR-645	Art Exhibition Critque	3
STAR-758	Studio Art Critique	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Glass program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. View the general cost of attendance (https://www.rit.edu/admissions/tuition-and-fees/) or estimate the cost of your graduate degree (https://www.rit.edu/admissions/graduate/estimate-education-costs/).

A combination of sources can help fund your graduate degree. Learn how to fund your degree (https://www.rit.edu/admissions/financial-aid/graduate-funding-sources/)

Crafts Scholarships

Students applying to the MFA programs in ceramics, glass, furniture design, and metals and jewelry design may apply for a competitive, full-tuition scholarship. Learn more about the crafts scholarships (https://www.rit.edu/artdesign/crafts-scholarships/), including eligibility, application requirements, and deadlines to apply.

Industrial Design MFA

Plan Code: IDDE-MFA | **HEGIS:** 1009.00

Program Overview

Form, function, and experience tell a story of considered design and the best possible outcome. RIT's industrial design MFA will enhance your career success by further developing your knowledge in design processes and technology. This project-based program allows you to explore design theory, design history, and human-centered design. You will conduct unique research on various topics which will further your understanding of the industry and society. As you conclude your studies, you will obtain hands-on experience in technical competence, analytical thought, sustainability, and transdisciplinary collaboration, all key to fueling your career. The project-oriented program is designed to enhance your career or to take you in a new redirection. The first year of study includes seminar courses in design history and research, which are common to all graduate students in the School of Design. In addition, studio courses involve extensive design work with respect to sustainability, design process, the meaning of artifacts, and critical analysis. Additional course work using three-dimensional software for modeling and fabrication fills out the program. In the second year, students conduct research and develop a thesis project.

Cooperative education, internships, and other experiential learning opportunities are encouraged for graduate students in the MFA in industrial design.

Accreditation

The master of fine arts program in industrial design is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
IDDE-607	Technology Studio	3
IDDE-701	Design Laboratory I	3
IDDE-703	Function of Form	3
IDDE-705	2D Ideation and Visualization	3
IDDE-710	Industrial Design History, Theory, and Culture	3
	Hours	**15**
Spring		
IDDE-702	Design Laboratory II	3
IDDE-704	Form of Function	3
IDDE-706	Integrated Design Visualization	3
IDDE-711	Design Research and Proposals	3
Open Elective		3
	Hours	**15**
Second Year		
Fall		
IDDE-671	Graduate ID Studio I	3
IDDE-790	Thesis: Research and Planning	6
Art History Elective [1]		3
Open Elective		3
	Hours	**15**
Spring		
IDDE-672	Graduate ID Studio II	3

IDDE-890	Thesis: Implementation and Evaluation	6
Open Electives		6
	Hours	**15**
	Total Hours	**60**

1 The Art History Elective is any designated graduate-level Art History course offered from CAD or COLA.

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Industrial Design program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Metals and Jewelry Design MFA

Plan Code: METAL-MFA | **HEGIS:** 1009.00

Program Overview

The MFA in metals and jewelry design is a professional degree for practicing artists, craftspeople, or designers who desire to leave a lasting impression on their fields through devotion to their work and to the high standards of discipline and artistic ideals. By immersing yourself in soldering, fabrication, stone setting, silversmithing, forging, and casting, this jewelry design degree will develop your knowledge and deepen your experience. You will work with different theories and materials while you are challenged to think unconventionally to redefine industry standards. You will spend ample time creating work while also exploring the process of critical analysis of your studio work. You will also gain deep knowledge in gallery administration and operations, and you'll participate in gallery and museum visitations and research. You will also learn the business side of art, including portfolio management, pricing, marketing strategies, and public relations–all skills needed by artists who embark on a professional career as a studio artist. The program involves the presentation of a thesis at the end of your studies.

Cooperative education, internships, and other experiential learning opportunities are encouraged for graduate students in the MFA in metals and jewelry design.

Accreditation

The master of fine arts program in metals and jewelry design is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CMTJ-601	Metals and Jewelry Design Graduate Studio [1]	6
STAR-701	Technology in the Studio	3
STAR-714	Ideation and Series	3
Open Elective		3
	Hours	**15**
Spring		
CMTJ-601	Metals and Jewelry Design Graduate Studio [1]	6
STAR-702	Studio Art Research	3
Professional Elective [2]		3
Open Elective		3
	Hours	**15**
Second Year		
Fall		
CMTJ-601	Metals and Jewelry Design Graduate Studio [1]	6
STAR-706	Business Practices for Studio Artists	3
STAR-790	Research and Thesis	3
Open Elective		3
	Hours	**15**
Spring		
CMTJ-601	Metals and Jewelry Design Graduate Studio [1]	6
STAR-718	Research Methods and Publication	3
STAR-890	Thesis	6
	Hours	**15**
	Total Hours	**60**

[1] The graduate studio course (CMTJ-601 Metals and Jewelry Design Graduate Studio) is a repetitive, 24-credit hour requirement. Course content is not sequential but continually builds on previous experiences. By retaking this course four times, students develop their creative and technical skills in the particular focus.

[2] Students must select one (1) Professional Elective from the list below (p. 25).

Professional Electives

Code	Title	Hours
ARTH-6xx Any ARTH-600 level course or above		3
IDEA-705	Thinking About Making: The Practice of Art in a Global Society	3
IDEA-776	College Teaching and Learning	3
STAR-635	Curating and Managing Art Spaces	3
STAR-645	Art Exhibition Critique	3
STAR-758	Studio Art Critique	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Metals and Jewelry Design program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None

- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. View the general cost of attendance (https://www.rit.edu/admissions/tuition-and-fees/) or estimate the cost of your graduate degree (https://www.rit.edu/admissions/graduate/estimate-education-costs/).

A combination of sources can help fund your graduate degree. Learn how to fund your degree (https://www.rit.edu/admissions/financial-aid/graduate-funding-sources/)

Crafts Scholarships

Students applying to the MFA programs in ceramics, glass, furniture design, and metals and jewelry design may apply for a competitive, full-tuition scholarship. Learn more about the crafts scholarships (https://www.rit.edu/artdesign/crafts-scholarships/), including eligibility, application requirements, and deadlines to apply.

Photography and Related Media MFA

Plan Code: IMGART-MFA | **HEGIS:** 1011.00

Program Overview

RIT's MFA in photography and related media emphasizes an expansive interpretation of photography as a conceptual art form, while nurturing the individuality of each student in their continued development as innovative, critical artists in the world. Successful completion of the MFA in photography enables you to become a successful visual artist and to seek careers in education, archives, museum or gallery work, or as a professional photographer. The program polishes your technical and artistic photographic skills while you refine your artistic vision and create a new body of work. You will spend time in state-of-the-art imaging facilities designed for you to explore, learn, and develop your photography skills and techniques. Elective courses are available in dynamic areas such as video, printmaking, painting, sculpture, communication design, crafts, bookmaking, graphic design, new media, computer graphics, art history, and archival preservation and conservation. Students also have opportunities to enhance their studies through independent studies and internships. The program culminates in a graduate thesis exhibition, where you will install and exhibit an original body of work.

Cooperative education, internships, and other experiential learning opportunities are encouraged for graduate students in the MFA in photography and related media.

Accreditation

The master of fine arts program in photography and related media is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
PHGR-701	Histories and Aesthetics of Photography I	3
PHGR-703	Studio Core I	6
PHGR-716	Integrated Practices I	3
Open Elective		3
	Hours	**15**
Spring		
PHGR-702	Histories and Aesthetics of Photography II	3
PHGR-704	Studio Core II	6
Professional Elective [1]		3
CAD Studio Elective [2]		3
	Hours	**15**
Second Year		
Fall		
PHGR-721	Research Core I	3
PHGR-724	Professional Development for the Emerging Artist	3
PHGR-890	Thesis	6
Open Elective		3
	Hours	**15**
Spring		
PHGR-723	Research Core II	3
PHGR-890	Thesis	6

Open Electives	6
Hours	**15**
Total Hours	**60**

[1] Professional Electives are graduate studio courses offered in Photography and Related Media Program (PHGR).
[2] CAD Studio Electives are graduate courses offered by CAD that are designated with studio/lab hours in the course description.

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Photography and Related Media program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Visual Arts - All Grades (Art Education) MST

Plan Code: VISART-MST | **HEGIS:** 0831.00

Program Overview

The MST in visual arts-all grades (art education) prepares you to teach the next generation of artists and to create art experiences while honing your own artistic skills. RIT's art education master's degree is an accelerated visual arts education program in which you will gain a year of hands-on experience that will heavily mirror your life as an art educator. The program prepares you for a teaching career by embedding certifications and job placement support right into the curriculum. You will work with regional schools to find the best fit for your personality, talents, and teaching goals. The program features pedagogical studies, studio inquiry, clinical fieldwork, and community partnerships. The curriculum prepares candidates to meet the national, state, and regional needs of teachers of the visual arts. RIT's art education master's degree leads to Initial/Professional New York State certification in visual arts for pre-K through 12th grades. The program is nationally accredited and is for candidates who hold a BFA or BA in an area of art including studio, design, new media, or photography.

Accreditation

The master of science for teachers visual arts–all grades program maintains Initial Program accreditation from the Council for the Accreditation of Educator Preparation (CAEP), www.caepnet.org (https://caepnet.org/). The program's most recent CAEP accreditation approval was spring 2021. Reporting outcomes and student achievement data (https://www.rit.edu/artdesign/accreditation-and-program-review/) are available for review on the College of Art and Design website.

Educator Preparation Program: Master of Science for Teachers, Visual Arts - All Grades
Level: Initial
Date Reviewed/Next Review: Spring 2021/Fall 2028

The master of science for teachers visual arts-all grades program is also accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ARED-701	Child Development in Art	3
ARED-702	Inclusive Art Education: Teaching Students with Disabilities in the K-12 Art Classroom	3
ARED-703	Multicultural Issues in Art and Education	3
ARED-704	Methods in Teaching and Learning	3
ARED-705	Methods II: Studio Thinking	3
CAD Studio Elective [1]		3
	Hours	**18**
Spring		
ARED-711	Professional Practices in Art Education	3
ARED-790	Student Teaching	9
ARED-890	Graduate Seminar in Art Education	6
	Hours	**18**
	Total Hours	**36**

[1] CAD Studio Electives are graduate courses offered by CAD that are designated with studio/lab hours in the course description.

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Visual Arts–All Grades (Art Education) program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Visual Communication Design MFA

Plan Code: VISCOM-MFA | **HEGIS:** 1009.00

Program Overview

RIT's visual communication design MFA offers a comprehensive opportunity to investigate the intersection of graphic, interaction, and motion design. The curriculum focuses on conceptualizing and creating user-centered design wherever there is a screen or digital experience, including mobile phones, automotive instrument panels, medical devices, wearables, and more. The program reinforces the importance of user experience design by combining insight from all areas of design. You may choose to concentrate your studies or combine course sequences from communication design, interaction design, motion design, and design studies. By combining historical, communication and aesthetic theory, design principles, and creativity, your work will anticipate design evolution and lead innovation. You will advance your design knowledge and technical skills by choosing an option in communication design, interaction design, or motion or 3D digital design. The cross-disciplinary nature of the program offers greater potential to foster innovation and creativity in visual communication design. The program reflects the current views and changes occurring in the professional design field, and the skill sets required of graphic, interactive, and digital design have now crossed over and are interrelated.

Cooperative education, internships, and other experiential learning opportunities are encouraged for graduate students in the MFA in visual communication design.

Accreditation

The master of fine arts program in visual communication design is accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
VCDE-701	Design History Seminar	3
VCDE-706	3D Modeling and Motion	3
VCDE-707	Web and UI Design	3
VCDE-708	Typography	3
VCDE-709	Digital Design in Motion	3
	Hours	**15**
Spring		
VCDE-712	Design Studies Seminar	3
Professional Elective [1]		3
Professional Elective [1]		3
Open Elective		3
Select one of the following:		3
VCDE-718	Project Design and Implementation	
VCDE-722	Design Praxis I	
	Hours	**15**
Second Year		
Fall		
VCDE-790	Thesis: Research and Planning	3
Professional Elective [1]		3
Professional Elective [1]		3
Professional Elective [1]		3

Open Elective		3
	Hours	**15**
Spring		
VCDE-890	Thesis: Implementation and Evaluation	6
Professional Elective [1]		3
Open Electives		6
	Hours	**15**
	Total Hours	**60**

[1] Students must select six (6) Professional Electives from the list below (p. 30).

Professional Electives

Professional electives are approved graduate studio courses (listed below) offered in Visual Communication Design (VCDE). Professional Electives can count towards any Open Elective requirement.

Code	Title	Hours
VCDE-601	Advanced Design Systems	3
IGME-609	Programming for Designers	3
VCDE-617	Experimental Workshop	3
VCDE-621	Character Design and Rigging	3
VCDE-622	3D Environment Design	3
VCDE-626	Physical Interface Design	3
VCDE-627	Real Time Design	3
VCDE-628	3D Particles and Dynamics	3
VCDE-633	Hard Surface Modeling	3
VCDE-636	3D Motion Design	3
VCDE-702	Materials and Methods for Advanced Graphics	3
VCDE-717	Design Systems	3
VCDE-723	Interaction Design	3
VCDE-726	Design Praxis II	3
VCDE-728	Motion Graphics	3
VCDE-731	3D Visual Design	3
VCDE-732	Branding and Identity Design	3
VCDE-733	Digital Media Integration	3
VCDE-737	UX Design Strategies	3
VCDE-741	Experiential Graphic Design	3
VCDE-742	Information Design	3
VCDE-746	Professional Practices	3
VCDE-799	Visual Communication Design Independent Study	1-4

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Visual Communication Design program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

College of Art and Design Faculty

Dean's Office

Todd Jokl, BA, Yale University; MFA, University of Connecticut; Ed.D., Southern Connecticut State University—Dean, Professor

Chris B. Jackson, BFA, Alfred University; MFA, Rochester Institute of Technology—Senior Associate Dean; Professor

Christine Shank, BFA, Miami University; MFA, Texas Woman's University—Associate Dean of Undergraduate Studies; Associate Professor

School for American Crafts

Andy Buck, BA, Virginia Commonwealth University; MFA, Rhode Island School of Design—Professor

Juan Carlos Caballero-Perez, BFA, MFA, Rochester Institute of Technology—Professor

Laurel Fulton, BA, University of Northern Colorado; MFA, University of Georgia—Assistant Professor

Rolf Hoeg, AOS, BS, Rochester Institute of Technology; MFA, Vermont College of Fine Arts—Lecturer

Albert Paley, BFA, MFA, Temple University; Ph.D. (honorary), University of Rochester—Artist-in-Residence, Charlotte Fredericks Mowris Chair in Contemporary Crafts

Suzanne Peck, BA, The Colorado College; MFA, Rhode Island School of Design—Lecturer

David Schnuckel, BA, Anderson University; MFA, Rochester Institute of Technology—Charlotte Mowris Fellow; Associate Professor

Jane Shellenbarger, BFA, Kansas City Art Institute; MFA, Southern Illinois University at Edwardsville—Graduate Co-Director, School for American Crafts; Ann Mowris Mulligan Endowed Professor

School of Art

Michaël Amy, BA, Vrije Universiteit Brussel (Belgium); MA, Ph.D., New York University—Distinguished Professor

Rachel Bajema, BA, University of Southern California; MS, University of Illinois at Chicago—Assistant Professor

Kofi Bazzell-Smith, BA, Eastern Illinois University; MFA, University of Illinois—Future Faculty Fellow

Denton Crawford, BFA, University of South Florida; MFA, University of Georgia—Graduate Director, Fine Art Studio; Senior Lecturer

Craig Foster, BFA, University of Michigan; MS, Medical College of Georgia at Augusta University—Undergraduate Program Co-Director, Medical Illustration; Associate Professor

Alan Gesek, BFA, MFA, Rochester Institute of Technology—Visiting Lecturer

Emily Glass, BFA, State University College at Potsdam; MFA, Kansas State University—Principal Lecturer

Kathleen Johnson, BFA, Fashion Institute of Technology; MFA, Rochester Institute of Technology—Art Experience Director; Visiting Lecturer

Taylor Kennedy, BFA, Rochester Institute of Technology; MFA, Pratt Institute—Visiting Lecturer

Elizabeth Kronfield, BFA, Bowling Green State University; MFA, University of Georgia—Director, School of Art and School for American Crafts; Professor

Christina Leung, BA, Miami University of Ohio; MFA, Cornell University—Visiting Assistant Professor

Heidi Nickisher, BA, University of California at Santa Barbara; MA, California State University, Fullerton; Ph.D., University of Buffalo—Principal Lecturer

Peter Pincus, BFA, MFA, New York State College of Ceramics at Alfred University—Associate Professor

Lauren Ramich, BFA, MST, MFA, Rochester Institute of Technology—Graduate Director, Visual Arts-All Grades; Lecturer

Jennifer Schoonmaker, BFA, MFA, State University Ciollege at New Paltz; MFA, Rochester Institute of Technology—Visiting Lecturer

Luvon Sheppard, BFA, MST, Rochester Institute of Technology—Professor

Ellen Tani, BA, Dartmouth College; Ph.D., Stanford University—Assistant Professor

Sarah Thompson, BA, University of California at San Diego; MA, Ph.D., University of California at Santa Barbara—Associate Professor

Alesha Williams, BFA, Columbus College of Art and Design; MFA, Kent State University—Assistant Professor

Daniel Worden, BA, Texas Christian University; MA, Ph.D., Brandeis University—Cary Fellow in Comics Studies at RIT's Cary Graphic Arts Collection; Professor

Clifford Wun, BFA, Rhode Island School of Design; MFA, Maryland Institute College of Art—Associate Professor

Alexander Zimmerman, BFA, University of Washington; MFA, San Diego State University—Visiting Lecturer

School of Design

Jason Arena, BS, University of Buffalo; MFA, Pratt Institute—Undergraduate Program Director, New Media Design; Associate Professor

Peter Byrne, MFA, York University (Canada)—Professor

Joey Byun, BFA, Hongik University (South Korea); MFA, Rochester Institute of Technology—Assistant Professor

Melissa Dawson, BS, Cornell University; MFA, Rochester Institute of Technology—Undergraduate Program Director, Industrial Design; Associate Professor

Daniel DeLuna, BFA, Ball State University; MFA, Pratt Institute—Associate Professor

David Halbstein, BA, MA, William Patterson University—Associate Professor

Rachel Herring Gill, BFA, Auburn University; MFA, Rutgers University—Assistant Professor

Joyce Hertzson, BFA, Rhode Island School of Design; MFA, Indiana University—Professor

Chris B. Jackson, BFA, Alfred University; MFA, Rochester Institute of Technology—Senior Associate Dean; Professor

Alex Lobos, BA, Universidad Rafael Landivar (Guatemala); MFA, University of Notre Dame—Director, School of Design; Professor

Mindy Magyar, BS, Cornell University; MFA, Cranbrook Academy of Art; MBA, University of Pennsylvania—Associate Professor

Ihab Mardini, BA, International University of Science and Technology (Syria); MFA, Rochester Institute of Technology—Associate Professor

Steven Matteson, BS, Rochester Institute of Technology—Melbert B. Cary Endowed Professor in Graphic Arts; Visiting Associate Professor

Juan Noguera, BS, Colegio Lehnsen (Guatemala); BID, Universidad Rafael Landivar (Guatemala); MID, Rhode Island School of Design—Assistant Professor

Josh Owen, BA, BFA, Cornell University; MFA, Rhode Island School of Design—Director, Vignelli Center for Design Studies; Massimo and Lella Vignelli Distinguished Professor In Design

Stan Rickel, BID, Pratt Institute; MID, Syracuse University—Graduate Director, Industrial Design; Associate Professor

Joel Rosen, BFA, Virginia Commonwealth University; MFA, Rochester Institute of Technology—Lecturer

Amos Scully, BFA, Rochester Institute of Technology; MFA, California College of Arts and Crafts—Associate Professor

Adam Smith, BFA, MFA, Rochester Institute of Technology—Associate Professor

Michael Strobert, BFA, MFA, Rochester Institute of Technology—Graduate Director, Visual Communication Design; Senior Lecturer

Philip Szrama, BS, State University College at Geneseo; MFA, Rochester Institute of Technology—Assistant Professor

Marissa Tirone, B.Arch, University of Kentucky; M.Arch, Cornell University —Assistant Professor

School of Film and Animation

Amy Adrion, BA, Georgetown University; MFA, University of California, Los Angeles—Assistant Professor

Vashti Anderson, BA, University of Wisconsin-Madison; MFA, New York University—Assistant Professor

Meghdad Asadilari, BSc, MSc, Shiraz University (Iran); MFA, Rochester Institute of Technology— Assistant Professor

Christine A. Banna, BFA, Boston University; MFA, Tufts University—Assistant Professor

Kevin Bauer, BFA, State University College at Oneonta; MFA, Rochester Institute of Technology—Graduate Director, Film and Animation; Principal Lecturer

Jack Beck, BA, Denison University; MFA, University of Iowa—Undergraduate Program Director, Production; Professor

Mari Jaye Blanchard, BFA, Massachusetts College of Art & Design; MFA, University of Pennsylvania—Associate Professor

Frank Deese, BA, MFA, University of California, Los Angeles—Associate Professor

Ricardo Figueroa, BS, MS, University of Puerto Rico at Mayagüez; Ph.D., Rochester Institute of Technology—Director, School of Film and Animation; Professor

Brian Larson, BFA, Colorado State University; MFA, Miami International University—Undergraduate Program Director, Animation; Associate Professor

David Long, BS, University of Texas; MS, University of Rochester—Director, RIT MAGIC Center and MAGIC Spell Studios; Professor

Peter Murphey, BFA, Massachusetts College of Art; MFA, The Art Institute of Boston—Principal Lecturer

Atia Newman, BFA, National College of the Arts, Lahore (Pakistan); MFA, Pratt Institute—Associate Professor

Jesse O'Brien, BS, The Art Institute of Pittsburgh; MFA, The Academy of Art University—Assistant Professor

Flip Phillips, BFA, Ph.D., The Ohio State University—Professor

Mark Reisch, BFA, Savannah College of Art and Design; Certificate in Advanced Studies of Animation, AnimationMentor. Com; MFA, Rochester Institute of Technology Associate Professor

Jonathan Seligson, BFA, Rhode Island School of Design; MFA, California Institute of the Arts—Senior Lecturer

Andrew Sonntag, BA, Catholic University of America; MA, American University; MFA, Rochester Institute of Technology—Assistant Professor

Vanessa Sweet, BFA, The University of the Arts; MFA, California Institute of the Arts—Associate Professor

Shanti Thakur, BA, Ottawa University; BA, Concordia University; MFA, Temple University—Professor

Munjal Yagnik, BFA, MFA, Syracuse University—Associate Professor

School of Photographic Arts and Sciences

Kristy Boyce, BFA, Ryerson University (Canada); MFA, OCAD University (Canada)—Assistant Professor

Meredith Davenport, BFA, Rochester Institute of Technology; MFA, Hunter College—Associate Professor

Rachel Ferraro, BFA, Rochester Institute of Technology; MFA, Visual Studies Workshop—Associate Professor

Gregory Halpern, BA, Harvard University; MFA, California College of the Arts—Associate Professor

Rachel Hutcheson, BA, Virginia Commonwealth University; MA, School of the Art Institute of Chicago; Ph.D., Columbia University—Visiting Assistant Professor

Laurie O'Brien, BA, San Francisco State University; MFA, California Institute of the Arts—Undergraduate Program Director, Visual Media; James E. McGhee Fellow; Associate Professor

Juan Orrantia, MFA, University of Hartford; Ph.D., Yale University—Assistant Professor

Ahndraya Parlato, BA, Bard College; MFA, California College of the Arts—Assistant Professor

Jennifer Poggi, BS, Syracuse University; MA, Ohio University—Undergraduate Program Director, Photojournalism; Associate Professor

Robert Rose, BS, Rochester Institute of Technology; M.Ed, American InterContinental University—Graduate Director, Media Arts and Technology; Associate Professor

Christine Shank, BFA, Miami University; MFA, Texas Woman's University—Associate Dean of Undergraduate Studies; Associate Professor

Christye Sisson, BS, MS, Rochester Institute of Technology—School Director, School of Photographic Arts and Sciences; Gannett Distinguished Professor

Josh Thorson, BA, University of Minnesota-Twin Cities; MFA, Bard College; Ph.D, Rensselaer Polytechnic Institute—Graduate Director, Photography and Related Media; Associate Professor

Carole Woodlock, BFA, Alberta College of Art (Canada); MFA, Concordia University—Professor

Catherine Zuromskis, BA, Harvard College; MA, University of New York at Stony Brook; MA, Ph.D., University of Rochester—Undergraduate Program Director, Fine Art Photography; Professor

Emeritus Faculty

Patricia Albanese, Professor Emeritus
Patti Ambrogi, Associate Professor Emeritus
Louis Andolino, Professor Emeritus
Charles Arnold, Jr., Professor Emeritus
Bekir Arpag, Professor Emeritus
Cathleen (Cat) Ashworth, Professor Emeritus
James Aumer, Professor Emeritus
Carl Battaglia, Professor Emeritus
MaryAnn Begland, Professor Emeritus
Jean-Louis Bigourdan, Research Scientist Emeritus
William Birkett, Professor Emeritus
Kener Bond, Professor Emeritus
Philip Bornarth, Professor Emeritus
Joseph Bowles, Professor Emeritus
Edward Brabant, Professor Emeritus
Harold J. Brennan, Dean Emeritus
Joseph E. Brown, Professor Emeritus
Donald Bujnowski, Professor Emeritus
Owen Butler, Professor Emeritus
Walter A. Campbell, Professor Emeritus
Adrianne Carageorge, Associate Professor Emeritus
Gunther Cartwright, Associate Professor Emeritus
Robert Chung, Professor Emeritus
Nancy Chwiecko, Associate Professor Emeritus
Nancy Ciolek, Associate Professor Emeritus
Douglas Cleminshaw, Associate Professor Emeritus
John Compton, Professor Emeritus
W. Frederick Craig, Professor Emeritus
Neil Croom, Professor Emeritus
Ira Current, Professor Emeritus
Andrew Davidhazy, Professor Emeritus
Denis Defibaugh, Professor Emeritus
David Dickinson, Professor Emeritus
William Dubois, Professor Emeritus
David Engdahl, Professor Emeritus
Lothar Engelmann, Professor Emeritus
Richard A. Floberg, Associate Professor Emeritus
Hugh Fox, Professor Emeritus
Clifton Frazier, Professor Emeritus
Tom Gasek, Professor Emeritus
Peter Giopulos, Professor Emeritus
Mark F. Guldin, Professor Emeritus
Ruth Gutfrucht, Professor Emeritus
Robert Hacker, Professor Emeritus
A. Ronald Handy, Associate Professor Emeritus
Mark Haven, Professor Emeritus
Robert Heischman, Professor Emeritus
Richard Hirsch, Professor Emeritus
Barbara Hodik, Professor Emeritus
Walter G.Horne, Professor Emeritus
Alfred Horton, Professor Emeritus
Robert H. Johnston, Dean Emeritus and Professor Emeritus
Lorraine Justice, Dean Emeritus and Professor Emeritus
Robert Kayser, Associate Professor Emeritus
Angela Kelly, Professor Emeritus
Weston Kemp, Professor Emeritus
Robert Keogh, Professor Emeritus
Michael Kepler, Professor Emeritus
Robert Kerr, Professor Emeritus
Bill Keyser, Professor Emeritus
Michael Kleper, Professor Emeritus
Russell Kraus, Professor Emeritus
Robert Kushner, Professor Emeritus
Patti Lachance, Associate Professor Emeritus
Howard Lester, Professor Emeritus
Howard LeVant, Professor Emeritus
Charles Lewis, Professor Emeritus
Thomas Lightfoot, Associate Professor Emeritus
Douglas Lyttle, Professor Emeritus
Stephanie Maxwell, Professor Emeritus
Craig McArt, Professor Emeritus
James Jr. McMillion, Professor Emeritus
Bruce Ian Meader, Professor Emeritus
Bernadette Merkel, Professor Emeritus
Robert Morgan, Professor Emeritus
Joe Noga, Professor Emeritus
Elaine O'Neil, Professor Emeritus
William Osterman, Professor Emeritus
William Pakan, Professor Emeritus
Archie Provan, Professor Emeritus
Harry Rab, Associate Professor Emeritus
Douglas Rea, Professor Emeritus
Werner Rebsamen, Professor Emeritus
R. Roger Remington, Professor Emeritus
Martin A. Rennalls, Professor Emeritus
James Rice, Professor Emeritus
Al Rickmers, Professor Emeritus
Albert D. Rickmers, Professor Emeritus
Donald L. Ritchie, Professor Emeritus
David Robertson, Professor Emeritus
Michael Rogers, Professor Emeritus
Frank Romano, Professor Emeritus
Nile Root, Professor Emeritus
Patricia Russotti, Associate Professor Emeritus

Emery Schneider, Professor Emeritus
Gerhard Schumann, Professor Emeritus
Marla Schwappe, Professor Emeritus
Anthony Sears, Professor Emeritus
William Shoemaker, Professor Emeritus
Douglas Sigler, Professor Emeritus
Julius Silver, Professor Emeritus
Donald Smith, Associate Professor Emeritus
Arnold Sorvari, Professor Emeritus
Miles Southworth, Professor Emeritus
Malcolm Guy Spaull, Director Emeritus and Professor Emeritus
Loret Steinberg, Associate Professor Emeritus
Joan Stone, Dean Emeritus
Leslie Stroebel, Professor Emeritus
Hector Sutherland, Professor Emeritus
Richard Tannen, Professor Emeritus
James Thomas, Professor Emeritus
Norman Thompson, Professor Emeritus
Toby Thompson, Professor Emeritus
Hollis N. Todd, Professor Emeritus
Robert Tompkins, Assistant Professor Emeritus
John Trauger, Professor Emeritus
Leonard Urso, Professor Emeritus
James VerHague, Professor Emeritus
Allen Vogel, Professor Emeritus
Joseph Watson, Professor Emeritus
Robert Webster, Associate Professor Emeritus
Charles J. Weigand, Associate Professor Emeritus
Charles Werberig, Professor Emeritus
Frans Wildenhain, Professor Emeritus
Norman Williams, Professor Emeritus
Edwin M. Wilson, Professor Emeritus
Tom Wilson, Professor Emeritus
Stanley H. Witmeyer, Professor Emeritus
Richard Zakia, Professor Emeritus

SAUNDERS COLLEGE OF BUSINESS

Overview

Success in the 21st century business environment requires leadership and management attuned to rapid changes in technology and increasingly vigorous global competition. Astute problem solvers who have gained a systems perspective must be able to convert product development and management challenges into competitive advantages. Saunders College of Business offers a portfolio of comprehensive, vigorous programs of study. Our innovative, multidisciplinary curriculum —embedding an international perspective and current technology throughout—produces graduates able to convert managerial learning into pragmatic business applications.

Please visit the college's website–**www.rit.edu/business (https://www.rit.edu/business/)**–for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

The college offering the program makes all decisions on graduate admission. Please refer to each individual program for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarship

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Accreditation

Saunders College of Business is accredited by the nationally recognized Association to Advance Collegiate Schools of Business (AACSB International), www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting agency for schools of business in the United States.

Graduate Programs

Doctoral Degrees

Master's Degrees

Advanced Certificates

Accounting and Analytics MS

Plan Code: ACCT-MS | **HEGIS:** 0502.00

Program Overview

RIT's master of science in accounting and analytics pulls together key areas of technology, finance, strategy, analytics, and data modeling to help you advance your accounting career. The innovative curriculum allows you to dive into the technology and data analytics for accounting, with a specific focus on developing traditional accounting acumen, understanding various ways in which accounting and business data is accessed and used, and using current industry tools in data access, data insights, and data visualization. The program will teach you methods to compile and use data, develop a familiarity with analyzing information to gain significant insights, predict future outcomes, and even ascertain risk. Today's market demands accounting and analytics graduates who can demonstrate a variety of data-related skills and an understanding of how technology can be used to further an organization's mission. RIT's master's in accounting analytics balances this modern need with traditional accounting preparation.

Students in the accounting and analytics MS are encouraged to participate in at least one cooperative education or internship experience.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ACCT-740	Comparative Financial Statement Analysis	3
ACCT-745	Accounting Information and Analytics	3
FINC-780	Financial Analytics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
	Hours	**12**
Spring		
Elective		3
ACCT-710	Tax Analysis and Strategy	3
ACCT-738	Information Systems Auditing and Assurance Services	3
ACCT-796	Accounting Capstone Experience	3
	Hours	**12**
Summer		
Electives		6
	Hours	**6**
	Total Hours	**30**

Approved Electives

All FINC, ACCT, and MGIS courses 600-700 level and other as approved by program director or department chair.

Code	Title	Hours
BANA-680	Data Management for Business Analytics [1]	3
BANA-780	Advanced Business Analytics [1]	3

[1] Students must have a background in Python and have permission from instructor

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Accounting and Analytics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Accounting and Financial Analytics Advanced Certificate

Plan Code: ACCFIN-ACT | **HEGIS:** 0703.00

This program is available online.

Program Overview

Developed and taught by RIT's esteemed faculty in Saunders College of Business, the advanced certificate in accounting and financial analytics provides knowledge in data science and statistical analysis, so accounting and finance professionals can mine and analyze data to improve business strategy, operations, and outcomes. Designed for working professionals studying part-time, you may complete this graduate certificate in 12 months. The program is available both online and on-campus. The analytics courses focus on a variety of applications across various business disciplines. This certificate provides you with the skills you need to operate effectively in today's modern, data-centric business environment. A selection of advanced financial analytics courses will help you learn how to access, interpret, analyze, and report business and financial data. Courses completed in the certificate program can be applied later to RIT's master's degree in business analytics, or they may be used as a valuable add-on if you are pursuing graduate degrees from RIT in fields such as finance, accounting and analytics, applied statistics, and computer science.

Curriculum

First Year		
Summer		**Hours**
ACCT-745	Accounting Information and Analytics	3
	Hours	**3**
Fall		
Select one of the following: [1]		3
MGIS-725	Data Management and Analytics	
BANA-680	Data Management for Business Analytics	
FINC-780	Financial Analytics	3
	Hours	**6**
Spring		
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
	Hours	**3**
	Total Hours	**12**

[1] This can be completed fall or spring.

Admission Requirements

This program is available on-campus or online.

On Campus
Offered: Part-time
Admit Term(s): Fall or Spring
Application Deadline: Rolling
STEM Designated: No

Online
Offered: Part-time
Admit Term(s): Fall or Spring
Application Deadline: Rolling
STEM Designated: No

Part-time study is 1-8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Accounting and Financial Analytics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Online Degree Information

The online Accounting and Financial Analytics Advanced Certificate can only be completed part-time, taking one or two courses per term. The average time to completion is one year. Delivery is a blend of asynchronous and synchronous study, and academic advisors work with students to select courses that meet degree requirements and student schedules. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Accounting and Financial Analytics Adv. Cert. is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Business Administration - Executive MBA

Plan Code: EXEC-MBA | **HEGIS:** 0506.00

Program Overview

The executive MBA program enhances your career through an applied academic and strategic-focused experience. The curriculum focuses on core business concepts that provide fundamental skills, knowledge, and perspectives in accounting, statistics, leadership, finance, negotiations, and economics. You will also develop skills in cross-functional analysis with an emphasis on strategy, marketing, technology, and international business. The program also augments your executive skills in strategic and cross-functional thinking, data-driven decision making, client consulting, and leadership while encouraging analytical thinking, problem solving, collaboration, and peer group interaction. Throughout the program, and especially during the required capstone consulting project, you will leverage RIT's local and regional relationships with area businesses.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Code	Title	Hours
Term: Residency		
MGMT-806	Team Building and Ethics	1
Term: 1		
ACCT-801	Financial Accounting and Reporting	2
ACCT-802	Managerial Accounting	2
DECS-810	Statistical Analysis for Managers	2
ESCB-840	Microeconomics & Pricing	2
MGMT-800	Leadership Development I	1
MGMT-810	Leadership	2
Term: 2		
FINC-845	Valuation and Capital Budgeting	2
FINC-846	Financial Planning and Analysis	2
MGMT-850	Negotiations and Decision-making	2
MGMT-818	Strategic Thinking I	2
MGMT-819	Strategic Thinking II	2
MKTG-851	Marketing Strategy	2
Term: 3		
DECS-864	Systems Support for Operations	2
DECS-875	Business Simulation	2
MGMT-801	Leadership Development II	1
MGMT-861	Managing Technology, Innovation and Research	2
MGMT-889	Capstone Consulting Project I	3
MKTG-865	Managing New Product Commercialization	2
Term: 4		
Approved Elective [1]		2
Approved Elective [1]		2
Approved Elective [1]		2
Approved Elective [1]		2
MGMT-890	Capstone Consulting Project II	3
Total Hours		**47**

[1] Select one elective from the Approved Electives.

Approved Electives

Choose 8 or more credits in one track:

Track 1: Traditional MBA Electives

Code	Title	Hours
FINC-850	International Finance	2
INTB-820	International Business	2
INTB-825	International Study Seminar	2
MGMT-860	Executive Leadership Series	2

Track 2: Life Science Electives

Code	Title	Hours
BIME-607	Graduate Biodesign	3
BIME-617	Principals of Biomedical Device Regulations	3
BIOL-625	Ethics in Bioinformatics	3
BIOL-689	Graduate Special Topics	3
STAT-614	Applied Statistics	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: June 30
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Business Administration–Executive program, candidates must fulfill the following requirements:

- Complete the Executive MBA graduate application (https://www.rit.edu/emba/apply/).
- Submit copies of official transcript(s) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae demonstrating a minimum of six years of professional experience and advanced technical, managerial, or executive responsibilities.

- Submit a personal statement consisting of 1) a description of a significant workplace challenge and how you resolved it and 2) your rationale for choosing RIT's Online EMBA program to enhance and fulfill your career objectives.
- Submit three letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 0
IELTS: 0.0
PTE Academic: 0

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

Tuition for the Executive MBA includes course materials, travel costs for trips, and access to RIT services.

Every Executive MBA student is eligible for exclusive program scholarships based on need and qualifications that can be combined with select company-sponsored plans, and qualifying discounts.

Learn more about Executive MBA tuition (https://www.rit.edu/emba/tuition/)

Business Administration - Online Executive MBA

Plan Code: ONLINE-MBA | **HEGIS:** 0506.00

This program is available exclusively online.

Program Overview

RIT's online executive MBA program is designed for busy professionals in established careers who are looking to improve executive skills in leadership as well as strategic and cross-functional thinking. The curriculum provides skills, knowledge and perspectives in the core business concepts of accounting, statistics, leadership, finance, negotiations, and economics. It also develops aptitude in cross-functional analysis with an emphasis on strategy, marketing, technology, and international business. Interdisciplinary examples, case analyses, and an applied orientation are also key components of the program. You will learn from knowledgeable and professional instructors as well as from your successful, motivated, and diverse peer group. When you leave the program, you will have a solid community of influential peers and a global alumni network to support your career.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Code	Title	Hours
Term: Residency		
MGMT-806	Team Building and Ethics	1
Term: 1		
ACCT-801	Financial Accounting and Reporting	2
ACCT-802	Managerial Accounting	2
DECS-810	Statistical Analysis for Managers	2
ESCB-840	Microeconomics & Pricing	2
MGMT-800	Leadership Development I	1
MGMT-810	Leadership	2
Term: 2		
FINC-845	Valuation and Capital Budgeting	2
FINC-846	Financial Planning and Analysis	2
MGMT-818	Strategic Thinking I	2
MGMT-819	Strategic Thinking II	2
MGMT-850	Negotiations and Decision-making	2
MKTG-851	Marketing Strategy	2
Term: 3		
DECS-864	Systems Support for Operations	2
DECS-875	Business Simulation	2
MGMT-801	Leadership Development II	1

MGMT-861	Managing Technology, Innovation and Research	2
MGMT-889	Capstone Consulting Project I	3
MKTG-865	Managing New Product Commercialization	2
Term: 4		
MGMT-890	Capstone Consulting Project II	3
Approved Elective [1]		2
Approved Elective [1]		2
Approved Elective [1]		2
Approved Elective [1]		2
Total Hours		**47**

[1] Select one Elective from the Approved Electives.

Approved Electives

Choose 8 or more credits in one track:

Track 1: Traditional MBA Electives

Code	Title	Hours
FINC-850	International Finance	2
INTB-820	International Business	2
INTB-825	International Study Seminar	2
MGMT-860	Executive Leadership Series	2

Track 2: Life Science Electives

Code	Title	Hours
BIME-607	Graduate Biodesign	3
BIME-617	Principals of Biomedical Device Regulations	3
BIOL-625	Ethics in Bioinformatics	3
BIOL-689	Graduate Special Topics	1-4
STAT-614	Applied Statistics	3

Admission Requirements

This program is available on-campus or online. The following admissions details apply to the on-campus program.

Offered Full-time
Full-time Admit Term(s): Fall, Spring, or Summer
Full-time Application Deadline: Fall - July 1; Spring - Dec. 1
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Business Administration–Online Executive program, candidates must fulfill the following requirements:

- Complete an Online EMBA graduate application (https://www.rit.edu/emba/apply/).
- Submit copies of official transcript(s) (in English) of all previously completed undergraduate and graduate coursework, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae demonstrating a minimum of six years of professional experience and advanced technical, managerial, or executive responsibilities.
- Submit a personal statement consisting of 1) a description of a significant workplace challenge and how you resolved it and 2) your rationale for choosing RIT's Online EMBA program to enhance and fulfill your career objectives.
- Submit three letters of recommendation.
- Entrance exam requirements: None
- Participate in an interview with the Program Director.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 0
IELTS: 0.0
PTE Academic: 0

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

Tuition for the Executive MBA includes course materials, travel costs for trips, and access to RIT services.

Every Executive MBA student is eligible for exclusive program scholarships based on need and qualifications that can be combined with select company-sponsored plans, and qualifying discounts.

Learn more about Executive MBA tuition (https://www.rit.edu/emba/tuition/)

Business Administration MBA

Plan Code: BUSADM-MBA | **HEGIS:** 0506.00

Program Overview

The master's in business administration at RIT prepares you for leadership positions with a strong focus on technology, strategy, entrepreneurship and data analytics. The MBA program curriculum focuses on core business concepts that provide fundamental skills, knowledge, and perspectives in accounting, statistics, leadership, finance, negotiations, and economics. While these core courses allow you to develop transferable skills highly valued in every kind of organization, your elective courses will help you build knowledge and aptitude in business areas that are specific to your career goals. At RIT, you will study alongside peers in business, as well as student and faculty artists, designers, engineers, and scientists. Industry advisory board members and a large worldwide network of alumni can help you connect to employers in meaningful ways through capstone projects, mentorships, guest speakers, career fairs, and a vast co-op program. As a globally diverse university, you will also have the opportunity to connect with an international student body on global campuses in Dubai, Croatia, or Kosovo.

Cooperative education in the MBA program is optional, but encouraged. Academic credit is not granted, but formal recording of the co-op experience is made on the student's transcript. Students in good academic standing are eligible for co-op after completing the foundation course, and a substantial portion of their concentration courses. They also must attend a series of co-op and career services workshops. RIT does not guarantee co-op placements.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ACCT-603	Accounting for Decision Makers	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGMT-740	Leading Teams in Organizations	3
MKTG-761	Marketing Concepts and Commercialization	3
	Hours	**12**
Spring		
DECS-743	Operations and Supply Chain Management	3
ESCB-705	Economics and Decision Modeling	3
FINC-721	Financial Analysis for Managers	3
MGMT-775	Ethical Decision Making and Corporate Social Performance	3
	Hours	**12**
Second Year		
Fall		
MGMT-735	Management of Innovation	3
STEM Elective		3
STEM Elective		3
STEM Elective		3
	Hours	**12**
Spring		
MGIS-735	Design and Information Systems	3
MGMT-759	Competitive Strategy	3
Graduate Elective		3
Graduate Elective		3
	Hours	**12**
	Total Hours	**48**

List of STEM Electives

Code	Title	Hours
ACCT-738	Information Systems Auditing and Assurance Services	3
ACCT-745	Accounting Information and Analytics	3
BANA-680	Data Management for Business Analytics	3
BANA-780	Advanced Business Analytics	3
BANA-785	Business Analytics Experience	3
CSCI-654	Foundations of Parallel Computing	3
CSCI-721	Foundations of Data Cleaning and Preparation	3
DECS-744	Project Management	3
DECS-750	Supply Chain Analytics	3
FINC-610	Financial Risk Management and Analysis	3
FINC-725	Securities and Investment Analysis	3
FINC-742	Financial Modeling and Analysis	3
FINC-772	Equity Analysis	3
FINC-780	Financial Analytics	3
FINC-795	Computational Finance Experience	3
HSPT-735	Hospitality and Tourism Customer Experience and Engagement	3
HSPT-745	Advanced Lodging Operations and Revenue Management	3
HSPT-755	Strategic Food and Beverage Business Management	3
HSPT-760	Hospitality Asset Management	3
HSPT-780	Hospitality Analytics	3
INTB-710	Global Business Analytics	3
ISEE-682	Lean Six Sigma Fundamentals	3
ISEE-703	Supply Chain Management	3
MATH-601	Methods of Applied Mathematics	3
MATH-605	Stochastic Processes	3
MATH-712	Numerical Methods for Partial Differential Equations	3
MATH-735	Mathematics of Finance I	3
MATH-736	Mathematics of Finance II	3
MATH-741	Partial Differential Equations I	3
MATH-742	Partial Differential Equations II	3
MGIS-720	Information Systems Design and Development	3
MGIS-725	Data Management and Analytics	3
MGIS-760	Integrated Business Systems	3

MGMT-720	Entrepreneurship and Technology Entrepreneurship	3
MKTG-768	Marketing Analytics	3
MKTG-772	Internet Marketing: Strategy & Tactics	3
SERQ-723	Service Analytics	3
SERQ-732	Assessment of Service Quality	3
SERQ-735	Data Mining In the Service Sector	3
SERQ-747	Design Thinking and Creativity	3
STAT-611	Statistical Software - R	3
STAT-621	Statistical Quality Control	3
STAT-747	Principles of Statistical Data Mining	3
STAT-756	Multivariate Analysis	3
STAT-773	Time Series Analysis and Forecasting	3
STAT-784	Categorical Data Analysis	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall, Spring, or Summer
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Business Administration program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Business Administration Ph.D.

Plan Code: BUSADM-PHD | **HEGIS:** 0501.00

Program Overview

The Ph.D. in business administration at RIT prepares you to advance your knowledge and practice through research and exploration of the latest trends and biggest challenges found at the intersection of business and technological innovation. The program is designed to inspire and train scholars to identify, investigate, and solve novel business challenges that influence business and society, particularly, those that are triggered by technological changes. With sharp emphasis on the effects of technological innovation on discipline-based theories and research, the program offers three areas of specialization, including digital transformation, strategy and innovation, and finance and accounting.

Digital transformation emphasizes the integration of digital technologies that have altered the marketing of products and services, as well as the management of information systems. You will study the design and development of digital artifacts and their implications for interpersonal interaction, analyze the modes of human information processing in digitally transformed business contexts, and theorize the emergence of new business models and ways of organizing in digitally immersive environments.

The strategy and innovation specialization focuses on the growing role of technological capabilities and innovation-based products and processes as a source of competitive advantage. You will acquire knowledge and skills to address novel research questions about firm-level strategy and innovation-related challenges faced by managers and policy makers.

Finance and accounting narrows in on new challenges and research areas that have emerged from technological innovations within finance and accounting disciplines. These areas include FinTech, high-frequency trading, alternative trading systems (dark pool and ECNs), crowdfunding platforms, P2P lending platforms, blockchains, cryptocurrencies, data analytic tools in auditing and credit rating, digital transformation of SEC filings and corporate disclosures. You will also study the antecedents and consequences of technology in finance and accounting.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
MGIS-815	Research Design	3
Focus Area Course 1		3
Support Area Course 1		3
Select one of the following Research Methodology I courses:		3
ESCB-830	Econometrics I	
MKTG-825	Multivariate Methods and Analyses	
	Hours	**12**
Spring		
Elective Course 1		3
Focus Area Course 2		3
Support Area Course 2		3
Select one of the following Research Methodology II courses:		3
ESCB-830	Econometrics I	
ESCB-835	Econometrics II	
MKTG-830	Structural Equation Modeling	
	Hours	**12**
Second Year		
Fall		
Elective Course 2		3
Focus Area Course 3		3
Focus Area Course 4		3
Support Area Course 3		3
	Hours	**12**
Spring		
Elective Course 3		3
Elective Course 4		3
Focus Area Course 5		3
Support Area Course 4		3
	Hours	**12**
Summer		
SCBI-801/895	Business Administration PhD Second Year Paper	0
	Hours	**0**
Third Year		
Fall		
SCBI-890	Business Administration PhD Dissertation Research	5
	Hours	**5**
Spring		
SCBI-890	Business Administration PhD Dissertation Research	5
	Hours	**5**
Fourth Year		
Fall		
SCBI-890	Business Administration PhD Dissertation Research	5
	Hours	**5**
Spring		
SCBI-890	Business Administration PhD Dissertation Research	5
	Hours	**5**
Fifth Year		
Fall		
SCBI-890	Business Administration PhD Dissertation Research	5
	Hours	**5**
Spring		
SCBI-890	Business Administration PhD Dissertation Research	5
	Hours	**5**
	Total Hours	**78**

Notes:

- Students must declare a focus area in either Finance & Accounting, Strategy & Innovation or Digital Transformation. The tables below detail the courses for each focus area and corresponding support area and graduate electives.

Focus Areas

Digital Transformation

Code	Title	Hours
Focus Area Courses		
MGIS-805	Advanced Data Analytics	3
MGIS-810	Societal Impacts of Digital Transformation	3
MGIS-812	Management Information Systems: Theories and Perspectives	3
or MKTG-810	Marketing Theory	
MGMT-822	Innovation	3
MKTG-805	Psychological Foundations of Business Research	3
Support Area Courses		
ESCB-830	Econometrics I	3
or MGIS-811	Qualitative Research Methods	
Select three of the following:		9
ESCB-835	Econometrics II	
FINC-810	Research Seminar: Technology in Accounting & Finance	
MGMT-820	Foundations of Strategy Research	
MGMT-821	Organizational Behavior & Creativity	
MGMT-825	Seminar: Emergent Topics in Management	
Graduate Courses 700 level and above with advisor approval		
Graduate Electives		
Select four of the following:		12
BANA-780	Advanced Business Analytics	
MGIS-725	Data Management and Analytics	
MGIS-735	Design and Information Systems	
MGIS-745	Information Systems Development	
MGIS-760	Integrated Business Systems	
MKTG-763	Buyer Behavior	
MKTG-768	Marketing Analytics	
MKTG-772	Internet Marketing: Strategy & Tactics	
MKTG-776	Product and Brand Management	
MKTG-778	Commercialization and Marketing of New Products	
Graduate Courses 700 level and above with advisor approval		
Total Hours		**39**

Management, Strategy, and Innovation

Code	Title	Hours
Focus Area Courses		
MGMT-820	Foundations of Strategy Research	3
MGMT-821	Organizational Behavior & Creativity	3
MGMT-822	Innovation	3
MGMT-823	Business, Technology and Society	3
MGMT-824	Contemporary Topics in Strategy Research	3
Support Area Courses		
Select two of the following:		6
ESCB-835	Econometrics II	
MGIS-805	Advanced Data Analytics	
MGIS-811	Qualitative Research Methods	
MKTG-830	Structural Equation Modeling	
Select two of the following:		6
ESCB-810	Financial Economics	
MGIS-810	Societal Impacts of Digital Transformation	
MGMT-825	Seminar: Emergent Topics in Management	
MKTG-805	Psychological Foundations of Business Research	
Graduate Courses 700 level and above with advisor approval		
Graduate Electives		
Select up to four:		12
Graduate Courses 700 level and above with advisor approval		
Total Hours		**39**

Finance & Accounting

Code	Title	Hours
Focus Area Courses		
ESCB-810	Financial Economics	3
FINC-810	Research Seminar: Technology in Accounting & Finance	3
Select three of the following:		9
ACCT-810	Doctoral Seminar in Research in Financial Accounting	
ACCT-820	Auditing Research Seminar	
ACCT-858	Seminar: Special Topics in Accounting	
FINC-820	Research Topics & Methods in Corporate Finance	
FINC-830	Research Topics & Methods in Investment & Asset Pricing	
FINC-858	Seminar: Special Topics in Finance	
Support Area Courses		
Select four of the following: [1]		12
ACCT-745	Accounting Information and Analytics	
BANA-680	Data Management for Business Analytics	
FINC-780	Financial Analytics	
MGIS-725	Data Management and Analytics	
MGIS-805	Advanced Data Analytics	
Graduate Electives		
Select four of the following:		12
MGIS-811	Qualitative Research Methods	
MKTG-825	Multivariate Methods and Analyses	
MKTG-830	Structural Equation Modeling	
Graduate Courses 700 level and above with advisor approval		
Total Hours		**39**

[1] Note: Any waived course in this category should be substituted by 700+ Analytics course with approval of PhD Advisor and Director

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline, rolling thereafter
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Business Administration program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/). The application fee for this program is waived for the Fall 2026 term.
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#business-administration-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GMAT or GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 94
IELTS: 7.0
PTE Academic: 66

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Business Analytics MS

Plan Code: BANA-MS | **HEGIS:** 0599.00

This program is available online.

Program Overview

RIT's master's in business analytics teaches you to harness the power of data analysis to drive and optimize business performance, strategy, and operations at the intersection of business, data science, and analytics. The program trains you to help understand and connect contemporary analytics technologies with today's business practices. You will take courses to develop the advanced skills needed to conduct the descriptive, diagnostic, predictive, and prescriptive analysis of information as you learn to manage data and analytics in a range of business settings. You will also acquire broad and in-depth training in multiple disciplines related to business analytics, like advanced business analytics, business intelligence, accounting analytics, financial analytics, and marketing analytics. The curriculum allows you to dive deeper into a discipline that enhances your career goals with elective courses in topics such as predictive analytics, information systems design, data management and analytics, categorical data analysis, and more.

During your program, you will have access to the most advanced analytics software and Bloomberg Terminals by working in the modern, interactive Sklarsky Business Analytics Center, and you will have the opportunity to leverage RIT's Active Learning Collaboratory to connect interactively with RIT's global campuses in Dubai, Croatia, Kosovo, and China, as well as corporate partners around the world.

Cooperative education is optional but strongly encouraged for graduate students in the business analytics master's degree.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
BANA-680	Data Management for Business Analytics	3
FINC-780	Financial Analytics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
	Hours	**9**
Spring		
BANA-780	Advanced Business Analytics	3
MKTG-768	Marketing Analytics	3
Analytics Elective		3
Open Elective		3
	Hours	**12**
Summer		
ACCT-745	Accounting Information and Analytics	3

BANA-785	Business Analytics Experience	3
Analytics Elective		3
	Hours	**9**
	Total Hours	**30**

Approved Analytics Electives

Code	Title	Hours
IDAI-610	Fundamentals of Artificial Intelligence	3
IDAI-620	Mathematical Methods for Artificial Intelligence	3
IDAI-700	Ethics of Artificial Intelligence	3
IDAI-710	Fundamentals of Machine Learning	3
STAT-641	Applied Linear Models - Regression	3
STAT-773	Time Series Analysis and Forecasting	3
MGIS-720	Information Systems Design and Development	3
MGIS-725	Data Management and Analytics	3
MGIS-735	Design and Information Systems	3
MGIS-758	Seminar in Management Information Systems	3
MGIS-760	Integrated Business Systems	3
MGIS-805	Advanced Data Analytics	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Business Analytics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GMAT or GRE required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

It is expected that prospective students have experience with object-oriented programming and statistics. Students admitted without the necessary background will be assigned bridge courses.

Online Degree Information

The online Business Analytics MS program can only be completed part-time, taking one or two courses per term. The average time to completion is two and a half to three years. Courses in the online program are a blend of synchronous and asynchronous study. This online program does not have any in-person requirements. Academic advisors work with students after admission to select courses that meet degree requirements and student schedules. Program electives are slightly more limited than courses available in the on-campus program. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. The program culminates with a capstone project that is completed through the final course (785-Business Analytics Experience). For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Business Analytics MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Finance MS

Plan Code: FINC-MS | **HEGIS:** 0504.00

Program Overview

RIT's master of science in finance prepares you for careers in corporate finance, investment analysis, wealth management, portfolio management, financial consulting, commercial banking, investment banking, insurance, cryptocurrencies and FinTech. A highly flexible program with a strong emphasis on experiential learning opportunities, the MS in finance enables you to apply your knowledge in real-world scenarios. Accessing Bloomberg Terminals in the Sklarsky Business Analytics Center, you can tap into the latest financial market developments by using tools to analyze and develop unique insights. The degree includes projects and teaching materials that expose you to financial analytics skills and software. You will complete core courses in accounting, corporate finance, investments, and risk management, and then choose elective courses that correlate to your professional interest, such as banking, algorithmic trading, financial modeling, and financial analytics. You will also have access to data courses offered at RIT and build skills in specific languages like Python and SQL.

Cooperative education is optional but strongly encouraged for graduate students in the finance program.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ACCT-603	Accounting for Decision Makers	3
FINC-721	Financial Analysis for Managers	3
FINC-725	Securities and Investment Analysis	3
Finance Elective 1		3
	Hours	**12**
Spring		
FINC-740	Options and Futures	3
Finance Elective 2		3
STEM Elective 1		3
STEM Elective 2		3
	Hours	**12**
Summer		
FINC-790	Field Exam Preparatory	1
Finance Elective 3		3
STEM Elective 3		3
	Hours	**7**
	Total Hours	**31**

Approved Finance Electives

Code	Title	Hours
FINC-610	Financial Risk Management and Analysis	3
FINC-722	Financial Management II	3
FINC-732	Portfolio Management	3
FINC-742	Financial Modeling and Analysis	3
FINC-758	Seminar in Finance (topics vary)	3
FINC-760	International Finance	3
FINC-761	Stock Market Algorithmic Trading	3
FINC-772	Equity Analysis	3
FINC-780	Financial Analytics (instructor permission)	3
FINC-795	Computational Finance Experience	3
All FINC, ACCT, and MGIS courses 600-700 level and other as approved by program director or department chair		

Approved STEM Electives

Code	Title	Hours
ACCT-745	Accounting Information and Analytics	3
ACCT-796	Accounting Capstone Experience	3
BANA-680	Data Management for Business Analytics [1]	3
BANA-780	Advanced Business Analytics [1]	3
FINC-610	Financial Risk Management and Analysis	3
FINC-742	Financial Modeling and Analysis	3
FINC-761	Stock Market Algorithmic Trading	3
FINC-780	Financial Analytics	3
FINC-795	Computational Finance Experience	3
MATH-735	Mathematics of Finance I	3
MATH-736	Mathematics of Finance II	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGIS-725	Data Management and Analytics	3

[1] Students must have a background in Python and have permission from instructor

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Finance program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT is optional, but recommended for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Global Supply Chain Management MS

Plan Code: GSCM-MS | **HEGIS:** 0513.00

Program Overview

The supply chain management master's degree is an interdisciplinary program that integrates concepts from supply chain, logistics, operations management, analytics, data visualization, industrial engineering, global business, sustainability, ethics, and risk management. The program provides a strong foundation in supply chain, industry-specific practices, and the latest trends and technologies. It aims to enhance your expertise and make you more competitive in your chosen career path by preparing you for the complexities of global supply chains, and teaching you to analyze sustainability, ethics, and the impact of emerging technologies. The curriculum will prepare you for global career opportunities by helping you to gain an understanding of cultural differences, global trade regulations, and logistical practices in different global regions, while you become adept at managing global supply chain networks.

Cooperative education is optional but strongly encouraged for graduate students in the global supply chain management program.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
DECS-743	Operations and Supply Chain Management	3
INTB-710	Global Business Analytics	3
MS GSCM Elective		3
MS GSCM Elective		3
	Hours	**12**
Spring		
DECS-750	Supply Chain Analytics	3
INTB-755	Export, Import, and Global Sourcing	3
MGMT-755	Negotiations	3
Select one of the following:		3
MGMT-790	Field Exam Prep (plus one (1) MS GSCM Elective)	
MGMT-791	Graduate Project	
	Hours	**12**
Summer		
MS GSCM Elective		3
MS GSCM Elective		3
	Hours	**6**
	Total Hours	**30**

Approved GCSM Electives

Code	Title	Hours
Select at least two from the following:		6-9
BANA-780	Advanced Business Analytics	
DECS-744	Project Management	
ISEE-682	Lean Six Sigma Fundamentals	
MGIS-725	Data Management and Analytics	
MGIS-760	Integrated Business Systems	
MKTG-768	Marketing Analytics	
Select at least one from the following:		3-6
MGMT-710	Sustainable Business Innovation: Strategy and Practice	
MGMT-735	Management of Innovation	
MGMT-740	Leading Teams in Organizations	
MKTG-761	Marketing Concepts and Commercialization	
MKTG-762	Strategic Marketing Management	

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Global Supply Chain Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Hospitality Business Management MS

Plan Code: HSPT-MS | **HEGIS:** 0510.10

This program is available online.

Program Overview

RIT's master's in hospitality business management specializes in enhancing the analytics and technology skills essential for leadership positions in the hospitality industry. The comprehensive curriculum empowers working professionals and career changers to excel in sales, marketing, revenue management, business strategy, customer experience design and management, sustainability, data analytics, and hotel real estate development and investment. The program allows you to build upon your previous course work and skills in management, hospitality, tourism, and retail by providing a variety of courses in accounting, business analytics, entrepreneurship, finance, human resources, management, marketing, and supply chain management. This versatility unlocks abundant job opportunities, enabling you to pursue diverse career paths within and beyond the hospitality industry.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
HSPT-735	Hospitality and Tourism Customer Experience and Engagement	3
HSPT-745	Advanced Lodging Operations and Revenue Management	3
HSPT-755	Strategic Food and Beverage Business Management	3
Elective [1]		3
Elective [1]		3
	Hours	**15**
Spring		
HSPT-760	Hospitality Asset Management	3
HSPT-780	Hospitality Analytics	3
HSPT-797	Capstone Project in Hospitality and Tourism	3
Elective [1]		3
Elective [1]		3
	Hours	**15**
	Total Hours	**30**

[1] See individual course list below.

Hospitality Business Management Electives

Students may take any College of Business graduate course with Program Director approval. The following is a non-exhaustive list of examples:

Code	Title	Hours
Business Analytics		
BANA-680	Data Management for Business Analytics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MKTG-768	Marketing Analytics	3
Entrepreneurship		
FINC-605	Financing New Ventures	3
MGMT-610	Global Entrepreneurship	3
MGMT-720	Entrepreneurship and Technology Entrepreneurship	3
MGMT-765	Applied Venture Creation	3
MKTG-778	Commercialization and Marketing of New Products	3
Supply Chain and Operations		
DECS-743	Operations and Supply Chain Management	3
DECS-744	Project Management	3
DECS-750	Supply Chain Analytics	3
Human Resource Leadership		
HRDE-722	Talent Development	3
HRDE-735	Leading Human Resources	3
HRDE-765	Diversity in Global Workplace	3

Code	Title	Hours
Other		
ACCT-603	Accounting for Decision Makers	3
ESCB-705	Economics and Decision Modeling	3
FINC-721	Financial Analysis for Managers	3
FINC-760	International Finance	3
HSPT-761	Planning & Development for Hospitality and Tourism Industries	3
HSPT-767	Convention and Event Management	3
SERQ-710	Service Design Fundamentals	3
SERQ-740	Leading Innovation	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time

Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Hospitality Business Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT optional for Spring 2025 and Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Online Degree Information

This online program is designed to be done part-time, taking one or two classes per term. The program is 10 classes (or 30 credits) to completion. The average time to earn the degree is 2.5 to 3 years. The 6 core courses will be offered asynchronously. The 4 elective courses could be synchronous or asynchronous, depending on the student's choice. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility
The online Hospitality Business Management MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Organizational Leadership and Innovation MS

Plan Code: SVCLED-MS | **HEGIS:** 0599.00

This program is available exclusively online.

Program Overview

The master of science in organizational leadership and innovation empowers you with the knowledge, skills, and mindset to lead organizations of the future, those that are constantly adopting and evolving with the latest tech innovations. The program will equip you to spearhead innovative projects, foresee emerging technologies, and lead your organization in embracing the changes that come with innovation. The curriculum focuses on the following concepts: managing technological change and its implications for leadership; developing the ability to foresee emerging trends and technologies; creating strategies to exploit foresight; leading teams of innovators; and creating a work environment that encourages experimentation and enables individuals to change, adapt, and evolve. It also provides future-focused and innovative leadership-oriented courses that leverage faculty expertise in organizational leadership, innovation, technology, and strategy development. You will learn to create an entrepreneurial culture and build sustainable teams while you develop skills in the leadership and management of innovation.

Cooperative education is optional but strongly encouraged for graduate students in the MS in organizational leadership and innovation.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
HRDE-726	Technology and the Future of Work	3
HRDE-742	Leading Change	3
	Hours	**6**
Spring		
MGMT-740	Leading Teams in Organizations	3
SERQ-720	Strategic Foresight and Innovation	3
	Hours	**6**
Summer		
Program Electives: See individual course list below.		6
	Hours	**6**
Second Year		
Fall		
Select one of the following Culminating Experience:		3
SERQ-790	Research Thesis	
SERQ-795	Comprehensive Exam (plus one Program Elective)	
SERQ-797	Capstone Project	
Program Elective: See individual course list below		3
	Hours	**6**
Spring		
Program Electives: See individual course list below.		6
	Hours	**6**
	Total Hours	**30**

MS Organizational Leadership and Innovation, Program Electives

Code	Title	Hours
GRCS-701	Research Methods [1]	3
HRDE-735	Leading Human Resources	3
HRDE-765	Diversity in Global Workplace	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGMT-755	Negotiations	3
MGMT-775	Ethical Decision Making and Corporate Social Performance	3
SERQ-710	Service Design Fundamentals [1]	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
SERQ-722	Customer Centricity [1]	3
SERQ-723	Service Analytics [1]	3
SERQ-735	Data Mining In the Service Sector [1]	3
SERQ-740	Leading Innovation	3
SERQ-747	Design Thinking and Creativity	3

[1] Program Electives that may be offered only at overseas campuses.

Admission Requirements

This program is available on-campus or online. The following admissions details apply to the on-campus program.

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Organizational Leadership and Innovation program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.

- Entrance exam requirements: GRE or GMAT required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores
International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid
An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information
Online Degree Information
The courses in the online Organizational Leadership and Innovation MS are a combination of asynchronous and synchronous. Delivery format will vary based on the preference of the faculty leading the course. Synchronous courses meet one day a week for a 2 1/2 hour session in the evening (ET). Academic advisors work with students on a study plan after admission to ensure classes fit student availability. The exit strategy for this program is a comprehensive exam (no capstone project or thesis option). Typically students finish this degree in 24-36 months. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility
The online Organizational Leadership and Innovation MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Technology Entrepreneurship Advanced Certificate

Plan Code: TECENT-ACT | **HEGIS:** 0506.00

Program Overview
Technology and entrepreneurship go hand-in-hand in developing some of today's most dynamic business ideas, innovative operations, and new ventures. The advanced certificate in technology entrepreneurship provides the skills and knowledge an entrepreneur needs to successfully navigate the process of starting a new venture and managing technological innovation in today's highly competitive and constantly changing marketplace. This graduate level certificate will help you understand the dynamics of continuous innovation in technology, business models, execution, and strategy, and how their interplay creates value for a new venture.

Curriculum

First Year		
Fall		**Hours**
MGMT-720	Entrepreneurship and Technology Entrepreneurship	3
Select one of the following:		3
MGMT-610	Global Entrepreneurship	
MGMT-620	Entrepreneurship & the Circular Economy	
MGMT-765	Applied Venture Creation	
MGMT-799	Independent Study Management (via Incubator/lab time)	
	Hours	**6**
Spring		
MGMT-730 or MGMT-735	Technology Entrepreneurship or Management of Innovation	3
FINC-605	Financing New Ventures	3
	Hours	**6**
	Total Hours	**12**

Admission Requirements
This program is available on-campus only.

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details
To be considered for admission to the Technology Entrepreneurship program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college with course work in mathematical, science, engineering, and computing subject areas. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.

- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Technology Innovation Management and Entrepreneurship MS

Plan Code: TIME-MS | **HEGIS:** 0506.00

Program Overview

The master's in technology innovation management and entrepreneurship at RIT prepares you with the skills required to create value for startups or entrepreneurial organizations. The program provides you with opportunities to engage with business leaders and entrepreneurs, learn from business coaches and mentors, and capitalize on the developmental opportunities available on campus. Teachers, industry mentors, an applied approach, and access to science, technology, engineering, and design resources will prepare you to focus on entrepreneurial and innovation processes by which inventions and creative new ideas are brought to market. You will have full access to RIT's robust, hands-on technology environment, including a world-class maker space (The SHED), a business incubator, a commercial production studio (MAGIC Spell Studios). and the Simone Center for Innovation and Entrepreneurship. By leveraging these experiential resources, you will emerge as a business leader who can lead technological entrepreneurship by solving problems, inventing solutions, creating innovative products and services, and commercializing your ideas.

Given the unique needs of innovation managers and technology entrepreneurs, you can choose to tailor the curriculum with either the technology management track or the technology entrepreneurship track.

Cooperative education is optional but strongly encouraged for graduate students in the MS in technology innovation management and entrepreneurship.

Accreditation

Saunders College of Business undergraduate and graduate degree programs are fully accredited by the Association to Advance Collegiate Schools of Business (AACSB) International, www.aacsb.edu/accredited/r/rochester-institute-of-technology (https://www.aacsb.edu/accredited/r/rochester-institute-of-technology/), the premier accrediting organization for business schools. Less than five percent of the institutions granting business degrees have received this accreditation.

Curriculum

Technology Management Option

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
INTB-710	Global Business Analytics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
	Hours	**12**
Spring		
MGMT-780	Technology Strategy	3
Data Management and Analytics Elective (1 of 2)		3
Managerial Skills Elective (1 of 2)		3
Select one of the following:		3

MGMT-790	Field Exam Prep (plus one additional Managerial Skills Elective)	
MGMT-791	Graduate Project	
	Hours	**12**
Summer		
Data Management and Analytics Elective (2 of 2)		3
Managerial Skills Elective (2 of 2)		3
	Hours	**6**
	Total Hours	**30**

Approved Program Electives

Code	Title	Hours
Category A: Data Management and Analytics Electives		
BANA-680	Data Management for Business Analytics	3
DECS-744	Project Management	3
DECS-782	Statistical Analysis for Decision Making	3
MGIS-725	Data Management and Analytics	3
Category B: Managerial Skills Electives		
ACCT-603	Accounting for Decision Makers	3
HRDE-742	Leading Change	3
MGMT-743	Advanced Topics in Technology Management	3
MGMT-755	Negotiations	3
SERQ-740	Leading Innovation	3
Any 700-level MGMT course		3

Technology Entrepreneurship Option

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
INTB-710	Global Business Analytics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGMT-720	Entrepreneurship and Technology Entrepreneurship	3
Managerial Skills Elective (1 of 2)		3
	Hours	**12**
Spring		
MGMT-740	Leading Teams in Organizations	3
MGMT-765	Applied Venture Creation	3
MGMT-780	Technology Strategy	3
Data Management and Analytics Elective (1 of 2)		3
	Hours	**12**
Summer		
MKTG-761	Marketing Concepts and Commercialization	3
Data Management and Analytics Elective (2 of 2)		3
	Hours	**6**
	Total Hours	**30**

Approved Program Electives

Code	Title	Hours
Category A: Data Management and Analytics Electives		
BANA-680	Data Management for Business Analytics	3
DECS-744	Project Management	3
DECS-782	Statistical Analysis for Decision Making	3
MGIS-725	Data Management and Analytics	3
Category B: Managerial Skills Electives		
FINC-605	Financing New Ventures	3
MGMT-610	Global Entrepreneurship	3
MGMT-620	Entrepreneurship & the Circular Economy	3
MGMT-710	Sustainable Business Innovation: Strategy and Practice	3
MGMT-755	Negotiations	3
MGMT-758	Seminar in Management	3
MKTG-778	Commercialization and Marketing of New Products	3
SERQ-740	Leading Innovation	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Technology Innovation Management and Entrepreneurship program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: GRE or GMAT required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Saunders College of Business Faculty

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Lisa Boice, BA, MBA, Long Island University; JD, Hofstra University School of Law—Assistant Dean of Student Services

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Finance and Accounting

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Philip C. Gelsomino II, BS, MS, Rochester Institute of Technology; CPA, New York—Senior Lecturer

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John Striebich, BA, University of Rochester; MBA, Rochester Institute of Technology—Lecturer

Kean Wu, BS, Jiangxi University of Finance and Economics (China); MS, Catholic University Leuven (Belgium); Ph.D., University of Oregon—Associate Professor

Rong Yang, BS, MS, Tianjin University of Finance and Economics (China); MBA, Ph.D., Rutgers University—Professor

Hao Zhang, BA, MA, Xiamen University (China); Ph.D., State University of New York at Buffalo—Program Director; Professor

Management

Richard DeJordy, BA, MS, Ph.D., Boston University; MBA, Northeastern University—Department Chair; Director, The Leadership Academy at Saunders; Program Director; Associate Professor

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Kalan Horton, BS, MBA, University of Arkansas; Ph.D., Florida State University—Assistant Professor

Clyde E. Hull, BA, Yale University; MBA, Ph.D., Indiana University—Professor

Dennis Jamrose, BS, Indiana University; MBA, MS, Rochester Institute of Technology; Ph.D., State University of New York at Buffalo— Senior Lecturer

Shalini Khazanchi, BS, South Gujarat University (India); MBA, University of Pune (India); Ph.D., University of Cincinnati—Associate Dean for Research and Graduate Programs, Professor

Richard M. Lagiewski, BS, MS, Rochester Institute of Technology; Ph.D., Edinburgh Napier University (Scotland)—Co-Director, Executive Education; Principal Lecturer

H. Andrew Lawrence, BS, EMBA, Rochester Institute of Technology—Senior Lecturer

Jieun Lee, BA, Yeungnam University (South Korea); MS, Sungkyunkwan University (South Korea); Ph.D., University of Missouri—Assistant Professor

Jennifer Matic, BA, Grand Valley State University; MS, Rochester Institute of Technology; Ph.D., University of Bath (United Kingdom)—Principal Lecturer

Molly McGowan, BA, State University College at Geneseo; MPA, State University College at Brockport—Co-Director Executive Education; Principal Lecturer

Michael E. Palanski, BS, Grove City College; MA, Covenant Theological Studies; Ph.D., Binghamton University—Professor

Shubhobrata Palit, B.Eng. Indian Institute of Engineering Science and Technology (India); MBA, Indian Institute of Management (India); MS, Ph.D., Georgia Institute of Technology—Visiting Assistant Professor

Sandra L. Rothenberg, BS, Syracuse University; MS, Ph.D., Massachusetts Institute of Technology—Professor

Ettore Spadafora, BS, MS, University of Pisa (Italy); Ph.D., University of South Carolina—Associate Professor

Torrence E. Sparkman, BS, University of Illinois at Chicago; M.Div., Trinity Evangelical Divinity School; Ph.D., University of Illinois at Urbana-Champaign—Associate Professor

Shawn Sturgeon, Ph.D., University of Cincinnati—Director of Accreditation and Assessment; Senior Lecturer

Kevin Sweeney, BS, Truman State University; Ph.D., University of Maryland—Program Director; Associate Professor

Zhi Tang, BA, Shandong University (China); MA, Fudan University (China); Ph.D., University of Alabama—Professor

MIS, Marketing, and Analytics

Quang (Neo) Bui, BS, MS, Brigham Young University; Ph.D., Bentley University—Associate Professor

Alex Butler, BA, State University College at Potsdam; MBA, Rochester Institute of Technology—Visiting Lecturer

Michael Caceci, BA, City University of New York; MBA, Pace University—Senior Lecturer

Sorim Chung, BJ, MA, University of Missouri, Columbia; MA, Ph.D., University of California, Riverside—Associate Professor

Deborah Colton-Hebert, BA, State University of New York at Buffalo; MBA, Rochester Institute of Technology; Ph.D., University of South Carolina—Associate Professor

Neil Hair, BS, Cardiff University (United Kingdom); DIPM, Chartered Institute of Marketing; MS, Sheffield Hallam University (United Kingdom); Ph.D., Cranfield University (United Kingdom)—Executive Director, Center for Teaching and Learning; Professor

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Guilherme de Alencar Ramos, BS, Brazilian School of Economics and Finance; MS, Ph.D., Brazilian School of Public and Business Administration—Assistant Professor

Siavash Rashidi-Sabett, BS, Iran University of Science and Techonology; MS, University of Sheffield (UK); Ph.D., Texas Tech University—Assistant Professor

Ashok J. Robin, B.Comm, University of Madras (India); MBA, Ph.D., State University of New York at Buffalo—Professor

Ali Tosyali, BS, Turkish Military Academy (Turkey); MS, Ph.D., Rutgers University—Assistant Professor

Qiang (John) Tu, BS, MS, Xi'an Jiaotong University (China); Ph.D., University of Toledo—Senior Associate Dean; Professor

Matthew Vollmer, BS, State University College at Oswego; MS, Rochester Institute of Rochester; Ph.D. University of Buffalo—Lecturer

International Hospitality and Service Innovation

Edwin Torres, BS, BA, University of Puerto Rico (Puerto Rico); MS, Ph.D., Purdue University—Department Chair, Professor

Edward Ganster, BS, Rochester Institute of Technology—Senior Lecturer

Lorraine E. Hems, BS, Nazareth College of Rochester; MS, Rochester Institute of Technology; CS, CWE—Senior Lecturer

Jerrie (Yu-chin) Hsieh, BS, National Taiwan Normal University (Taiwan); MS, Ph.D., Purdue University—Program Director; Professor

Dan Jin, BS, Xi'an International Studies University (China); MS, Purdue University; Ph.D., University of South Carolina—Assistant Professor

Muhammet Kesgin, BSc, MSc, Akdeniz University (Turkey); Ph.D., Coventry University (United Kingdom)—Professor

Emeritus Faculty

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Anthony (Jim) Baroody, Lecturer Emeritus
Robert Boehner, Principal Lecturer Emeritus
Mary E. Burnet, Professor Emeritus
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You-Keng Chaing, Professor Emeritus
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Eugene G. Hoff, Assistant Professor Emeritus
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George Johnson, Professor Emeritus
Daniel Joseph, Associate Professor Emeritus
Francis (Bud) Kearns, Assistant Professor Emeritus
Roberta Klein, Lecturer Emeritus
Marty Lawlor, Senior Lecturer Emeritus
Walter McCanna, Dean Emeritus and Professor Emeritus
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Wayne Morse, Professor Emeritus
Herbert J. Mossien, Professor Emeritus
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Bruce Oliver, Professor Emeritus
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Philip Tyler, Associate Professor Emeritus
Linda Underhill, Associate Professor Emeritus
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Stanley Widrick, Professor Emeritus
Thomas Williams, Professor Emeritus
Donald Wilson, Assistant Professor Emeritus
Eugene O. Wilson, Professor Emeritus

GOLISANO COLLEGE OF COMPUTING AND INFORMATION SCIENCES

Overview

The Golisano College of Computing and Information Sciences is one of the most comprehensive computing colleges in the United States. Please visit the college's website–**www.rit.edu/computing (https://www.rit.edu/computing/)**– for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarships

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

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Artificial Intelligence in Computer Science Advanced Certificate

Plan Code: AICS-ACT | **HEGIS:** 0701.00

Program Overview

RIT's advanced certificate in artificial intelligence in computer science teaches you to implement AI solutions to address a myriad of issues in business, computing, engineering, and more. You will advance your understanding of AI and learn how to apply deep learning, natural language processing, and knowledge representation to solve problems that have been considered unsolvable until recently. This graduate certificate will enable you to develop the skills needed to work in the many industries currently dealing with difficulties in the field of artificial intelligence.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CSCI-630	Foundations of Artificial Intelligence	3
	Hours	**3**
Spring		
CSCI-635	Introduction to Machine Learning	3
Elective		3
	Hours	**6**
Second Year		
Fall		
Elective		3
	Hours	**3**
	Total Hours	**12**

Admission Requirements

This program is available on-campus only.

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Artificial Intelligence in Computer Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in science, computing, or engineering. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Spring 2025 and Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicant must have college-level experience in probability and statistics and college-level knowledge of computer programming.

Artificial Intelligence MS

Plan Code: AI-MS | **HEGIS:** 0701.00

This program is available online.

Program Overview

RIT's artificial intelligence master's degree is designed for a variety of educational backgrounds across various AI sectors. In this program you will develop well-rounded skill sets in designing, developing, and deploying AI systems, as well as in understanding and analyzing AI's impact on policy and society. A rich set of core courses prepare you with essential technical skills and knowledge. If necessary, there are computer programming and mathematical bridge courses available. You can choose to develop depth in an area of special interest with electives that focus on central AI themes, such as machine learning, natural language and speech processing, computer vision, robotics, sociotechnical AI analysis, and more. You will gain career-enhancing experience through hands-on projects and course work. Choose to complete a capstone course and an extra elective course or spend the equivalent of two courses on a thesis project with an individual expert advisor.

Cooperative education is optional but strongly encouraged for graduate students in the artificial intelligence master's degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
IDAI-610	Fundamentals of Artificial Intelligence	3
IDAI-620	Mathematical Methods for Artificial Intelligence	3
IDAI-700	Ethics of Artificial Intelligence	3
	Hours	**9**
Spring		
IDAI-710	Fundamentals of Machine Learning	3
IDAI-720	Research Methods for Artificial Intelligence	3
Elective		3
	Hours	**9**
Second Year		
Fall		
Elective		3
Elective		3
	Hours	**6**
Spring		
Select one of the following tracks:		6
Professional Track:		
Elective		
IDAI-780	Capstone Project	
Research Track:		
IDAI-790	Research & Thesis [1]	
	Hours	**6**
	Total Hours	**30**

Notes:

- IDAI-699 Graduate Co-op: A Co-Op is entirely optional at the graduate level, with permission of the school director, and may delay time to completion depending on scheduling constraints. Co-op experiences are zero credit.

[1] IDAI-791 Continuation of Research and Thesis: An optional zero-credit course after completing IDAI-790 Research & Thesis.

Program Electives

Code	Title	Hours
Independent Study		
IDAI-799	Independent Study in Artificial Intelligence	1-3
Machine Learning		
CISC-863	Statistical Machine Learning	3
CISC-865	Deep Learning	3
or CMPE-679	Deep Learning	
CSCI-736	Neural Networks and Machine Learning	3
CSEC-720	Deep Learning Security	3
DSCI-640	Neural Networks	3
IMGS-789	Graduate Special Topics (Topic ID # 20: Machine Learning for Difficult Data)	3
ISEE-601	Systems Modeling and Optimization	3
ISEE-701	Linear Programming	3
ISEE-702	Integer and Nonlinear Programming	3
ISEE-761	Forecasting Methods	3
MECE-689	Grad.Lower Level Special Topic	3
STAT-747	Principles of Statistical Data Mining	3
Natural Language and Speech Processing		
PSYC-681	Natural Language Processing and Large Language Models I	3
PSYC-682	Natural Language Processing and Large Language Models II	3
PSYC-684	Graduate Speech Processing	3
PSYC-712	Graduate Cognition	3
Neuromorphic Computing		
CMPE-755	High Performance Architectures	3
CMPE-789	Special Topics (Topic ID No. 30: Neuromorphic Computing)	3
COGS-610	Laboratory Methods	3
COGS-760	Foundations of Cognitive Modeling	3
CSCI-633	Biologically Inspired Intelligent Systems	3
CSCI-722	Data Analytics Cognitive Comp	3
Robotics		
CSCI-632	Mobile Robot Programming	3
EEEE-636	Biorobotics/Cybernetics	3
EEEE-685	Principles of Robotics	3
EEEE-784	Advanced Robotics	3
Sociotechnical Analytics and Policy of Artificial Intelligence		
COMM-717	Artificial Intelligence and Communication	3
DSCI-633	Foundations of Data Science and Analytics	3
ISTE-782	Visual Analytics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
PSYC-712	Graduate Cognition	3
PSYC-714	Graduate Engineering Psychology	3
PSYC-719	Human Factors in Artificial Intelligence	1-4
PUBL-610	Technological Innovation and Public Policy	3

PUBL-650	AI, Policy and Law	3
Vision		
CMPE-685	Computer Vision	3
CMPE-789	Special Topics (Topic ID No. 31 Robot Perception)	3
CSCI-731	Advanced Computer Vision	3
CSCI-732	Image Understanding	3
CSCI-736	Neural Networks and Machine Learning	3
EEEE-670	Pattern Recognition	3
IMGS-621	Computer Vision	2
IMGS-682	Image Processing and Computer Vision	3
IMGS-712	Multi-view Imaging	3
IMGS-789	Graduate Special Topics (Topic ID No. 10 Deep Learning for Vision)	1-3
IMGS-789	Graduate Special Topics (Topic ID No. 19 Robust Machine Learning for Interdisciplinary Imaging Science Applications)	1-3
PSYC-715	Graduate Perception	3
Other		
CMPE-757	Quantum Computing	3
DSCI-650	High Performance Data Science	3
MATH-689	Advanced Special Topics (Topic ID No. 3 Mathematical Data Science)	1-4
SWEN-601	Software Construction	3
SWEN-711	Engineering Self-Adaptive Software Systems With Reinforcement Learning	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Artificial Intelligence program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicant must have college-level credit in Python programming and mathematics.

Online Degree Information

The online MS in artificial intelligence program offers core courses online in an asynchronous modality. Bridge courses, when assigned, are also taught asynchronously. Any live class or group meetings are usually optional in bridge and core courses. Elective courses for the online program are more limited than courses in the on-campus program and their availability will vary from semester to semester. Some electives will be synchronous only. Students in the online program have access to RIT computing and library resources. The online program is part-time, with students completing 1-2 courses per semester. Students will usually spend 10-12 hours per week per class, although this depends on course content and individual background knowledge. For details about the online learning experience, contact the program contact listed on this page. RIT does not offer international student visas for online study.

Online Tuition Eligibility

The online MS in artificial intelligence is a designated online degree program billed at a discount from the on-campus rate. Additional scholarships are not offered. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Big Data Analytics Advanced Certificate

Plan Code: BDATA-ACT | **HEGIS:** 0702.00

Program Overview

The advanced certificate in big data analytics is a multidisciplinary program intended for professionals who hold BS degrees in computing or other diverse fields such as finance, retail, science, engineering, or manufacturing–where knowledge in data analysis is in high demand. The mass amount of data collected by industries, retailers, and organizations requires knowledgeable professionals who can collect, mine, and analyze this information, as well as store, retrieve, and manage these large amounts of data. The big data analytics graduate certificate program prepares you to become a professional who can guide the analysis, preparation, and visualization of data to aid in understanding trends, patterns, and behaviors to help inform business decisions. The certificate features courses in the practical techniques used in exploratory data analysis and mining, as well as in the approaches used to store, retrieve, and manage data in the real world.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CSCI-620	Introduction to Big Data	3
	Hours	**3**
Spring		
CSCI-720	Big Data Analytics	3
Elective		3
	Hours	**6**
Second Year		
Fall		
Elective		3
	Hours	**3**
	Total Hours	**12**

Admission Requirements

This program is available on-campus only.

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Big Data Analytics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.

- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in science, computing, engineering, or a related major. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Spring 2025 and Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Have college-level credit or practical experience in probability and statistics, computer programming in a high-level language, and database systems.

Computer Science MS

Plan Code: COMPSCI-MS | **HEGIS:** 0701.00

This program is available online.

Program Overview

In the computer science MS degree, you will explore computer graphics and visualization, data management, and intelligent systems while developing the skills to excel in this ever-changing field. You'll apply theoretical principles underlying computer science, ensuring you acquire the intellectual tools necessary to keep up-to-date in this rapidly evolving discipline. With focused course work in areas such as computer graphics and visualization, data management, distributed systems, intelligent systems, programming languages and tools, and security, you'll be prepared for career advancement in a range of areas. You will also select three cluster courses from the following cluster areas: computer graphics and visualization, data science, distributed systems, artificial intelligence, languages and tools, security, and theory. Students may choose the thesis or project option as the capstone to the program.

Cooperative education is optional but strongly encouraged for graduate students in the computer science MS degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CSCI-620	Introduction to Big Data	3
CSCI-630	Foundations of Artificial Intelligence	3
CSCI-665	Foundations of Algorithms	3
CSCI-799	Computer Science Graduate Independent Study	3
	Hours	**12**
Spring		
CSCI-622	Data Security and Privacy	3
CSCI-631	Foundations of Computer Vision	3
CSCI-720	Big Data Analytics	3
CSCI-799	Computer Science Graduate Independent Study	3
	Hours	**12**
Second Year		
Fall		
Select one of the following:		6
CSCI-790	Computer Science MS Thesis	
CSCI-788	Computer Science MS Project [1]	
	Hours	**6**
	Total Hours	**30**

[1] Students who register for CSCI-788 Computer Science MS Project are required to concurrently register for colloquium, which is a mandatory class component associated with CSCI-788 Computer Science MS Project.

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring

Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Computer Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Spring 2025 and Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must satisfy prerequisite requirements in mathematics (differential and integral calculus, probability and statistics, discrete mathematics, and computer science theory) and computing (experience with a modern high-level language [e.g., C++, Java], data structures, software design methodology, introductory computer architecture, operating systems, and programming language concepts).

Bridge Courses

If an applicant lacks any prerequisites, bridge courses may be recommended to provide students with the required knowledge and skills needed for the program. If any bridge courses are indicated in a student's plan of study, the student may be admitted to the program on the condition that they successfully complete the recommended bridge courses with a grade of B (3.0) or better (courses with lower grades must be repeated). Generally, formal acceptance into the program is deferred until the applicant has made significant progress in this additional coursework. Bridge program courses are not counted as part of the 30 credit hours required for the master's degree. During orientation, bridge exams are conducted. These exams are equivalent to the finals of the bridge courses. Bridge courses will be waived if the exams are passed. Bridge courses commonly assigned in the first semester are CSCI 603/605/661.

Online Tuition Eligibility

The online Computer Science MS is considered a professional degree that is billed at the standard (on campus) RIT graduate tuition rate. It is not billed at the designated online tuition rate. Scholarship is available off the standard tuition rate for this online program. View the current Graduate tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Computing and Information Sciences Ph.D.

Plan Code: COMPIS-PHD | **HEGIS:** 1701.00

Program Overview

In RIT's computing and information sciences Ph.D., you will conduct both foundational and applied research to address diverse and important challenges within and beyond computing. This doctoral program highlights two of the most unique characteristics of the Golisano College for Computing and Information Sciences: its breadth of program offerings and its scholarly focus on discovering solutions to real-world problems by balancing theory and practice. The program brings together faculty from disciplines throughout the college's departments and schools, including computer science, cybersecurity, software engineering, the School of Information, and the School of Interactive Games and Media.

The Ph.D. focuses on the theoretical and practical aspects of cyberinfrastructure as applied to specific problems across multiple domains. It is a blend of intra-disciplinary computing knowledge areas and inter-disciplinary domain areas. You will complete both required foundation and core elective courses and teaching skills courses. Elective courses in cyberinfrastructure, domain courses and other electives will provide the foundation for your dissertation research. Students are required to conduct original research that leads to peer-reviewed publications. To earn your doctoral degree, you must pass three examinations in the following order: A research potential assessment completed after the first year; a thesis proposal defense which is an oral examination completed after the thesis proposal is written; and a dissertation defense which is the final exam consisting of a formal, oral presentation of the thesis research followed by questions from the audience.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CISC-810	Research Foundations	3
CISC-820	Quantitative Foundations	3
CISC-890	Dissertation and Research	3
CISC-896	Colloquium in Computing and Information Sciences	0
I-course (Infrastructure) elective		3
	Hours	**12**
Spring		
CISC-830	Cyberinfrastructure Foundations	3
CISC-890	Dissertation and Research	3
CISC-896	Colloquium in Computing and Information Sciences	0
I-course (Informatics) elective		3
I-course (Interaction) elective		3
	Hours	**12**
Summer		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Second Year		
Fall		
Elective		3
CISC-807	Teaching Skills Workshop	2
CISC-890	Dissertation and Research	4
CISC-896	Colloquium in Computing and Information Sciences	0
	Hours	**9**
Spring		
CISC-890	Dissertation and Research	3
CISC-896	Colloquium in Computing and Information Sciences	0
Elective		3
Elective		3
	Hours	**9**
Summer		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Third Year		
Fall		
CISC-890	Dissertation and Research	9
	Hours	**9**
Spring		
CISC-890	Dissertation and Research	9
	Hours	**9**
Summer		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Fourth Year		
Fall		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Spring		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Summer		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Fifth Year		
Fall		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Spring		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
Summer		
CISC-898	Continuation of Dissertation and Research	0
	Hours	**0**
	Total Hours	**60**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: December 31 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Computing and Information Sciences program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. Since the program encompasses a wide variety of disciplines, students with diverse backgrounds (e.g. engineering, science, humanities, fine arts, business, and disciplines with sufficient computing backgrounds) are encouraged to apply. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete foundation courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#computing-and-information-sciences-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Additional Information

Prerequisites

- Have completed at least one full year of study in programming and computing concepts
- Have a strong mathematical background in subjects such as discrete mathematics and probability and statistics
- Have aptitude, vision, and experience (if applicable) in computing and information sciences-related research

Cybersecurity Advanced Certificate

Plan Code: INFOAS-ACT | **HEGIS:** 0799.00

Program Overview

RIT's advanced certificate in cybersecurity will teach you how to make computers and networks resistant to attack by monitoring intrusions and closing off vulnerabilities. You will gain the fundamental knowledge and expertise in network security and forensics necessary to implement security in networked environments. By training you to monitor intrusions and close off vulnerabilities, the program provides you with the skills required to make computers and networks resistant to attack. Those attacks that are successful can be detected by applying forensics, which requires gathering information on the nature and extent of the attack for presentation in a court of law, as well as assessing the extent of the damage to an organization. Courses taken as part of this certificate can be transferred into the MS program in cybersecurity.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
Program Elective 1		3
Program Elective 2		3
	Hours	**6**
Spring		
Program Elective 3		3
Program Elective 4		3
	Hours	**6**
	Total Hours	**12**

Prerequisite

Code	Title	Hours
CSEC-600	Introduction to Computing Security	3

Program Electives [1]

Code	Title	Hours
CSEC-603	Enterprise Security	3
CSEC-730	Advanced Computer Forensics	3
CSEC-733	Information Security Risk Management	3
CSEC-742	Computer System Security	3
CSEC-743	Computer Viruses and Malicious Software	3
CSEC-744	Network Security	3

[1] This course list is suggested and non-exhaustive.

Admission Requirements

This program is available on-campus only.

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Cybersecurity program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in computing security, computer science, software engineering, information technology, networking, computer engineering, electrical engineering, applied mathematics, or computer engineering technology (exceptional students from other fields may be admitted on a contingent basis). A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: GRE optional for Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 61

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must satisfy prerequisite requirements in computing (computer networking theory and practice, and systems administration theory and practice).

Bridge Courses

Based on the evaluation of an applicant's academic and relevant experience, the graduate program director may require some applicants to complete a bridge course to fulfill any gaps in the required prerequisites needed for admission to the program. The bridge course, Introduction to Computing Security (CSEC-600), is not part of the 12 credit hours required for the advanced certificate.

Cybersecurity MS

Plan Code: COMPSEC-MS | **HEGIS:** 0799.00

Program Overview

The master's in cybersecurity gives you an understanding of the technological and ethical roles of computing security in today's society and its importance across computing disciplines. This degree aims to prepare you to meet the critical demand of building security and survivability into the hardware and software of computing systems as they are designed and developed, rather than adding it on once systems have been designed, developed, and installed. This master's degree enables you to develop a strong theoretical and practical foundation in security computing, preparing you for leadership positions in the cybersecurity industry, academia, or research careers, or to pursue a more advanced degree in cybersecurity or another computing discipline. The degree consists of core courses, technical electives, and a thesis, project, or capstone experience. You can develop a specialization in one of several cybersecurity-related areas by selecting technical electives under the guidance of a faculty advisor.

Cooperative education is optional but strongly encouraged for graduate students in the cybersecurity MS degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Thesis Option

First Year		
Fall		**Hours**
CSEC-604	Cryptography and Authentication	3
Advanced Elective One		3
Research Elective One		3
	Hours	**9**
Spring		
CSEC-742	Computer System Security	3
Advanced Elective Two		3
Research Elective Two		3
	Hours	**9**
Second Year		
Fall		
CSEC-790	MS Thesis	3
Advanced Elective Three		3
Advanced Elective Four		3
	Hours	**9**
Spring		
CSEC-790	MS Thesis	3
	Hours	**3**
	Total Hours	**30**

Capstone Option

First Year		
Fall		**Hours**
CSEC-604	Cryptography and Authentication	3
Advanced Elective One		3
Research Elective One		3
	Hours	**9**
Spring		
CSEC-742	Computer System Security	3
Advanced Elective Two		3
Research Elective Two		3
	Hours	**9**
Second Year		
Fall		
CSEC-603	Enterprise Security	3
Advanced Elective Three		3
Advanced Elective Four		3
	Hours	**9**
Spring		
Capstone Research Elective (CSEC-7xx)		3
	Hours	**3**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Cybersecurity program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in computing security, computer science, software engineering, information technology, networking, computer engineering, electrical engineering, applied mathematics, or computer engineering technology (exceptional students from other fields may be admitted on a contingent basis). A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: GRE optional for Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must satisfy prerequisite requirements in discrete mathematics, statistics, and computing (programming including Python, computer networking theory and practice, and systems administration theory and practice).

Bridge Courses

Students whose undergraduate preparation or employment experience does not satisfy the prerequisites required for the program may make up for deficiencies through additional study. Bridge course work, designed to close gaps in a student's preparation, can be completed either before or after enrolling in the program as advised by the graduate program director. Generally, formal acceptance into the program is deferred until the applicant has made significant progress through this additional preparation.

If completed through academic study, bridge courses must be completed with a grade of B (3.0) or better. Courses with lower grades must be repeated. Bridge courses are not counted toward the 30 credit hours required for the master's degree. However, grades earned from bridge courses taken at RIT are included in a student's graduate grade point average.

A bridge program can be designed in different ways. Courses may be substituted based on availability, and courses at other colleges may be applied. All bridge course work must be approved in advance by the graduate program director. For more information on the bridge program, please consult the Computing Security MS Student Handbook (https://www.rit.edu/computing/cybersecurity-resources/#ms-student-resources).

Data Science MS

Plan Code: DATASCI-MS | **HEGIS:** 0701.00

This program is available online.

Program Overview

RIT's data science master's degree gives you the practical and theoretical skills to handle large-scale data management and analysis challenges that arise in today's data-driven organizations. This degree fosters work with faculty experts in the fields of data science, analytics, and infrastructure who provide hands-on experience solving real-world problems. The curriculum includes opportunities for you to choose a range of elective courses.

Designed for working professionals studying on campus or online part-time, students will learn both practical and theoretical skills to handle large-scale data management and analysis challenges that are ever-present in today's data-driven organizations. This program places a unique focus on training data scientists with strong software engineering skills so that you can effectively develop real-world data science applications that operate within modern organizations' computational workflows. You'll be learning with students from varied professional backgrounds and working with practitioners who are active in the field.

Cooperative education is optional but strongly encouraged for graduate students in the data science MS degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

On-Campus Option

First Year		
Fall		**Hours**
DSCI-633	Foundations of Data Science and Analytics	3
STAT-614	Applied Statistics	3
SWEN-601	Software Construction	3
	Hours	**9**
Spring		
DSCI-601	Applied Data Science I	3
DSCI-644	Software Engineering for Data Science	3
ISTE-608	Database Design And Implementation	3
Elective 1		3
	Hours	**12**
Second Year		
Fall		
DSCI-602	Applied Data Science II	3
Elective 2		3
Elective 3		3
	Hours	**9**
	Total Hours	**30**

Online Option

First Year		
Fall		**Hours**
STAT-614	Applied Statistics	3
SWEN-601	Software Construction	3
	Hours	**6**
Spring		
DSCI-633	Foundations of Data Science and Analytics	3

ISTE-608	Database Design And Implementation	3
	Hours	**6**
Summer		
Elective 1		3
	Hours	**3**
Second Year		
Fall		
DSCI-644	Software Engineering for Data Science	3
Elective 2		3
	Hours	**6**
Spring		
DSCI-799	Graduate Capstone	3
Elective 3		3
	Hours	**6**
Summer		
Elective 4		3
	Hours	**3**
	Total Hours	**30**

Online + edX Option

First Year		
Fall		**Hours**
SWEN-601	Software Construction	3
edX Micromasters		3
	Hours	**6**
Spring		
ISTE-608	Database Design And Implementation	3
edX Micromasters		3
Elective 1		3
	Hours	**9**
Summer		
edX Micromasters		3
	Hours	**3**
Second Year		
Fall		
DSCI-644	Software Engineering for Data Science	3
Elective 2		3
	Hours	**6**
Spring		
DSCI-799	Graduate Capstone	3
Elective 3		3
	Hours	**6**
	Total Hours	**30**

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Data Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

It is expected that prospective students will have a sufficient background in object-oriented programming. However, accepted students without this prerequisite knowledge may complete prescribed bridge course(s) that are available.

Bridge Courses

Students whose undergraduate preparation or employment experience does not satisfy the prerequisites can make up for this by completing prerequisite bridge course(s), as prescribed by the graduate program director. The bridge course(s) are not part of the 30-semester credit hours required for the master's degree. Grades for bridge course(s) are not included in a student's GPA if taken before matriculation; they are included if completed after matriculation. Since bridge programs can be designed in a variety of ways, the graduate program director will assist students in planning and course selection.

Using edX MicroMasters Credit (Online Only)

Applicants interested in leveraging their edx MicroMasters for credit (https://www.rit.edu/online/pathways/ucsdx-data-science/) toward the online Data Science MS program should send their edX MicroMasters program record to RIT using these instructions (https://help.edx.org/edxlearner/s/article/Viewing-and-sharing-your-program-record/) and we will add the credential to their application for review.

Online Degree Information

The online Data Science MS program can only be completed part-time, taking one or two courses per term. The average time to completion is two and a half to three years. For the fully online Data Science MS, core classes are offered asynchronously, as are many electives. Students can complete the degree without any synchronous courses. Program electives are slightly more limited than courses available in the on-campus program, and some may be synchronous only. Any live group discussions or class meetings are typically optional and may be recorded, and students should connect with their professor to obtain the material. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. The online program culminates with a capstone course and capstone project. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Data Science MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Game Design and Development MS

Plan Code: GAMEDES-MS | **HEGIS:** 0799.00

Program Overview

In the game design and development master's degree, you will explore the entertainment technology landscape as well as other related areas through study in topics such as computer graphics, game engines, interactive narrative, and game world design. The program is characterized by a clear focus on development but also educates developers in the design process. This is a two-year, on-campus, cohort-based program in which students are admitted through a portfolio review process. During the second year, students form development teams that construct a working game engine and software title as the program capstone experience. This requirement includes both individual and group expectations. The capstone culminates in a defense, public presentation, and demonstration before program faculty.

Cooperative education is optional but strongly encouraged for graduate students in the game design and development program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
IGME-601	Game Development Processes	3
IGME-602	Game Design	3
IGME-695	Colloquium in Game Design and Development	1
MS GDD Advanced Elective I		3
	Hours	**10**
Spring		
IGME-603	Gameplay and Prototyping	3
IGME-795	Game Industry Themes and Perspectives	1
MS GDD Advanced Elective II		3
MS GDD Advanced Elective III		3
	Hours	**10**
Second Year		
Fall		
IGME-695	Colloquium in Game Design and Development	1
IGME-788	Capstone Design	3
MS GDD Research Elective		3
	Hours	**7**
Spring		
IGME-789	Capstone Development	3
MS GDD Advanced Elective IV		3
	Hours	**6**
	Total Hours	**33**

IGM/Grad Advanced Electives

The IGM/Grad Advanced Electives consist of courses that are approved by IGM faculty on a case by case basis as appropriate to student preparation and trends in the field, as a part of individual plans of study. The following list is non-exhaustive however IGM/Grad Advanced Electives are generally offered from the Interactive Games and Media unit, and additional courses from other units may be used with approval from a graduate student's individual faculty advisor.

Code	Title	Hours
CSCI-610	Foundations of Computer Graphics	3
CSCI-711	Global Illumination	3
CSCI-712	Computer Animation: Algorithms and Techniques	3
CSCI-713	Applied Perception in Graphics and Visualization	3
GCIS-610	Vertically Integrated Projects (VIP) for Computing - Graduate	1-3
IGME-621	Board and Card Game Design and Development	3
IGME-622	Game Balance	3
IGME-623	Theory and Design of Role Play and Interactive Narrative	3
IGME-624	Tabletop Role-Playing Game Design and Development	3
IGME-670	Digital Audio Production	3
IGME-671	Interactive Game Audio	3
IGME-680	IGM Production Studio	3
IGME-690	IGM Seminar	1-6
IGME-704	Research Methods: Human-Centered Research in Games	3
IGME-705	Game Development Research and Problem Solving	3
IGME-730	Game Design and Development for Casual and Mobile Platforms	3
IGME-740	Game Graphics Programming	3
IGME-742	Level Design	3
IGME-750	Game Engine Design and Development	3
IGME-753	Console Development	3
IGME-760	Artificial Intelligence for Gameplay	3
IGME-790	Graduate Seminar in IGM	1-6
IGME-796	Advanced Topics in Game Design	3
IGME-797	Advanced Topics in Game Development	3
IGME-799	Independent Study	1-6

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 31 priority deadline
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Game Design and Development program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in a relevant field such as game design, game development, information technology, computer science, software engineering, or computer graphics. Others with a strong background in a games-related field and some background in computing sciences may be considered. A minimum cumulative GPA of 3.25 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants are expected to have at least one year of programming experience in a widely-used object-oriented language (C++, C#, or Java preferred) and some experience with web development.

Bridge Courses

Applicants without significant programming experience in a current object-oriented language (C++, C#, or Java preferred) and a solid working knowledge of website development and interactive multimedia concepts will need to complete IGME 206 to bridge any educational gaps. The bridge course will not count toward degree completion.

Health Informatics MS

Plan Code: MEDINFO-MS | **HEGIS:** 1217.00

This program is available exclusively online.

Program Overview

The MS in health informatics applies the creative power of information technology to the information and data needs of health care. This degree provides professionals with an understanding of formal medical terminology, clinical processes, and guidelines; and an understanding of how information and communication systems can be used to successfully deliver patient information in various health care settings. Designed for working professionals, this degree is offered entirely onlihne and may be completed in two years by taking two 7-week courses per semester and two summer courses.

The curriculum consists of courses that focus on software development, system integration, data analysis, data intelligence, clinical application building, systems analysis, and project management. The degree draws upon the interdisciplinary strengths of the colleges within RIT, along with its health care partner, Rochester Regional Health (RRH).

An optional 7-week, onsite immersive session at RRH each June provides the opportunity for experiential learning in a three-day per week, in-person session. The unique blend of RIT informatics faculty and RRH clinical experts provides you with the data analytics, programming, and clinical experience to combine theory and practice.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
MEDI-701	Introduction to Health Informatics	3
Track Elective		3
	Hours	**6**
Spring		
HCIN-610	Foundations of Human-Computer Interaction	3
MEDI-735	Clinical Information Systems	3
	Hours	**6**
Summer		
MEDI-704	Practice of Health Care (requires onsite component)	3
	Hours	**3**
Second Year		
Fall		
Track Elective		3
Track Elective		3
	Hours	**6**
Spring		
CINT-628	Introduction to Applied Informatics	3
ISTE-764	Project Management	3
	Hours	**6**
Summer		
MEDI-788	Capstone In Health Informatics (joint among all parties)	3
	Hours	**3**
	Total Hours	**30**

Tracks

Clinician

Code	Title	Hours
ISTE-608	Database Design And Implementation	3
MEDI-610	Scripting Fundamentals	3
MEDI-731	System Integration Concepts	3

Analyst

Code	Title	Hours
ISTE-724	Data Warehousing	3
ISTE-780	Data Driven Knowledge Discovery	3
ISTE-782	Visual Analytics	3

Admission Requirements

This program is available on-campus or online. The following admissions details apply to the on-campus program.

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Health Informatics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae demonstrating a minimum of three years of experience in a health care, health-related, or information technology organization.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Complete an interview with the program chair (applies to applicants without health care or IT work experience).
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

It is recommended that applicants have a minimum of three years of experience in a health care, health-related, or information technology organization. Applicants who do not meet this requirement may be asked to complete certain undergraduate courses as a bridge for the content knowledge required for the graduate program.

Online Delivery

This program is offered exclusively online. Courses are fully asynchronous designed to accommodate working professionals that wish to complete program coursework at a time that suits their personal schedule. Coursework deliverables and assignments are typically due by a specific date/time during each week of the course.

Online Degree Information

Courses in the online Health Informatics MS are all asynchronous and are designed to accommodate working professionals that wish to complete program coursework at a time that suits their personal schedule. The program is cohort-based with students starting their studies in the fall, and moving through the course sequence together by taking two 7-week courses and two summer courses. This 100% online degree can be completed in two years. This degree also includes a three-day in-person immersion on-site at a Rochester healthcare facility. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Health Informatics MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Human-Computer Interaction MS

Plan Code: HUMCOMP-MS | **HEGIS:** 0799.00

This program is available online.

Program Overview

The human-computer interaction master's degree provides the knowledge and skills necessary for conceptualizing, designing, implementing, and evaluating software applications and computing technologies for the benefit of the user, whether the user is an individual, a group, an organization, or a society. Human, technological, and organizational concerns are interwoven throughout the curriculum and addressed in team- and project-based learning experiences. With an emphasis on making computing technologies more user-friendly, human-computer interaction (HCI) has emerged as a dynamic, multifaceted area of study. The curriculum's core courses provide knowledge and skills in the conceptual and methodological frameworks of HCI and HCI research. Course work emphasis is on understanding human cognition as it applies to information systems plus interaction design, interface prototyping, and usability evaluation. You can also select two elective courses, and in select cases, students can petition for approval to include a course complementary to the degree program as an elective. You can also complete two courses in any of the application domain areas. A special topics option is also available with faculty approval for individuals with an interest in other HCI-related areas. You may also complete a thesis or capstone project. This experience is meant to be an empirical study of a HCI problem, which can be the development of a software product through user-centered design processes.

Cooperative education is optional but strongly encouraged for graduate students in the human-computer interaction program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
HCIN-600	Research Methods	3
HCIN-610	Foundations of Human-Computer Interaction	3
HCIN-620	Information and Interaction Design	3
Application Domain		3
	Hours	**12**
Spring		
HCIN-630	Usability Testing	3
Application Domain		3
Program Elective		3
Select one of the following:		3
Project Option:		
HCIN-794	MS Human Computer Interaction Capstone Proposal	
Thesis Option:		
Program Elective		
Directed Final Project Option [1]		
Program Elective		
	Hours	**12**
Second Year		
Fall		
Select one of the following:		6
Project Option:		
HCIN-795	MS HCI Project	

Program Elective		
Thesis Option:		
HCIN-796	MS HCI Thesis	
Directed Final Project Option [1]		
HCIN-797	MS HCI Directed Final Project	
Program Elective		
	Hours	**6**
	Total Hours	**30**

[1] Directed Final Project Option is for online students.

Approved Program Electives

Code	Title	Hours
HCIN-660	Fundamentals of Instructional Technology	3
HCIN-661	Interactive Courseware	3
HCIN-662	Research in Accessibility	3
HCIN-663	Access and Assistive Technology	3
HCIN-700	Current Topics in HCI	3
HCIN-720	Prototyping Wearable and Internet of Things Devices	3
HCIN-722	Human-Computer Interaction with Mobile, Wearable, and Ubiquitous Devices	3
HCIN-730	User-Centered Design Methods	3
HCIN-794	MS Human Computer Interaction Capstone Proposal	3
IGME-770	Spatial Data Science	3
IGME-772	Geographic Visualization	3
ISTE-645	Foundations of Web Technologies I	3
ISTE-646	Foundations Of Web Technologies II	3
ISTE-730	Foundations of IoT	3
ISTE-732	IoT Analytics	3
ISTE-764	Project Management	3
ISTE-782	Visual Analytics	3
MEDI-701	Introduction to Health Informatics	3
PSYC-712	Graduate Cognition	3
PSYC-715	Graduate Perception	3

Application Domains

Students matriculated in this degree will select one two-course application domain representing six semester hours of work. Application domains and corresponding course choices are listed below.

Web Development

Code	Title	Hours
ISTE-645	Foundations of Web Technologies I	3
ISTE-646	Foundations Of Web Technologies II	3

Geographic Information Science and Technology

Code	Title	Hours
IGME-770	Spatial Data Science	3
IGME-772	Geographic Visualization	3

e-Learning Technologies

Code	Title	Hours
HCIN-660	Fundamentals of Instructional Technology	3
HCIN-661	Interactive Courseware	3

Smart Device Application Design and Development

Code	Title	Hours
HCIN-720	Prototyping Wearable and Internet of Things Devices	3
HCIN-722	Human-Computer Interaction with Mobile, Wearable, and Ubiquitous Devices	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Fall - February 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Human-Computer Interaction program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Spring 2025 and Fall 2025 applicants. No minimum score requirement.

- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

The program requires strong technical and social science skills. Knowledge of quantitative statistical methodologies is important since students review research studies as well as analyze the results of their own usability evaluations. Students are also expected to have a solid background in computer programming. These competencies may be demonstrated by previous course work, technical certifications, or comparable work experience. Bridge courses are available to fulfill any gaps in an applicant's qualifications. Applicants will be made aware of any areas where additional course work may be necessary.

Online Degree Information

The Human-Computer Interaction MS program is designed to be completed part-time (1 or 2 courses per term). Full-time options may be available with Graduate Program Director's approval. Time to completion will depend on the student's individual plan of study, when courses are offered, what electives are selected, and if the student takes a summer course. Advisors work closely with students after admission on course registration. Typically students finish this degree in 2 years. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Human-Computer Interaction MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Information Technology and Analytics MS

Plan Code: INFOST-MS | **HEGIS:** 0699.00

This program is available online.

Program Overview

RIT's master of science degree in information technology and analytics addresses the demand at the intersection of information technology and data science. With a program rich in analytics and in-depth career-oriented study, you will explore how information is organized, verified, analyzed, and applied in today's data-rich environment.

This degree is of particular value to professionals in the field of information technology who need to upskill in data science knowledge to handle the huge volumes of data that organizations must utilize. In this degree, you will apply critical, analytical thinking to database design, management, and mining. The program also addresses web systems and integration technologies, and the information management and database technology pillars of the IT academic discipline, along with the additional option of discovery informatics. Domain electives are available in analytics, information management and database technology, or web systems and integration technologies. With permission of the graduate program director, students may select the special topics track to fulfill this requirement. Students may choose a project or a thesis to build upon their domain of study. The project option requires one additional domain elective while the thesis option does not require an additional elective.

Cooperative education is optional but strongly encouraged for graduate students in the MS in information technology and analytics.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ISTE-608	Database Design And Implementation	3
ISTE-782	Visual Analytics	3
STAT-614	Applied Statistics	3
	Hours	**9**
Spring		
DSCI-633	Foundations of Data Science and Analytics	3
ISTE-610	Non-Relational Data Management	3
ISTE-612	Information Retrieval and Text Mining	3
	Hours	**9**
Second Year		
Fall		
ISTE-605	Scholarship In Information Technology And Analytics	3
Elective		3
	Hours	**6**
Spring		
Select one of the following:		6
Project Option:		
ISTE-791 or ISTE-793	Project in Information Technology and Analytics or Capstone in Information Technology and Analytics	
Elective		
Thesis Option:		

ISTE-790	Thesis in Information Technology and Analytics	
	Hours	**6**
	Total Hours	**30**

Approved Electives

Code	Title	Hours
ISTE-721	Information Assurance Fundamentals	3
ISTE-724	Data Warehousing	3
ISTE-730	Foundations of IoT	3
ISTE-732	IoT Analytics	3
ISTE-764	Project Management	3
ISTE-780	Data Driven Knowledge Discovery	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Information Technology and Analytics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Spring 2025 and Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

It is expected that prospective students will have a background in fundamental information technology concepts including object-oriented programming, website development, database theory and practice, and statistics. Students without the necessary background should complete the prerequisites before applying to the program. However, bridge courses are available to satisfy the prerequisites.

Bridge Courses

Students whose undergraduate preparation or employment experience does not satisfy the prerequisites can make up for these deficiencies by completing prerequisite bridge courses as prescribed by the graduate program director. The bridge courses are not part of the 30-semester credit hours required for the master's degree. Grades for bridge courses are not included in a student's GPA if the courses are taken before matriculation; they are included if completed after matriculation. Since bridge programs can be designed in a variety of ways, the graduate program director will assist students in planning and course selection.

Online Degree Information

The information technology and analytics MS program is designed to be completed part-time (one or two courses per term). Full-time options may be available with graduate program director's approval. Time to completion will depend on the student's individual plan of study, when courses are offered, what electives are selected, and if the student takes a summer course. Advisors work closely with students after admission on course registration. Typically students finish this degree in two years. For specific details about the delivery format and learning experience, contact the program contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Information Technology and Analytics MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Software Engineering MS

Plan Code: SOFTENG-MS | **HEGIS:** 0999.00

Program Overview

RIT's master's in software engineering focuses on a team-based approach that recognizes the significant role teams play in the design, development, and implementation of software systems of varying size and complexity. You will actively engage in software architecture, software security, and mining of software repositories research. You will also be involved in the software engineering department's emerging areas of research.

With careful selection of your electives and the topics chosen for your course projects, capstone project, or thesis research, you may focus on core software engineering topics, or you may specialize in the application of software engineering in numerous fields, including data science, full-stack web development, artificial intelligence and machine learning, and technology and project management. You may choose a thesis or a capstone project in your final year of the program. The capstone requires engagement in team projects that simulate real-world development scenarios. For students entering the program who need to get up to speed on basic computing and programming, introductory courses in software construction and in software engineering fundamentals are available.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
SWEN-601	Software Construction	3
SWEN-610	Foundations of Software Engineering	3
Elective		3
	Hours	**9**
Spring		
SWEN-640	Research Methods	3
SWEN-732	Collaborative Software Development	3
Elective		3
	Hours	**9**
Second Year		
Fall		
SWEN-755	Software Architecture	3
SWEN-783	Software Engineering Masters Project I	3
Elective		3
	Hours	**9**
Spring		
SWEN-777	Software Quality Assurance	3
SWEN-784	Software Engineering Masters Project II	3
Elective		3
	Hours	**9**
	Total Hours	**36**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Software Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional for Fall 2025 applicants. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

Candidates without a computing background will be considered. Based on the evaluation of academic and relevant experience, the graduate program director may require some applicants to successfully complete bridge courses to fill in any gaps in their background.

Web Development Advanced Certificate

Plan Code: IMDEV-ACT | **HEGIS:** 0699.00

Program Overview

With a graduate certificate in web development you'll develop an expertise in interactive multimedia design as well as in enhancing the communication and digital media experience for users. As interactive technologies advance, the ways in which we communicate change—and the importance of improving communication experiences within electronic environments increases. This graduate certificate provides an opportunity for you to gain firsthand knowledge and proficiency in the art and science of interactive multimedia design. You will explore theories of interactive computing and fundamentals of interactive design, web and multimedia programming, and the impact of networked technologies in web communications. You will get hands-on experience with projects, including the development of websites and interactive multimedia applications, and have at your disposal a variety of computer, video, and digitizing equipment in our state-of-the-art interactive media laboratories.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
HCIN-610	Foundations of Human-Computer Interaction	3
ISTE-645	Foundations of Web Technologies I	3
	Hours	**6**
Spring		
HCIN-636	Interactive Programming	3
ISTE-646	Foundations Of Web Technologies II	3
	Hours	**6**
	Total Hours	**12**

Admission Requirements

This program is available on-campus only.

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Fall: February 15 priority deadline, rolling thereafter; Spring: rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Web Development program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.

- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Due to continuing advances in the technologies used for interactive multimedia, knowledge of programming is necessary in this field. Students must have object-oriented programming skills equivalent to one year of study. Bridge courses are available to complete any requirements missing from the applicant's credentials.

Golisano College of Computing and Information Sciences Faculty

Dean's Office

Matt Huenerfauth, MS, University of Delaware; MSc, University College Dublin (Ireland); Ph.D., University of Pennsylvania—Dean; Professor

Michael A. Yacci, BS, Ithaca College; MS, Rochester Institute of Technology; Ph.D., Syracuse University—Senior Associate Dean for Academic Affairs; Professor

Pengcheng Shi, BS, Shanghai Jiao Tong University (China); MS, M Phil, Ph.D., Yale University—Doctorate Program Director; Associate Dean for Research and Scholarship; Professor

Naveen Sharma, MS, Indian Institutes of Science (India); Ph.D., Kent State University—Associate Dean for Faculty Affairs and Industry Engagement; Professor

Computer Science

Dukka KC, BE, M.Inf., Ph.D., Kyoto University (Japan)—Department Chair; Professor

Abeer Ahmad, BS, Lahore University; MS, Ph.D., Stony Brook University—Lecturer

Fawad Ahmad, BSc, University of Engineering and Technology Peshawar (Pakistan); MSc, Ph.D., University of Southern California—Assistant Professor

Anthony Audi, BS Clarkson University; MS, Rochester Institute of Technology—Lecturer

Reynold Bailey, BS, Midwestern State University; MS, Ph.D., Washington University—Associate Undergraduate Program Director; Professor

Ivona Bezakova, BS, Comenius University (Slovakia); MS, Ph.D., University of Chicago—Professor

T.J. Borrelli, BS, St. John Fisher College; MS, Rochester Institute of Technology—Principal Lecturer

Jeremy Brown, BS, Rochester Institute of Technology; MS, Florida Institute of Technology—Lecturer

Zack Butler, BS, Alfred University; Ph.D., Carnegie Mellon University—Professor

Ting Cao, BS, Changsha University of Science and Technology (China); MS, University of Edinburgh (United Kingdom)—Lecturer

Warren Carithers, BS, MS, University of Kansas—Associate Professor

Maria Cepeda, BS, Antonio Machado Education Institute (Spain); MS, Rochester Institute of Technology—Lecturer

Amal Chaaben, BS, MS, University of Sfax Higher Institute of Computer Science—Lecturer

Aaron Deever, BS, Pennsylvania State University; Ph.D., Cornell University—Senior Lecturer, Associate Undergraduate Program Director

Eduardo Coelho De Lima, MS, Ph.D., Rochester Institute of Technology—Lecturer

Matthew Fluet, BS, Harvey Mudd College; Ph.D., Cornell University—Associate Professor

Joe Geigel, BS, Manhattan College; MS, Stevens Institute of Technology; Ph.D., George Washington University—Professor

Edith Hemaspaandra, BS, MS, Ph.D., University of Amsterdam (Netherlands)—Professor

Christopher Homan, AB, Cornell University; MS, Ph.D , University of Rochester—Associate Professor

Ifeoluwatayo Ige, MS, Ph.D., University of Obadan (Nigeria)—Lecturer

Scott Johnson, BS, MS, Rochester Institute of Technology—Senior Lecturer

Thomas Kinsman, BS, University of Delaware; MS, Carnegie Mellon University; Ph.D., Rochester Institute of Technology—Senior Lecturer

Mohan Kumar, BE, Bangalore University (India); MTech, Ph.D., Indian Institute of Science (India)—Professor

Minseok Kwon, BS, MS, Seoul National University (South Korea); Ph.D., Purdue University—Associate Chair; Associate Professor

Xumin Liu, BE, Dalian University of Technology (China); ME, Jinan University (China); Ph.D., Virginia Polytechnic Institute and State University—Associate Professor

Michael Mior, BS, University of Ontario (Canada); MS, University of Toronto (Canada); Ph.D., University of Waterloo (Canada)—Assistant Professor

Arthur Nunes-Harwitt, BS, Brandeis University; MS, University of Pittsburgh; Ph.D., Rochester Institute of Technology—Senior Lecturer

Jansen Orfan, BS, Monmouth University; MS, University of Rochester—Lecturer

Alex Ororbia, BS, Bucknell University; MS, Ph.D., Pennsylvania State University—Assistant Professor

Stanislaw Radziszowski, MS, Ph.D., University of Warsaw (Poland)—Professor

Muhammed Mustapha Rafique, BS, National University of Computer and Emerging Sciences (Pakistan); MS, Ph.D. Virginia Tech University—Assistant Professor

Rajendra K. Raj, BS, Indian University of Technology (India); MS, University of Tennessee; Ph.D., University of Washington—Professor

Carlos Rivero Osuna, BS, MS, Ph.D., University of Seville (Spain)—Associate Professor

Leonid Reznik, Degree of Electronics, Leningrad Institute of Aeronautical Construction (Russia); MS, St. Petersburg Aircraft Academy (Russia); Ph.D., St. Petersburg Polytechnic Institute (Russia)—Professor

Sean Strout, BS, MS, Rochester Institute of Technology—Principal Lecturer

Phil White, BS, Clarkson College; MS, Rochester Institute of Technology—Principal Lecturer

Richard Zanibbi, BA, MS, Ph.D., Queens University (Canada)—Professor

Cybersecurity

Matthew Wright, BS, Harvey Mudd College; MS, Ph.D., University of Massachusetts—Department Chair; Professor

Billy Brumley, Sc.D., Aalto University (Finland)—Professor

Yidan Hu, BE, MS, Hangzhou Dianzi University; Ph.D. University of Delaware—Assistant Professor

Daryl Johnson, BS, St. John Fisher College; MS, Rochester Institute of Technology—Associate Professor

Sumita Mishra, BS, Patna University (India); BS, Ph.D., State University of New York at Buffalo—Professor

Rob Olson, BS, MS, State University College at Fredonia; MS, Nova Southeastern University—Senior Lecturer

Yin Pan, BS, MS, Shanghai Normal University (China); MS, Ph.D., State University of New York at Binghamton—Professor

Gahyun Park, BS, Ewha Womans University (South Korea); MS, Ph.D., Purdue University—Senior Lecturer

Justin M. Pelletier, BS, Stonehill College; MBA, Rochester Institute of Technology; Ph.D., Capella University—Professor of Practice

Hanif Rahbari, BS, Sharif University of Technology (Iran); MS, Amirkabir University (Iran); Ph.D., University of Arizona—Assistant Professor

William Stackpole, BS, Roberts Wesleyan College; MS, Rochester Institute of Technology—Professor Emeritus

Jonathan S. Weissman, BS, College of Staten Island; MA, Brooklyn College—Senior Lecturer

Bo Yuan, BS, MS Shanghai Normal University (China); Ph.D., State University of New York at Binghamton—Department Chair; Professor

School of Information

Sharon P. Mason, BS, Ithaca College; MS, Rochester Institute of Technology; Ph.D., University of Buffalo—School Director; Professor

Cecilia Ovesdotter Alm, BA, Universitat Wien (Austria); MA, Ph.D., University of Illinois Urbana- Champaign—Artificial Intelligence Program Director; Professor

Garret Arcoraci, State University College at Brockport—Lecturer

Catherine I. Beaton, BA, B.Ed., MITE, Dalhousie University (Canada)—Associate Professor

Daniel S. Bogaard, BFA, Indiana University; MS, Rochester Institute of Technology—Undergraduate Program Director; Associate Professor

Christopher Bondy, BS, New York Institute of Technology; MS, Ph.D., Rochester Institute of Technology—Program Coordinator, Professor of Practice

Stephen Cady, BA, Brooks Institute; BA, Antioch University; MFA, University of Illinois—Lecturer

Bryan French, BA, State University College at Potsdam; MS, Rochester Institute of Technology—Principal Lecturer

Dean Ganskop, BS, MS, Rochester Institute of Technology—Lecturer

Erik Golen, BS, Ph.D., Rochester Institute of Technology—Senior Lecturer

James Habermas, BA, MS, State University College at Brockport—Visiting Lecturer

Bruce H. Hartpence, BS, MS, Rochester Institute of Technology—Professor

Lawrence Hill, BS, MS, Rochester Institute of Technology—Networking and Systems Administration Program Coordinator; Associate Professor

Hidy Kong, BA, BS, Calvin University; Ph.D., University of Illinois Urbana-Champaign—Associate Professor

Jeffrey A. Lasky, BBA, City College of New York; MBA, City University of New York; MS, University of Minnesota—Professor Emeritus

Pengfei Li, MSE, Johns Hopkins University—Assistant Professor

Tae (Tom) Oh, BS, Texas Tech University; MS, Ph.D., Southern Methodist University—Professor

Roshan Peiris, BSc, University of Moratuwa (Sri Lanka); Ph.D., National University of Singapore (Singapore)—Assistant Professor

Sylvia Perez-Hardy, BS, MBA, Cornell University—Associate Professor

Ezgi Siir Kibris, BA, MA, MS., Sabanci University (Turkey); MA, MS, Ph.D., University of Rochester—Lecturer

Nirmala Shenoy, BE, ME, University of Madras (India); Ph.D., University of Bremen (Germany)—Professor

Kristen Shinohara, BS, University of Puget Sound; MS, University of Washington-Tacoma; Ph.D., University of Washington-Seattle—Associate Professor

Nick Snyder, BS, MBA, Rochester Institute of Technology—Lecturer

Xinchao Song, BE, Tianjin University (China); MS, MS, Northeastern University; Ph.D., Clarkson University—Assistant Professor

Zhiqiang Tao, BE, MS, Tianjin University; Ph.D., Northeastern University—Assistant Professor

Garreth Tigwell, BS, MS, Ph.D., University of Dundee (United Kingdom)—Assistant Professor

Elissa M. Weeden, BS, MS, Rochester Institute of Technology; Ed.S., Ph.D., Nova Southeastern University—Associate Professor

Qi Yu, BE, Zhejiang University (China); MS, National University of Singapore (Singapore); Ph.D., Virginia Polytechnic Institute and State University—Professor

Stephen Zilora, BS, University of Rochester; MS, New Jersey Institute of Technology—Professor Emeritus

School of Interactive Games and Media

David I. Schwartz, BS, MS, Ph.D., University at Buffalo—Director; Professor

Jake Adams, BFA, Maryland Institute College of Art; MS, University of Edinburgh (United Kingdom)—Lecturer

Eric Baker, BS, MS, Rochester Institute of Technology—Senior Lecturer

Jessica Bayliss, BS, California State University, Fresno; MS, Ph.D., University of Rochester—Professor

John A. Biles, BA, MS, University of Kansas—Professor Emeritus

Alberto Bobadilla Sotelo, BS Universidad Nacional Autonoma de Mexico (Mexico); MS, Rochester Institute of Technology—Senior Lecturer

Sean Boyle, BS, MS, Rochester Institute of Technology—Principal Lecturer

Christopher Cascioli, BS, MS, Rochester Institute of Technology—Senior Lecturer

Erin Cascioli, BS, MS, Nazareth College—Senior Lecturer

Carlos Castellanos, BA, San Francisco State University; MFA, San Jose State University; Ph.D., Simon Fraser University—Assistant Professor

Christopher A. Egert, BS, MS, Rochester Institute of Technology; Ph.D., University at Buffalo—Associate Professor

Stephen Kurtz, BA, University of Miami; MFA, MS, Rochester Institute of Technology—Professor Emeritus

Gordon Goodman, BA, State University of New York at Binghamton; MS (instructional technology), MS (computer science), Rochester Institute of Technology—Professor Emeritus

Owen Gottlieb, BS, Dartmouth College; MA, University of Southern California—Associate Professor

W. Michelle Harris, MPS, New York University—Associate Professor

Anthony Jefferson, BS, State University College at Oswego; MS, Rochester Institute of Technology—Principal Lecturer

Nicholas LaLone, BS, MA, Texas State University; Ph.D., Pennsylvania State University—Professor

Sten McKinzie, BS, MS, Rochester Institute of Technology—Senior Lecturer

Erika Mesh, BS, MS, Rochester Institute of Technology—Senior Lecturer

Elouise Oyzon, BFA, MFA, Rochester Institute of Technology—Undergraduate Program Coordinator; Associate Professor

Ji Hwan Park, BS, Hongik University (South Korea); MS, Korea Advanced Institute of Science (South Korea); Ph.D., Stony Brook University—Assistant Professor

Konstantinos Papangelis, BS, University of Huddersfield (United Kingdom); MS, University of Lancaster (United Kingdom); Ph.D., University of Aberdeen (United Kingdom); Fellow of the Royal Society of the Arts—Assistant Professor

Chao Peng, B.Arch., Hebei University of Engineering (China); MFA, University of Alaska Fairbanks; Ph.D., Virginia Polytechnic Institute and State University—Associate Professor

Justus Roberston, BS, MS, Ph.D., North Carolina State University—Assistant Professor

Travis Stodter, BS, MS, Pennsylvania State University—Lecturer

Brian Tomaszewski, BA, University of Albany; MA, University at Buffalo; Ph.D., Pennsylvania State University—Professor

Andrew Wheeland, MS, Rochester Institute of Technology—Senior Lecturer

Austin Willoughby, BS, MS, Rochester Institute of Technology— Senior Lecturer

Software Engineering

Daqing Hou, BS, MS, Peking University (China); Ph.D., University of Alberta (Canada)—Department Chair; Professor

Travis Desell, BS, MS, Ph.D., Rensselaer Polytechnic Institute—Graduate Program Director, Data Science; Professor

Bruce Herring, BS, MS Florida State University—Senior Lecturer

Ashique KhudaBukhsh, BTech, West Bengal University of Technology; (India) MS, University of British Columbia (Canada); Ph.D., Carnegia Mellon University—Assistant Professor

Larry Kiser, BS, Roberts Wesleyan College; MS, Rochester Institute of Technology—Senior Lecturer

Daniel Krutz, BS, St. John Fisher College; MS, Rochester Institute of Technology; Ph.D., Nova Southeastern University—Associate Professor

Samuel Malachowsky, BBA, State University of New York at Buffalo; MBA, Medaille College—Senior Lecturer

Kenn Martinez, BS, Syracuse University; MS, Rensselaer Polytechnic Institute—Senior Lecturer

Thomas Maszerowski, BS, MS, Rochester Institute of Technology—Visiting Lecturer

Andy Meneely, BA, Calvin College; Ph.D., North Carolina Sate University—Undergraduate Program Director; Associate Professor

Christian Newman, BS, MS, Ph.D., Kent State University—Graduate Program Director, Software Engineering; Associate Professor

Kal Rabb, BS, University of Rochester; MS, Rochester Institute of Technology—Lecturer

Nidhi Rastogi, BS, University of Delhi (India); MS, University of Cincinnati; Ph.D., Rensselaer Polytechnic Institute—Assistant Professor

Sophia Sandhu, BS, Panjab Technical University; MS, University of Toledo—Lecturer

Naveen Sharma, MS, Indian Institutes of Science (India); Ph.D., Kent State University—Department Chair; Professor

Bob St. Jacques, BS, MS, Rochester Institute of Technology—Senior Lecturer

Yiming Tang, BEng, Xidian University (China); MS, The University of Manchester (United Kingdom); Ph.D., City University of New York—Assistant Professor

Zhe Yu, BS, MS, Shanghai Jiao Tong University (China); Ph.D., North Carolina State University—Assistant Professor

Xueling Zhang, BS, Chonqing University of Posts and Telecommunications (China); Ph.D., The University of Texas at San Antonio—Assistant Professor

Computing and Information Sciences

Pengcheng Shi, BS, Shanghai Jiao Tong University (China); MS, M.Phil., Ph.D., Yale University—Doctorate Program Director; Professor; Associate Dean for Research and Scholarship

Rui Li, BS, Harbin Institute of Technology (China); MS, Tianjin University of Technology (China); Ph.D., Rochester Institute of Technology—Assistant Professor

Linwei Wang, BS, Zhejiang University (China); M.Phil., Hong Kong University of Science and Technology (Hong Kong); Ph.D., Rochester Institute of Technology—Professor

Haibo Yang, BS, MS, Lanzhou University (China); Ph.D., Iowa State University—Assistant Professor

Emeritus Faculty

Peter Anderson, Professor Emeritus
Al Biles, Professor Emeritus
Henry Etlinger, Professor Emeritus
Roger Gaborski, Professor Emeritus
Gordon Goodman, Professor Emeritus
Anne Haake, Dean Emeritus and Professor Emeritus
Vicki Hanson, Professor Emeritus
James Heliotis, Professor Emeritus
Edward Holden, Associate Professor Emeritus
Trudy Howles, Professor Emeritus
Andrew Kitchen, Professor Emeritus
Steve Kurtz, Professor Emeritus
Jeffrey Lasky, Professor Emeritus
James Leone, Professor Emeritus
Michael Lutz, Professor Emeritus
Peter Lutz, Professor Emeritus
Wiley McKinzie, Professor Emeritus
Kenneth Reek, Professor Emeritus
Margaret Reek, Professor Emeritus
Carol Romanowski, Professor Emeritus
Evelyn Rozanski, Professor Emeritus
Nan Schaller, Professor Emeritus
Bill Stackpole, Professor Emeritus
Paul Tymann, Professor Emeritus
James Vallino, Professor Emeritus
Ronald Vullo, Associate Professor Emeritus
Walter Wolf, Professor Emeritus
Stephen Zilora, Professor Emeritus

KATE GLEASON COLLEGE OF ENGINEERING

Overview

The Kate Gleason College of Engineering offers comprehensive, innovative graduate programs in a broad range of engineering disciplines. Programs include master of science degrees, master of engineering degrees, advanced certificates, and broad-based, cross-disciplinary doctoral programs in engineering and micro- systems engineering.

Please visit the college's website–**www.rit.edu/engineering (https://www.rit.edu/engineering/)**–for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarships

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Doctoral Degrees

Master's Degrees

Advanced Certificates

Biomedical and Chemical Engineering Ph.D.

Plan Code: BMECHE-PHD | **HEGIS:** 0905.00

Program Overview

The biomedical and chemical engineering Ph.D. provides the knowledge and skills to develop successful independent researchers. Core courses are usually completed during the first two semesters of the program, and then you will choose electives in biomedical engineering and chemical engineering, as well as graduate level electives offered by any of the departments in the Kate Gleason College of Engineering, in consultation with your dissertation and research advisor. In addition, and subject to the program director's approval, you may choose graduate courses offered by any of the RIT colleges. Tailored course work will develop your core competency skills for research, introduce the research landscape in biomedical and chemical engineering, and help prepare you for the qualifying exam.

You will be required to complete a qualifying exam at the end of your first year. The exam evaluates your aptitude, potential, and competency in conducting doctorate-level research. During your third year, you will present a dissertation proposal and defend your dissertation. Research assistantships are available to doctoral students.

You may apply for internships in industry or at one of the national laboratories (https://www.usa.gov/federal-agencies/national-laboratories/) that align with your thesis research. Internships provide an opportunity for hands-on research experience, professional networking, and can serve to advance your thesis work. In addition, you may identify research opportunities at the National Labs Career Fair (https://www.rit.edu/careerservices/national-labs-career-fair/), an annual event hosted by RIT that brings representatives to campus from the United States' federally-funded research and development labs.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
BCEP-795	Doctoral Seminar	1
ENGR-701	Interdisciplinary Research Methods	3
Engineering Foundation 1 [1]		3
Discipline Concentration 1 [2]		3
	Hours	**10**
Spring		
BCEP-795	Doctoral Seminar	1
ENGR-702	Translating Discovery into Practice	3
Engineering Foundation 2 [1]		3
Discipline Concentration 2 [2]		3
	Hours	**10**
Summer		
BCEP-892	Graduate Research	3
	Hours	**3**
Second Year		
Fall		
BCEP-795	Doctoral Seminar	1
Discipline Concentration 3 [2]		3
Focus Area Elective 1 [3]		3
Focus Area Elective 2 [3]		3
	Hours	**10**
Spring		
BCEP-892	Graduate Research	3
Focus Area Elective 3 [3]		3
Focus Area Elective 4 [3]		3
	Hours	**9**
Summer		
BCEP-892	Graduate Research	3
	Hours	**3**
Third Year		
Fall		
BCEP-890	Dissertation and Research	8
	Hours	**8**
Spring		
BCEP-890	Dissertation and Research	8
	Hours	**8**
Summer		
BCEP-890	Dissertation and Research	5
	Hours	**5**
	Total Hours	**66**

1 Select an Engineering Foundation Elective from the list below.
2 Refers to any graduate level course offered by the departments of biomedical or chemical engineering, exclusive of capstones
3 Refers to any graduate level course offered by the Kate Gleason College of Engineering, exclusive of capstones.

Engineering Foundation Electives

Code	Title	Hours
BIME-750	Statistical Analysis and Modeling of Biomedical Data	3
CHME-709	Advanced Engineering Mathematics	3
EEEE-707	Engineering Analysis	3
EEEE-709	Advanced Engineering Mathematics	3
ISEE-760	Design of Experiments	3
MATH-655	Biostatistics	3

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall
Full-time Application Deadline: December 15 priority deadline
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Biomedical and Chemical Engineering program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-

materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#biomedical-and-chemical-engineering-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 94
IELTS: 7.0
PTE Academic: 66

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Biomedical Engineering MS

Plan Code: BIME-MS | **HEGIS:** 0905.00

Program Overview

RIT's biomedical engineering master's degree produces professionals who innovate solutions for today's most pressing health care challenges. Through core courses and electives, the program provides opportunities to develop and define your knowledge of biomedical engineering principles and practices. The degree also prepares you to design biomedical engineering systems that result in applications that improve and enhance the health and well-being of patients. The program culminates in a two-course sequence in a biodesign project and presentation. In the first course, you will conduct an assessment of a medical problem or challenge and develop a solution, while taking into account stakeholder and market analysis, as well as regulatory and intellectual property considerations. In the second course, you will use the knowledge gained in the first course to inform an advanced biodesign strategy that includes the design and fabrication of product concepts using rapid prototyping tools.

Cooperative education is optional but strongly encouraged for graduate students in the biomedical engineering master's program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
BCEP-795	Doctoral Seminar	1
BIME-607	Graduate Biodesign	3
BIME-791	Graduate Biomedical Laboratory	4
CHME-709	Advanced Engineering Mathematics	3
BME Graduate Elective [1]		3
	Hours	**14**
Spring		
BCEP-795	Doctoral Seminar	1
BIME-792	Project with Paper	6
BME Graduate Elective [1]		3
KGCOE Engineering Elective [2]		3
Select one of the following:		3
BIME-750	Statistical Analysis and Modeling of Biomedical Data	
ISEE-760	Design of Experiments	
MATH-655	Biostatistics	
STAT-614	Applied Statistics	
STAT-670	Design of Experiments	
	Hours	**16**
	Total Hours	**30**

1 BIME Graduate Elective refers to any graduate level course offered by the department of biomedical engineering, exclusive of capstones.
2 KGCOE Engineering Elective refers to any graduate level course offered by the Kate Gleason College of Engineering, exclusive of capstones.

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall

Full-time Application Deadline: February 15 priority deadline; rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Biomedical Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering (or a related scientific or technical field). A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Chemical Engineering MS

Plan Code: CHME-MS | **HEGIS:** 0906.00

Program Overview

RIT's chemical engineering master's degree prepares you to develop new, high-tech materials for use across a range of critical industries, including semiconductors, pharmaceuticals, renewable energy systems, battery and alternative energies, and more. In this program you will take core chemical engineering courses in topics such as advanced engineering mathematics, advanced thermodynamics, transport phenomena, and advanced reaction engineering. You may customize your chemical engineering master's with electives in chemical engineering, mechanical engineering, microelectronic engineering, microsystems engineering, imaging science, materials science and engineering, and mathematics. These focus areas give you an opportunity to tailor your course work in a wide variety of topics, including battery engineering, renewable energy systems, nanotechnology and microsystems, quantum mechanics, polymer science, thermodynamics, applied mathematics.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CHME-610	Advanced Thermodynamics	3
CHME-709	Advanced Engineering Mathematics	3
Focus Area Elective 1 [1]		3
Focus Area Elective 2 [1]		3
Focus Area Elective 3 [1]		3
	Hours	**15**
Spring		
CHME-620	Advanced Transport Phenomena	3
CHME-640	Advanced Reaction Engineering	3
CHME-792	Project with Paper	3
Focus Area Elective 4 [1]		3
Focus Area Elective 5 [1]		3
	Hours	**15**
	Total Hours	**30**

[1] Focus Area Electives refers to courses that are directly relevant to providing a breadth of expertise across chemical engineering, by drawing upon graduate course work as appropriate from across the college of engineering or related fields. Graduate courses from a discipline outside of KGCOE would require approval from the Department Graduate Program Director. Students interested in engaging with faculty advisors for graduate research would enroll in graduate independent studies to achieve that experience.

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall; Spring may be considered
Full-time Application Deadline: February 15 priority deadline; rolling thereafter
Full-time STEM Designated: Yes

Offered Part#time

Part-time Admit Term(s): Fall; Spring may be considered
Part-time Application Deadline: February 15 priority deadline; rolling thereafter
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Chemical Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in chemical engineering, or a related field with successful completion of courses in engineering thermodynamics, multi-variable calculus, differential equations, fluid mechanics, and reaction engineering. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Computer Engineering MS

Plan Code: CMPE-MS | **HEGIS:** 0999.00

Program Overview

RIT's computer engineering MS focuses on the design and development of computer and computer-integrated systems, with consideration of engineering factors like function, performance, security, and sustainability. The program emphasizes the careful adoption of design methodology and the application of sophisticated engineering tools. The intensive programming and laboratory work ensure significant, high-level, specialized knowledge and experience.

The degree consists of a required course, flexible core courses, graduate electives, graduate seminar, and your choice of a thesis research or a graduate project. You will choose one course from each of the following core clusters: computer architecture and digital design, computing, or communications and algorithms. With the help of an advisor, you will select most of your graduate electives from within a single research track. The tracks available include computer architecture, computer vision and machine intelligence, integrated circuits and systems, networks and security, signal processing, control, and embedded systems. You may take relevant courses from other academic programs, including electrical engineering, computer science, and software engineering to support a specific research focus. While you may also request to take graduate courses outside of the department, a minimum of three electives from the Department of Computer Engineering are required.

Cooperative education is optional but strongly encouraged for graduate students in the computer engineering master's program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Project Option

First Year		
Fall		**Hours**
CMPE-610	Analytical Topics in Computer Engineering	3
CMPE-795	Graduate Seminar	0
CMPE Flexible Core MS 1 [1]		3
CMPE Graduate Elective 1 [2]		3
	Hours	**9**
Spring		
CMPE Flexible Core MS 2 [1]		3
CMPE Graduate Elective 2 [2]		3
Graduate Elective 3		3
	Hours	**9**
Second Year		
Fall		
Project Focus Elective 1		3
Graduate Elective 4		3
CMPE Graduate Elective 5 [2]		3
	Hours	**9**
Spring		
CMPE-792	Graduate Project	3
	Hours	**3**
	Total Hours	**30**

1 Students must select one course from each cluster in the list below (p. 93).
2 By default, CMPE Grad Electives are CMPE courses 600 level and above. With advisor and department approval, students may request to take graduate courses outside of CMPE. At least three elective courses must be CMPE courses. The Computer Engineering department will list recommended courses on the CMPE web site. Students in the Project option are expected to take the CE Grad Electives to develop specialized skill-set for the Graduate Project.

Flexible Core

Code	Title	Hours
Computer Architecture and Digital Design		
Select one of the following:		3
CMPE-630	Digital Integrated Circuit Design	
CMPE-660	Reconfigurable Computing	
CMPE-755	High Performance Architectures	
Computing, Communications, & Algorithms		
Select one of the following:		3
CMPE-655	Multiple Processor Systems	
CMPE-670	Data and Communication Networks	
CMPE-677	Machine Intelligence	

Thesis Option

First Year		
Fall		**Hours**
CMPE-610	Analytical Topics in Computer Engineering	3
CMPE-795	Graduate Seminar	0
CMPE Flexible Core for MS 1 [1]		3
CMPE Graduate Elective 1 [2]		3
	Hours	**9**
Spring		
CMPE Flexible Core for MS 2 [1]		3
CMPE Graduate Elective 2 [1]		3
Graduate Elective 3		3
	Hours	**9**
Second Year		
Fall		
Graduate Elective 4		3
CMPE Graduate Elective 5 [2]		3
	Hours	**6**
Spring		
CMPE-790	Thesis	6
	Hours	**6**
	Total Hours	**30**

1 Students must select one course from each cluster in the list below (p. 93).
2 By default, CMPE Grad Electives are CMPE courses 600 level and above. With advisor and department approval, students may request to take graduate courses outside of CMPE. At least three elective courses must be CMPE courses. The Computer Engineering department will list recommended courses on the CMPE web site.

Flexible Core

Code	Title	Hours
Computer Architecture and Digital Design		
Select one of the following:		3
CMPE-630	Digital Integrated Circuit Design	
CMPE-660	Reconfigurable Computing	
CMPE-755	High Performance Architectures	
Computing, Communications, & Algorithms		
Select one of the following:		3
CMPE-655	Multiple Processor Systems	
CMPE-670	Data and Communication Networks	
CMPE-677	Machine Intelligence	

Comprehensive Exam Option

First Year		
Fall		**Hours**
CMPE-610	Analytical Topics in Computer Engineering	3
CMPE-795	Graduate Seminar	0
CMPE Primary Flexible Core MS 1 [1]		3
CMPE Primary Flexible Core MS 2 [1]		3
	Hours	**9**
Spring		
CMPE Primary Flexible Core MS 3 [1]		3
CMPE Secondary Flexible Core MS 1 [1]		3
CMPE Graduate Elective 1 [2]		3
	Hours	**9**
Second Year		
Fall		
CMPE-785	Comprehensive Exam	0
CMPE Graduate Elective 2 [2]		3
CMPE Graduate Elective 3 [2]		3
Graduate Elective 4		3
Graduate Elective 5		3
	Hours	**12**
	Total Hours	**30**

Notes:

- Students must pass a comprehensive examination (minimum passing grade of B) consisting of questions from CMPE-610 Analytical Topics in Computer Engineering and all three courses in the flexible core cluster that the student selected as primary. A maximum of two attempts are allowed to pass the exam.

Footnotes:

1 Students must identify a primary flexible core cluster and a secondary flexible core cluster. Students take all courses from the primary cluster and select one course from the secondary cluster. Cluster courses can be found in the list below (p. 94).
2 By default, CMPE Graduate Electives are CMPE courses 600 level and above. With advisor and department approval, students may request to take graduate courses outside of CMPE. At least three elective courses must be CMPE courses. The Computer Engineering department will list recommended courses on the CMPE web site.

Flexible Core

Students must identify a primary flexible core cluster and a secondary flexible core cluster. Students take all courses from the primary cluster and select one course from the secondary cluster.

Code	Title	Hours
Computer Architecture and Digital Design		
CMPE-630	Digital Integrated Circuit Design	
CMPE-660	Reconfigurable Computing	
CMPE-755	High Performance Architectures	
Computing, Communications, & Algorithms		
CMPE-655	Multiple Processor Systems	
CMPE-670	Data and Communication Networks	
CMPE-677	Machine Intelligence	

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Computer Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in computer engineering or a related field. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Electrical and Computer Engineering Ph.D.

Plan Code: ECE-PHD | **HEGIS:** 0909.00

Program Overview

Offered jointly by the Department of Electrical and Microelectronic Engineering and the Department of Computer Engineering, the Ph.D. program in electrical and computer engineering prepares you to become an explorer of the information age who can transform the world with trailblazing research that expands and creates knowledge. By conducting research under the guidance of RIT's world-class researchers , you will learn to become an independent researcher. The curriculum for the Ph.D. provides disciplinary and interdisciplinary courses, research mentorship, and seminars.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
ECEP-795	Doctoral Seminar	1
ENGR-701	Interdisciplinary Research Methods	3
Engineering Foundation 1 [1]		3
Discipline Concentration 1 [2]		3
	Hours	**10**
Spring		
ECEP-796	Research Methods in Electrical and Computer Engineering	2
ENGR-702	Translating Discovery into Practice	3
Engineering Foundation 2 [1]		3
Discipline Concentration 2 [2]		3
	Hours	**11**
Summer		
ECEP-892	Graduate Research	3
	Hours	**3**
Second Year		
Fall		
Discipline Concentration 3 [2]		3
Focus Area Elective 1 [3]		3
Focus Area Elective 2 [3]		3
	Hours	**9**
Spring		
ECEP-892	Graduate Research	3
Focus Area Elective 3 [3]		3
Focus Area Elective 4 [3]		3
	Hours	**9**
Summer		
ECEP-892	Graduate Research	3
	Hours	**3**
Third Year		
Fall		
ECEP-890	Dissertation and Research	8
	Hours	**8**
Spring		
ECEP-890	Dissertation and Research	8
	Hours	**8**
Summer		
ECEP-890	Dissertation and Research	5
	Hours	**5**
	Total Hours	**66**

1 Select a Engineering Foundation Elective below.
2 Refers to any graduate level course offered by the departments of Electrical (EEEE) and Microelectronic Engineering (MCEE) or Computer Engineering (CMPE), exclusive of capstones
3 Refers to any graduate level course offered by the Kate Gleason College of Engineering, exclusive of capstones. See below.

Engineering Foundation Electives

Code	Title	Hours
CMPE-610	Analytical Topics in Computer Engineering	3
EEEE-707	Engineering Analysis	3
EEEE-709	Advanced Engineering Mathematics	3

Focus Area Electives

Code	Title	Hours
KGCOE-6xx course offered by the Kate Gleason College of Engineering, exclusive of capstones		
KGCOE-7xx course offered by the Kate Gleason College of Engineering, exclusive of capstones		
KGCOE-8xx course offered by the Kate Gleason College of Engineering, exclusive of capstones		
BIOL-672	Computational Statistics and Data Science Methods	3
CISC-863	Statistical Machine Learning	3
CSCI-642	Secure Coding	3
CSCI-662	Foundations of Cryptography	3
CSCI-720	Big Data Analytics	3
CSEC-600	Introduction to Computing Security	3
CSEC-604	Cryptography and Authentication	3
CSEC-630	Trusted Computing and Trusted Execution	3
CSEC-669	Wireless Security	3
CSEC-720	Deep Learning Security	3
CSEC-741	Internet of Things Security	3
CSEC-744	Network Security	3
CSEC-769	Emerging Topics Wireless Security	3
DSCI-644	Software Engineering for Data Science	3
IMGS-633	Optics for Imaging	2
ISTE-780	Data Driven Knowledge Discovery	3
MATH-603	Optimization Theory	3
MATH-622	Mathematical Modeling I	3
MATH-645	Graph Theory	3
PHYS-614	Quantum Theory	3
PHYS-667	Quantum Optics	3
PHYS-732	Advanced Solid State Physics	3
TCET-740	Fiber Optic Communications	2
TCET-741	Fiber Optic Communications Lab	1
TCET-745	Advanced Fiber-Optic Communications	3
TCET-748	Fiber Optic Test & Measurement	3
TCET-752	Advanced Wireless Communication	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: December 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Electrical and Computer Engineering program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#electrical-and-computer-engineering-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 94
IELTS: 7.0
PTE Academic: 66

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Electrical Engineering MS

Plan Code: EEEE-MS | **HEGIS:** 0909.00

Program Overview

In RIT's electrical engineering master's degree you will engage in innovative research to solve industrial and business challenges. In this degree, you can customize a specialty of your choosing while working closely with electrical engineering faculty in a contemporary, applied research area. The program provides you with the skills to solve industry and business challenges and deploy high-level solutions to electrical engineering problems. The curriculum also prepares you for advanced study in doctorate programs, including RIT's microsystems engineering Ph.D. or our electrical and computer engineering Ph.D. You are required to choose an area of focus from several possibilities, including communications, controls, digital systems, electromagnetics, integrated electronics, MEMs, robotics, or signal and image processing.

Cooperative education is optional but strongly encouraged for graduate students in the electrical engineering master's program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
EEEE-707	Engineering Analysis	3
EEEE-795	Graduate Seminar	0
EEEE Graduate Focus Area 1 [1]		3
EEEE Graduate Focus Area 2 [1]		3
	Hours	**9**
Spring		
EEEE-709	Advanced Engineering Mathematics	3
EEEE Graduate Focus Area 3 [1]		3
Graduate Elective 1		3
	Hours	**9**
Second Year		
Fall		
Graduate Elective 2		3
Graduate Elective 3		3
Select one of the following Culminating Experience:		3
Thesis Option:		
EEEE-790	Thesis	
Graduate Paper Option:		
EEEE-792	Graduate Paper	
Comprehensive Exam Option:		
EEEE-6xx Graduate Elective		
	Hours	**9**
Spring		
Select one of the following Culminating Experiences:		3
Thesis Option:		
EEEE-790	Thesis	
Graduate Paper Option:		
Graduate Elective		
Comprehensive Exam Option:		
EEEE-785	Comprehensive Exam	
and EEEE-6xx Graduate Elective		
	Hours	**3**
	Total Hours	**30**

Notes:

- The program is also offered for part-time study. Students typically take one or two courses per semester and finish in three to five years. This example schedule is only one of many possible scenarios.

Footnotes:

[1] Students will complete three courses (9 credits) from one focus area found in the list below (p. 97).

Focus Areas

Complete three courses (9 credits) from one focus area:

Code	Title	Hours
Communication		
EEEE-602	Random Signals and Noise	3
EEEE-692	Communication Networks	3
EEEE-693	Digital Data Communication	3
EEEE-694	Sensor Array Processing for Wireless Communications	3
EEEE-797	Wireless Communication	3
Control Focus Area		
EEEE-602	Random Signals and Noise	3
EEEE-661	Modern Control Theory	3
EEEE-663	Real-Time & Embedded Systems	3
EEEE-683	Mechatronics	3
EEEE-765	Optimal Control	3
Digital Systems		
EEEE-620	Design of Digital Systems	3
EEEE-621	Design of Computer Systems	3
EEEE-720	Advanced Topics in Digital Systems Design	3
EEEE-721	Advanced Topics in Computer System Design	3
EEEE-722	Complex Digital Systems Verification	3
Electromagnetics, Microwaves and Antennas		
EEEE-602	Random Signals and Noise	3
EEEE-617	Microwave Circuit Design	3
EEEE-629	Antenna Theory	3
EEEE-710	Advanced Electromagnetic Theory	3
EEEE-718	Design and Characterization of Microwave Systems	3
Integrated Electronics		
EEEE-610	Analog IC Design	3
EEEE-711	Advanced Carrier Injection Devices	3
EEEE-712	Advanced Field Effect Devices	3
EEEE-726	Mixed-Signal IC Design	3
MCEE-601	Microelectronic Fabrication	3
MEMS		
EEEE-661	Modern Control Theory	3
EEEE-689	Fundamentals of MEMS	3
EEEE-787	MEMS Evaluation	3
MCEE-601	Microelectronic Fabrication	3
Robotics		
EEEE-602	Random Signals and Noise	3
EEEE-636	Biorobotics/Cybernetics	3
EEEE-647	Artificial Intelligence Explorations	3
EEEE-685	Principles of Robotics	3
EEEE-784	Advanced Robotics	3
Signal and Image Processing		
EEEE-602	Random Signals and Noise	3
EEEE-670	Pattern Recognition	3
EEEE-678	Digital Signal Processing	3
EEEE-779	Digital Image Processing	3
EEEE-781	Image and Video Compression	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Electrical Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering or a related field. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5

PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

Applicants with a bachelor's degree in fields outside of electrical engineering may be considered for admission, however, bridge courses may be required to ensure the student is adequately prepared for graduate study.

Engineering Management MS

Plan Code: ENGMGT-MS | **HEGIS:** 0913.00

Program Overview

The master of science in engineering management uses a blend of industrial and systems engineering courses from the Kate Gleason College of Engineering and business courses from Saunders College of Business to focus on the management of engineering and technological business challenges. To support the dual role of the engineering manager, as both a technologist and a leader, the program combines technological expertise with managerial skill development. You will engage in courses in organizational behavior, finance, accounting, decision making under uncertainty, and the engineering product development value chain. To customize the degree, you will choose either supply chain, production systems, or sustainability as a focus area.

Cooperative education is strongly encouraged for graduate students in the engineering management master's program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ISEE-750	Systems and Project Management	3
ISEE-771	Engineering of Systems I	3
Focus Area Elective (1) [1]		3
Culminating Experience - Thesis Option:		
ISEE-795	Graduate Seminar	
	Hours	**9**
Spring		
ISEE-752	Decision Analysis	3
MGMT-740	Leading Teams in Organizations	3
Focus Area Elective (2) [1]		3
Culminating Experience - Thesis Option:		
ISEE-795	Graduate Seminar	
	Hours	**9**
Second Year		
Fall		
ISEE-773	Engineering Value Creation	3
KGCOE (Engineering) or SCB (Business) Elective		3
Select one of the following Culminating Experiences:		3
Project or Capstone Option:		
KGCOE (Engineering) or SCB (Business) Elective		
Thesis Option:		
ISEE-790	Thesis	
	Hours	**9**
Spring		
Select one of the following Culminating Experiences:		3
Project Option:		
ISEE-788	Project with Paper	
Thesis Option:		
ISEE-790	Thesis	
Capstone Option:		
ISEE-792	Engineering Capstone	
	Hours	**3**
	Total Hours	**30**

[1] Students must select two electives from one of the four focus areas in the list below. (p. 99)

Focus Areas

Code	Title	Hours
Supply Chain		
BANA-680	Data Management for Business Analytics	3
BANA-780	Advanced Business Analytics	3
DECS-750	Supply Chain Analytics	3
INTB-755	Export, Import, and Global Sourcing	3
ISEE-703	Supply Chain Management	3
or DECS-743	Operations and Supply Chain Management	
ISEE-704	Logistics	3
ISEE-720	Production Control	3
ISEE-723	Global Facilities Planning	3
ISEE-761	Forecasting Methods	3
MGMT-755	Negotiations	3
Production Systems		
ISEE-626	Lean System Design	3
ISEE-660	Applied Statistical Quality Control	3
ISEE-682	Lean Six Sigma Fundamentals	3
ISEE-728	Production Systems Management	3
Sustainable Product Development		
ISEE-781	Excellence in New Product Development	3
ISEE-785	Fundamentals of Sustainable Engineering	3
ISEE-786	Lifecycle Assessment	3
ISUS-704	Industrial Ecology	3
ISUS-706	Economics of Sustainable Systems	3
ISUS-806	Risk Analysis	3
MGMT-710	Sustainable Business Innovation: Strategy and Practice	3
PUBL-631	Climate Change: Science, Technology and Policy	3
PUBL-701	Graduate Policy Analysis	3
Project Management		
PROF-711	Advanced Project Management	3
PROF-712	International Project Management	3
PROF-715	Agile Leadership and Self Organizing Teams	3
PROF-716	Agile and Design Thinking	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Engineering Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering, mathematics, or science. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Industrial and Systems Engineering MS

Plan Code: ISEE-MS | **HEGIS:** 0913.00

Program Overview

The industrial and systems engineering master's degree offers you hands-on experiences in designing, improving, and controlling complex systems to make them more profitable, practical, controllable, and flexible. The goal of the program is to teach you to become a problem-solver through courses that leverage skills in advanced manufacturing processes, operations research, data analytics, human computer interaction and augmented reality, product development, ergonomics and human factors, health care, logistics and supply chain management, and sustainable design and development.

The curriculum allows you to customize your course work while working closely with industrial and systems engineering faculty in a contemporary, applied research area. Faculty members are currently conducting applied project and research work in the areas of contemporary and advanced manufacturing processes/systems, ergonomic/biomedical analysis, human computer interaction and augmented reality, logistics and supply chain management, health systems, energy systems, sustainable design and development, systems engineering/product development, and systems simulation.

Cooperative education is strongly encouraged for graduate students in the industrial engineering master's program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Project or Capstone Option

First Year		
Fall		**Hours**
ISEE-601	Systems Modeling and Optimization	3
ISEE-771	Engineering of Systems I	3
ISEE-795	Graduate Seminar	0
ISEE Elective		3
	Hours	**9**
Spring		
ISEE-760	Design of Experiments	3
ISEE-795	Graduate Seminar	0
ISEE Elective		3
Graduate Elective		3
	Hours	**9**
Second Year		
Fall		
ISEE Elective		3
ISEE Elective		3
Graduate Elective		3
	Hours	**9**
Spring		
Select one of the following:		3
ISEE-788	Project with Paper	
ISEE-792	Engineering Capstone	
	Hours	**3**
	Total Hours	**30**

Thesis Option

First Year		
Fall		**Hours**
ISEE-601	Systems Modeling and Optimization	3
ISEE-771	Engineering of Systems I	3
ISEE-795	Graduate Seminar	0
ISEE Elective		3
	Hours	**9**
Spring		
ISEE-760	Design of Experiments	3
ISEE-795	Graduate Seminar	0
ISEE Elective		3
ISEE Elective		3
	Hours	**9**
Second Year		
Fall		
ISEE-790	Thesis	3
Graduate Elective		3
Graduate Elective		3
	Hours	**9**
Spring		
ISEE-790	Thesis	3
	Hours	**3**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Industrial and Systems Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering, mathematics, or science. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.

- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Lean Six Sigma Advanced Certificate

Plan Code: STATQL-ACT | **HEGIS:** 1702.00

This program is available online.

Program Overview

RIT's Lean Six Sigma certification utilizes the DMAIC methodology (define, measure, analyze, improve, and control) and is for engineers, process-improvement facilitators, and other practitioners looking to increase their effectiveness or enhance their qualifications. The course work focuses on quality control situations in engineering and on driving process improvements in a broad range of business environments and industries to improve business processes. Industry certifications such as Lean Six Sigma green belt and black belt are not the focus of this certificate program, however, students interested in obtaining these credentials are well prepared to do so after the deep topical coverage offered in this advanced certificate program. Certificate courses may be completed on campus or online.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ISEE-682	Lean Six Sigma Fundamentals	3
Select one of the following:		3
ISEE-660	Applied Statistical Quality Control	
STAT-621	Statistical Quality Control	
	Hours	**6**
Spring		
Elective		3
Select one of the following:		3
ISEE-760	Design of Experiments	
STAT-670	Design of Experiments	
	Hours	**6**
	Total Hours	**12**

Notes:

- This represents the typical sequence for a student taking two courses per semester. The program is also offered for part time study only. Students typically take one or two courses per semester, and will take two to four semesters to finish the certificate. This schedule is only one example since courses are offered on campus and online and many possible scenarios are possible.

Electives

Code	Title	Hours
DECS-743	Operations and Supply Chain Management	3
DECS-744	Project Management	3
BANA-680	Data Management for Business Analytics	3
INTB-710	Global Business Analytics	3
ISEE-626	Lean System Design	3
ISEE-703	Supply Chain Management	3
ISEE-704	Logistics	3
ISEE-720	Production Control	3
ISEE-723	Global Facilities Planning	3

ISEE-728	Production Systems Management	3
ISEE-745	Manufacturing Systems	3
ISEE-750	Systems and Project Management	3
ISEE-751	Decision and Risk Benefit Analysis	3
ISEE-752	Decision Analysis	3
ISEE-771	Engineering of Systems I	3
ISEE-786	Lifecycle Assessment	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
PROF-710	Project Management	3
PROF-711	Advanced Project Management	3
PROF-712	International Project Management	3
PROF-714	Agile Project Management	3
SERQ-723	Service Analytics	3
STAT-611	Statistical Software - R	3
STAT-614	Applied Statistics	3
STAT-641	Applied Linear Models - Regression	3
STAT-642	Applied Linear Models - ANOVA	3
STAT-745	Predictive Analytics	3
STAT-747	Principles of Statistical Data Mining	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Part#time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part#time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Lean Six Sigma program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have college-level credit or practical experience in statistics (at least one course in probability and statistics).

Online Degree Information

The online Lean Six Sigma Advanced Certificate can only be completed part-time, taking one or two courses per term. The average time to completion is one year. Delivery is a blend of asynchronous and synchronous study, and academic advisors work with students to select courses that meet degree requirements and student schedules. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Lean Six Sigma Adv. Cert. is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Manufacturing Leadership MS

Plan Code: MFLEAD-MS | **HEGIS:** 0599.00

This program is available online.

Program Overview

The manufacturing leadership master's degree is for experienced engineers and other professionals who aspire to high-level positions in operations, supply chain management, and process improvement. It is a focused program, developed jointly by the Kate Gleason College of Engineering and Saunders College of Business, that integrates both business and engineering management courses. Particular emphasis is placed on courses in supply chain management, global manufacturing and operations, lean systems thinking, leadership, and decision-making. A capstone project, oriented to solving an operations or service management problem or process improvement initiative, enables you to apply new skills and capabilities to solve a pressing real-world problem with significant financial benefit to your sponsor.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
ISEE-723	Global Facilities Planning	3
ISEE-771	Engineering of Systems I	3
	Hours	**6**
Spring		
ISEE-745	Manufacturing Systems	3
Select one of the following:		3
ISEE-703	Supply Chain Management	
DECS-743	Operations and Supply Chain Management	
	Hours	**6**
Summer		
ISEE-682	Lean Six Sigma Fundamentals	3
Select one of the following:		3
ISEE-750	Systems and Project Management	
PROF-710	Project Management	
PROF-714	Agile Project Management	
	Hours	**6**
Second Year		
Fall		
ISEE Engineering Elective or other non-Business elective		3
Select one of the following:		3
ACCT-603	Accounting for Decision Makers	
ACCT-794	Cost Management in Technical Organizations	
	Hours	**6**
Spring		
Select one of the following:		3
MGMT-740	Leading Teams in Organizations	
MGMT-758	Seminar in Management	
Select one of the following:		3
ISEE-792	Engineering Capstone	
ISEE-793	Manufacturing Leadership Capstone	
	Hours	**6**
	Total Hours	**30**

Electives

Code	Title	Hours
ACCT-745	Accounting Information and Analytics	3
BANA-680	Data Management for Business Analytics	3
DECS-750	Supply Chain Analytics	3
ESHS-620	Occupational Safety	3
ESHS-680	Environmental, Health and Safety Management	3
FINC-605	Financing New Ventures	3
FINC-721	Financial Analysis for Managers	3
HCIN-610	Foundations of Human-Computer Interaction	3
HLTH-710	Health Care Economics and Policy	3
HLTH-718	Evidence-Based Management in Health Care	3
HLTH-725	Health Care Strategic Marketing & Communications	3
HLTH-733	Health Systems Quality & Organizational Learning	3
HLTH-735	Management of Risk in Health Care	3
HLTH-736	Health Care Operations: Building High Reliability Systems	3
HLTH-760	Health Informatics and Decision Support	3
HLTH-796	Health Care Strategy: Analysis & Formulation	3
HRDE-710	Foundations in Human Resource Development	3
HRDE-712	Performance Analysis and Development	3
HRDE-715	Human Performance Design and Development	3
HRDE-721	Organizational Learning and Knowledge Management	3
HRDE-722	Talent Development	3
HRDE-726	Technology and the Future of Work	3
HRDE-742	Leading Change	3
IDAI-610	Fundamentals of Artificial Intelligence	3
IDAI-700	Ethics of Artificial Intelligence	3
INTB-710	Global Business Analytics	3
INTB-755	Export, Import, and Global Sourcing	3
INTB-780	Global Issues and Strategies	3
ISEE-601	Systems Modeling and Optimization	3
ISEE-626	Lean System Design	3
ISEE-661	Data Analytics and Predictive Modeling	3
ISEE-720	Production Control	3
ISEE-728	Production Systems Management	3
ISEE-732	Systems Safety Engineering	3
ISEE-734	Graduate Engineering Psychology	3
ISEE-741	3D Printing	3
ISEE-751	Decision and Risk Benefit Analysis	3
ISEE-752	Decision Analysis	3
ISEE-760	Design of Experiments	3
ISEE-772	Engineering of Systems II	3
ISEE-773	Engineering Value Creation	3
ISEE-781	Excellence in New Product Development	3
ISEE-782	Product Development in the Extended Enterprise	3
ISEE-785	Fundamentals of Sustainable Engineering	3
ISEE-786	Lifecycle Assessment	3
ISEE-787	Design for the Environment	3
ISEE-789	Special Topics	3

ISTE-762	Software Economics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGIS-720	Information Systems Design and Development	3
MGIS-725	Data Management and Analytics	3
MGIS-735	Design and Information Systems	3
MGIS-758	Seminar in Management Information Systems	3
MGIS-760	Integrated Business Systems	3
MGMT-610	Global Entrepreneurship	3
MGMT-710	Sustainable Business Innovation: Strategy and Practice	3
MGMT-720	Entrepreneurship and Technology Entrepreneurship	3
MGMT-735	Management of Innovation	3
MGMT-745	Business, Government, and Public Policy	3
MGMT-755	Negotiations	3
MGMT-761	Managing Research and Innovation	3
MGMT-765	Applied Venture Creation	3
MGMT-770	Business Research Methods	3
MGMT-775	Ethical Decision Making and Corporate Social Performance	3
MKTG-761	Marketing Concepts and Commercialization	3
MKTG-763	Buyer Behavior	3
MKTG-768	Marketing Analytics	3
MKTG-772	Internet Marketing: Strategy & Tactics	3
MKTG-776	Product and Brand Management	3
MKTG-778	Commercialization and Marketing of New Products	3
PROF-711	Advanced Project Management	3
PROF-712	International Project Management	3
PROF-713	Program Management for Product and Service Development	3
PROF-714	Agile Project Management	3
PROF-715	Agile Leadership and Self Organizing Teams	3
PROF-716	Agile and Design Thinking	3
PUBL-610	Technological Innovation and Public Policy	3
PUBL-630	Energy Policy	3
PUBL-700	Readings in Public Policy	3
PUBL-810	Technology, Policy and Sustainability	3
SERQ-710	Service Design Fundamentals	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
SERQ-720	Strategic Foresight and Innovation	3
SERQ-722	Customer Centricity	3
SERQ-723	Service Analytics	3
SERQ-747	Design Thinking and Creativity	3
SERQ-787	Service Design and Implementation	3
STAT-611	Statistical Software - R	3
STAT-614	Applied Statistics	3
STAT-621	Statistical Quality Control	3
STAT-631	Foundations of Statistics	3
STAT-641	Applied Linear Models - Regression	3
STAT-642	Applied Linear Models - ANOVA	3
STAT-670	Design of Experiments	3
STAT-672	Survey Design and Analysis	3
STAT-745	Predictive Analytics	3
STAT-747	Principles of Statistical Data Mining	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Manufacturing Leadership program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores.

Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have at least two years of experience in a manufacturing-related organization or business environment.

Online Degree Information

The Manufacturing Leadership MS program is designed to be completed part-time (1 or 2 courses per term). Full-time options may be available with Graduate Program Director's approval. Time to completion will depend on the plan of study when courses are offered, selected electives, and if the student takes a summer course. Courses may be synchronous or asynchronous. Academic advisors work with students on a study plan after admission to ensure classes fit student availability. Typically students finish this degree in 24-36 months. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Manufacturing Leadership MS is considered a professional degree that is billed at the standard (on campus) RIT graduate tuition rate. It is not billed at the designated online tuition rate. Scholarship is available off the standard tuition rate for this online program. View the current Graduate tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Mechanical and Industrial Engineering Ph.D.

Plan Code: MIE-PHD | **HEGIS:** 0910.00

Program Overview

With a doctorate in mechanical and industrial engineering you will graduate with a depth of knowledge in mechanical or industrial engineering while engaging in cutting-edge, cross-disciplinary research. The flexible curriculum encourages you to gain domain-specific knowledge from courses offered throughout the college's portfolio of engineering programs. The curriculum, coupled with the depth of knowledge in mechanical or industrial engineering disciplines, develops world-class researchers who can capitalize on the most promising discoveries and innovations to develop interdisciplinary solutions for real-world challenges.

The program finds its roots in tackling global problems in energy, transportation, health care, communications, and manufacturing. The mechanical and industrial engineering departments offer a broad range of technological research strengths including additive and advanced manufacturing, nanotechnology, robotics and mechatronics, heat transfer and thermo-fluids, simulation, modeling and optimization, ergonomics, biomimetic systems, wearable sensors, health care data analytics, prognostics and fault detection, and energy systems. You will collaborate with faculty advisors to build on these technological strengths to solve fundamental technical problems of national and global significance. The program will prepare you for careers in both industry and academia.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
ENGR-701	Interdisciplinary Research Methods	3
MIEP-795	Doctoral Seminar	1
Engineering Foundation 1 [1]		3
Discipline Concentration 1 [2]		3
	Hours	**10**
Spring		
ENGR-702	Translating Discovery into Practice	3
MIEP-795	Doctoral Seminar	1
Engineering Foundation 2 [1]		3
Discipline Concentration 2 [2]		3
	Hours	**10**
Summer		
MIEP-892	Graduate Research	3
	Hours	**3**
Second Year		
Fall		
MIEP-795	Doctoral Seminar	1
Discipline Concentration 3		3
Focus Area Elective 1 [3]		3
Focus Area Elective 2 [3]		3
	Hours	**10**
Spring		
MIEP-892	Graduate Research	3
Focus Area Elective 3 [3]		3

Focus Area Elective 4 [3]		3
	Hours	**9**
Summer		
MIEP-892	Graduate Research	3
	Hours	**3**
Third Year		
Fall		
MIEP-890	Dissertation and Research	8
	Hours	**8**
Spring		
MIEP-890	Dissertation and Research	8
	Hours	**8**
Summer		
MIEP-890	Dissertation and Research	5
	Hours	**5**
	Total Hours	**66**

1 See list below
2 Refers to any graduate level course offered by the departments of Mechanical (MECE) or Industrial and Systems engineering (ISEE), exclusive of capstones
3 Refers to any graduate level course offered by the Kate Gleason College of Engineering, exclusive of capstones

Engineering Foundation Electives

Code	Title	Hours
ISEE-601	Systems Modeling and Optimization	3
ISEE-760	Design of Experiments	3
ISEE-771	Engineering of Systems I	3
MECE-707	Engineering Analysis	3
or ENGR-707	Engineering Analysis	
MECE-709	Advanced Engineering Mathematics	3
or ENGR-709	Advanced Engineering Mathematics	

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: December 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Mechanical and Industrial Engineering program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#mechanical-and-industrial-engineering-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required. No minimum requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 94
IELTS: 7.0
PTE Academic: 66

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Mechanical Engineering ME

Plan Code: MECE-ME | **HEGIS:** 0910.00

Program Overview

RIT's mechanical engineering ME degree equips you will the skills needed to design engineered systems using core mechanical engineering principles and tools. You will work independently as well as collaboratively with leaders in the industry, while demonstrating the professional and ethical responsibilities of the engineering profession. You will enhance your skills through course work, training, independent inquiry, and professional development. In addition to required courses, the curriculum allows you to choose electives in a variety of focus areas that will customize the degree around your professional goals and interests. Focus areas include automotive systems, business, controls, manufacturing, mechanics-design/materials, product development, sustainability, thermo/fluids engineering, and vibrations engineering.

Cooperative education is strongly encouraged for graduate students in the ME in mechanical engineering.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
MECE-707	Engineering Analysis	3
MECE-795	Graduate Seminar [1]	0
MECE Grad Elective I		3
MECE Grad Elective II		3
	Hours	**9**
Spring		
MECE-709	Advanced Engineering Mathematics	3
MECE-795	Graduate Seminar	0
MECE Grad Elective III		3
MECE Grad Elective IV		3
	Hours	**9**
Second Year		
Fall		
MECE Grad Elective V		3
MECE Grad Elective VI		3
MECE Grad Elective VII		3
	Hours	**9**
Spring		
Select one of the following:		3
MECE-730	Design Project Leadership	
MECE-777	Graduate Internship	
MECE-792	Project with Paper	
	Hours	**3**
	Total Hours	**30**

1 Two semesters of MECE-795 Graduate Seminar are required of all full-time students

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Mechanical Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in mechanical engineering, physics, or a related field. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required (waived for Spring 2025 and Fall 2025). No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Mechanical Engineering MS

Plan Code: MECE-MS | **HEGIS:** 0910.00

Program Overview

RIT's mechanical engineering master's degree focuses on an in-depth examination of dynamics, robotics, nanotechnology, biomechanics, and energy systems to prepare you to enhance or enter a career in industry or research. Designed for those who desire advanced training in specific areas of mechanical engineering, you will customize your areas of study by focusing on courses related to your technical and professional development interests and goals. The program consists of course options in a variety of disciplines, including dynamics, robotics, nanotechnology, biomechanics, and energy systems, as well as focus areas in automotive systems, business, controls, manufacturing, mechanics-design/materials, product development, sustainability, thermo/fluids engineering, and vibrations engineering.

You may also earn a limited number of credit hours through independent study with guidance from a member of the graduate faculty. Areas for independent study include selected topics in applied mathematics, analytical mechanics, nonlinear mechanics, fracture mechanics, heat transfer, fluid mechanics, thermodynamics, control systems, optimal control, thermal stresses, composite materials, and biomechanics. Prior to completing all required course work, you will prepare and present a formal thesis proposal to your faculty advisor and then deliver a successful written and oral presentation of your thesis.

Cooperative education is strongly encouraged for graduate students in the mechanical engineering master's program.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
MECE-707	Engineering Analysis	3
MECE-795	Graduate Seminar [1]	0
MECE Grad Elective I		3
MECE Grad Elective II		3
	Hours	**9**
Spring		
MECE-709	Advanced Engineering Mathematics	3
MECE-795	Graduate Seminar	0
MECE Grad Elective III		3
MECE Grad Elective IV		3
	Hours	**9**
Second Year		
Fall		
MECE-790	Thesis	3
MECE Grad Elective V		3
MECE Grad Elective VI		3
	Hours	**9**
Spring		
MECE-790	Thesis	3
	Hours	**3**
	Total Hours	**30**

[1] Two semesters of MECE-795 Graduate Seminar are required of all full-time students

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Mechanical Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in mechanical engineering, physics, or a related field. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required (waived for Spring 2025 and Fall 2025). No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Microelectronic Engineering MS

Plan Code: MCEE-MS | **HEGIS:** 0999.00

This program is available online.

Program Overview

The microelectronic engineering master's degree provides an opportunity for you to perform graduate-level research as you prepare for entry into either the semiconductor industry or a doctoral program. The degree focuses on the study, design, and fabrication of semiconductor and photonic devices that impact virtually every aspect of human life; from communication, entertainment, and transportation to health, solid-state lighting, and solar cells. With courses in physics, chemistry, and engineering, the curriculum prepares you for the real world.

The program is offered both on campus and online. The on-campus program consists of core courses, graduate electives, graduate seminar, and a research project or thesis. Students in the online version of the program complete all of the same requirements, with the exception of the graduate seminar. The degree requires strong preparation in the area of microelectronics and requires a research project or a thesis, which is undertaken once you have completed approximately 20 semester credit hours of study.

Cooperative education is strongly encouraged for graduate students in the MS in microelectronic engineering.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CHMG-131	General Chemistry for Engineers	3
MATH-181	Calculus I (fulfills General Education: Mathematical Perspective A)	4
MCEE-101	Semiconductors and Microchips	1
UWRT-150	FYW: Writing Seminar (General Education: First Year Writing (WI) (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/firstyearwriting/))	3
YOPS-10	RIT 365: RIT Connections	0
General Education: Artistic Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/artistic/)		3
General Education: Elective		3
	Hours	**17**
Spring		
CMPR-271	Computational Problem Solving for Engineers	3
EEEE-120	Digital Systems I	3
MATH-182	Calculus II (fulfills General Education: Mathematical Perspective B)	4
PHYS-211	University Physics I	4
General Education: Ethical Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/ethical/)		3
	Hours	**17**
Second Year		
Fall		
EEEE-281	Circuits I	3
EEEE-281R	Circuits I Recitation	0
MATH-221	Multivariable and Vector Calculus	4
MCEE-205	Statistics and Design of Experiments	3

PHYS-212	University Physics II (fulfills General Education: Natural Science Inquiry Perspective)	4
EGEN-99	Engineering Co-op Preparation	0
General Education: Global Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/global/)		3
	Hours	**17**
Spring		
EEEE-260	Introduction to Semiconductor Devices	3
EEEE-282	Circuits II	3
MATH-231	Differential Equations	3
MCEE-201	IC Technology	3
General Education: Social Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/social/)		3
	Hours	**15**
Third Year		
Fall		
MCEE-499	Microelectronic Engineering Co-op	0
	Hours	**0**
Spring		
EEEE-380	Digital Electronics	3
MCEE-320	E&M Fields for Microelectronics	3
MCEE-502	Semiconductor Process Integration	3
Restricted STEM Elective [1]		3
General Education: Immersion 1		3
	Hours	**15**
Summer		
MCEE-499	Microelectronic Engineering Co-op	0
	Hours	**0**
Fourth Year		
Fall		
EEEE-353	Linear Systems	4
EEEE-480	Analog Electronics	4
MCEE-503	Thin Films (WI-PR)	3
MCEE-505	Lithography Materials and Processes	3
EEEE-795	Graduate Seminar	0
General Education: Immersion 2		3
	Hours	**17**
Spring		
EEEE-707	Engineering Analysis	3
MCEE-550	CMOS Processing	4
EEEE Graduate Focus Area 1 [2]		3
General Education: Immersion 3		3
Open Elective		3
	Hours	**16**
Summer		
MCEE-499	Microelectronic Engineering Co-op	0
	Hours	**0**
Fifth Year		
Fall		
MCEE-495	Senior Design I	3
EEEE-709	Advanced Engineering Mathematics	3
EEEE Graduate Focus Area 2 [2]		3
EEEE-6xx Graduate Elective [3,4]		3
Open Elective		3
Select one of the following Culminating Experiences:		3
EEEE-790	Thesis	
EEEE-792	Graduate Paper [5]	
EEEE-6xx Graduate Elective [3,6]		
	Hours	**18**
Spring		
MCEE-496	Senior Design II	3
EEEE-xxx Graduate Focus Area 3 [2]		3
EEEE-6xx Graduate Elective [3,7]		3
EEEE-xxx Graduate Elective [3,8]		3
Open Elective		3
Select one of the following based on selected Culminating Experience:		3
EEEE-785	Comprehensive Exam (plus one EEEE-6xx Graduate Elective) [6]	
EEEE-790	Thesis	
EEEE-6xx Graduate Elective [3,5]		
	Hours	**18**
	Total Hours	**150**

Notes:

- All students pursuing a bachelor's degree are also required to complete two different Wellness courses.
- In this dual degree program, 9 credits from the graduate program are double-counted because they also fulfill degree requirements in the undergraduate program.

1 Courses for the Restricted STEM Elective are listed below (p. 110).
2 Students select three courses from one focus area (p. 110).
3 Select EEEE Graduate Electives from the list below (p. 111).
4 This course fulfills a Professional Elective in the BS program.
5 Students who select Graduate Paper as their Culminating Experience must complete EEEE-792 Graduate Paper and one additional Graduate Elective.
6 Students who select Comprehensive Exam as their Culminating Experience must complete EEEE-785 Comprehensive Exam and two additional Graduate Electives.
7 This course fulfills a Professional Elective in the BS program.
8 This course fulfills a Professional Elective in the BS program.

Restricted STEM Electives

Code	Title	Hours
BIOG-140	Cell and Molecular Biology for Engineers I	3
CHMG-142	General & Analytical Chemistry II	3
CHMG-201	Introduction to Organic Polymer Technology	3
MATH-241	Linear Algebra	3
MATH-251	Probability and Statistics	3
PHYS-213	Modern Physics I	3

EEEE-MS Graduate Focus Areas

Select three courses (9 credits) from one focus area:

Code	Title	Hours
Communication		
EEEE-602	Random Signals and Noise	3
EEEE-692	Communication Networks	3
EEEE-693	Digital Data Communication	3
EEEE-694	Sensor Array Processing for Wireless Communications	3
EEEE-797	Wireless Communication	3
Control Focus Area		
EEEE-602	Random Signals and Noise	3
EEEE-661	Modern Control Theory	3
EEEE-663	Real-Time & Embedded Systems	3
EEEE-683	Mechatronics	3
EEEE-765	Optimal Control	3

Digital Systems		
EEEE-620	Design of Digital Systems	3
EEEE-621	Design of Computer Systems	3
EEEE-720	Advanced Topics in Digital Systems Design	3
EEEE-721	Advanced Topics in Computer System Design	3
EEEE-722	Complex Digital Systems Verification	3
Electromagnetics		
EEEE-602	Random Signals and Noise	3
EEEE-617	Microwave Circuit Design	3
EEEE-629	Antenna Theory	3
EEEE-710	Advanced Electromagnetic Theory	3
EEEE-718	Design and Characterization of Microwave Systems	3
Integrated Electronics		
EEEE-610	Analog IC Design	3
EEEE-711	Advanced Carrier Injection Devices	3
EEEE-712	Advanced Field Effect Devices	3
EEEE-726	Mixed-Signal IC Design	3
MCEE-601	Microelectronic Fabrication	3
MEMS		
EEEE-661	Modern Control Theory	3
EEEE-689	Fundamentals of MEMS	3
EEEE-787	MEMS Evaluation	3
MCEE-601	Microelectronic Fabrication	3
Robotics		
EEEE-602	Random Signals and Noise	3
EEEE-636	Biorobotics/Cybernetics	3
EEEE-647	Artificial Intelligence Explorations	3
EEEE-685	Principles of Robotics	3
EEEE-784	Advanced Robotics	3
Signal and Image Processing		
EEEE-602	Random Signals and Noise	3
EEEE-670	Pattern Recognition	3
EEEE-678	Digital Signal Processing	3
EEEE-779	Digital Image Processing	3
EEEE-781	Image and Video Compression	3

EEEE-MS Graduate Electives

Select courses from the list below, or any Focus Area course not already used:

Code	Title	Hours
CLRS-601	Principles of Color Science	3
CMPE-610	Analytical Topics in Computer Engineering	3
CMPE-630	Digital Integrated Circuit Design	3
CMPE-655	Multiple Processor Systems	3
CMPE-660	Reconfigurable Computing	3
CMPE-661	Hardware and Software Design for Cryptographic Applications	3
CMPE-663	Real-time & Embedded Systems	3
CMPE-670	Data and Communication Networks	3
CMPE-677	Machine Intelligence	3
CMPE-679	Deep Learning	3
CMPE-685	Computer Vision	3
CMPE-731	Design and Test of Multi-Core Chips	3
CMPE-750	Advanced Computer Architecture	3
CMPE-755	High Performance Architectures	3
CSCI-620	Introduction to Big Data	3
CSCI-631	Foundations of Computer Vision	3
CSCI-652	Distributed Systems	3
CSCI-731	Advanced Computer Vision	3
CSCI-742	Compiler Construction	3
CSEC-744	Network Security	3
EEEE-602	Random Signals and Noise	3
EEEE-605	Modern Optics For Engineers	3
EEEE-610	Analog IC Design	3
EEEE-617	Microwave Circuit Design	3
EEEE-620	Design of Digital Systems	3
EEEE-621	Design of Computer Systems	3
EEEE-622	Electric Power Transmission & Distribution	3
EEEE-624	Advances in Power Systems	3
EEEE-629	Antenna Theory	3
EEEE-630	Biomedical Instrumentation	3
EEEE-631	Biomed Sensors & Transducers I	3
EEEE-632	Fundamental Electrophysiology	3
EEEE-633	Biomedical Signal Processing	3
EEEE-636	Biorobotics/Cybernetics	3
EEEE-646	Power Electronics	3
EEEE-647	Artificial Intelligence Explorations	3
EEEE-661	Modern Control Theory	3
EEEE-663	Real-Time & Embedded Systems	3
EEEE-664	Performance Engineering of Real Time and Embedded Systems	3
EEEE-665	Modeling of Real Time Systems	3
EEEE-669	Fuzzy Logic & Applications	3
EEEE-670	Pattern Recognition	3
EEEE-678	Digital Signal Processing	3
EEEE-679	Analog Filter Design	3
EEEE-683	Mechatronics	3
EEEE-685	Principles of Robotics	3
EEEE-689	Fundamentals of MEMS	3
EEEE-692	Communication Networks	3
EEEE-693	Digital Data Communication	3
EEEE-694	Sensor Array Processing for Wireless Communications	3
EEEE-695	Optimization Methods for Engineers	3
EEEE-710	Advanced Electromagnetic Theory	3
EEEE-711	Advanced Carrier Injection Devices	3
EEEE-712	Advanced Field Effect Devices	3
EEEE-713	Solid State Physics	3
EEEE-715	Photonic Integrated Circuits	3
EEEE-716	Lasers	3
EEEE-717	Nonlinear Optics	3
EEEE-718	Design and Characterization of Microwave Systems	3
EEEE-720	Advanced Topics in Digital Systems Design	3

EEEE-721	Advanced Topics in Computer System Design	3
EEEE-722	Complex Digital Systems Verification	3
EEEE-726	Mixed-Signal IC Design	3
EEEE-730	Advanced Analog IC Design	3
EEEE-731	Integrated Optical Devices & Systems	3
EEEE-733	Robust Control	3
EEEE-743	Digital Controls	3
EEEE-765	Optimal Control	3
EEEE-766	Multivariable Modeling	3
EEEE-768	Adaptive Signal Processing	3
EEEE-771	Optoelectronics	3
EEEE-779	Digital Image Processing	3
EEEE-780	Digital Video Processing	3
EEEE-781	Image and Video Compression	3
EEEE-784	Advanced Robotics	3
EEEE-787	MEMS Evaluation	3
EEEE-789	Special Topics	3
EEEE-793	Error Detection and Error Correction	3
EEEE-794	Information Theory	3
EEEE-797	Wireless Communication	3
EEEE-799	Independent Study	1-3
IMGS-628	Design and Fabrication of Solid State Cameras	3
IMGS-642	Testing of Focal Plane Arrays	3
IMGS-682	Image Processing and Computer Vision	3
IMGS-684	Deep Learning for Vision	3
IMGS-754	Pattern Recognition	3
IMGS-789	Graduate Special Topics	1-3
IMGS-799	Imaging Science Independent Study	1-4
ISEE-682	Lean Six Sigma Fundamentals	3
ISEE-750	Systems and Project Management	3
ISEE-771	Engineering of Systems I	3
ISUS-702	Fundamentals of Sustainability Science	3
ISUS-706	Economics of Sustainable Systems	3
ISUS-806	Risk Analysis	3
MATH-631	Dynamical Systems	3
MATH-645	Graph Theory	3
MCEE-601	Microelectronic Fabrication	3
MCEE-602	Semiconductor Process Integration	3
MCEE-603	Thin Films	3
MCEE-605	Lithography Materials and Processes	3
MCEE-615	Nanolithography Systems	3
MCEE-620	Photovoltaic Science and Engineering	3
MCEE-704	Physical Modeling of Semiconductor Devices	3
MCEE-706	SiGe and SOI Devices and Technologies	3
MCEE-730	Metrology for Failure Analysis and Yield of ICs	3
MCEE-732	Microelectronics Manufacturing	3
MCEE-770	Microelectromechanical Systems	3
MCSE-889	Special Topics	3
MECE-606	Systems Modeling	3
MECE-743	Digital Controls	3
MECE-744	Nonlinear Controls	3
NSSA-605	Principles of System Admin	3
PROF-710	Project Management	3
PROF-712	International Project Management	3
RMET-685	Robotics & Automation	3
STAT-670	Design of Experiments	3
TCET-661	Telecommunications Systems	3
TCET-689	Special Topics in MSTET	1-3
TCET-710	Principles of Telecommunications Networks	3
TCET-720	Telecommunications Concepts	3
TCET-740	Fiber Optic Communications	2
TCET-741	Fiber Optic Communications Lab	1
TCET-755	Wireless Communications Techniques	3
TCET-760	Network Planning & Design	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Microelectronic Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering or a related field. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.

- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

Applicants applying with a bachelor's degree in fields outside of electrical and microelectronic engineering may be considered for admission; however, bridge courses may be required to ensure the student is adequately prepared for graduate study.

Online Degree Information

The Microelectronic Engineering MS program is designed to be completed part-time (1 or 2 courses per term). Time to completion depends on the plan of study, when courses are offered, selected electives, and if the student takes a summer course. Courses may be synchronous or asynchronous. Academic advisors work with students on a study plan after admission to ensure classes fit student availability. Typically students finish this degree in 24-36 months. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Microelectronic Engineering MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Microsystems Engineering Ph.D.

Plan Code: MCSE-PHD | **HEGIS:** 0999.00

Program Overview

This microsystems engineering doctorate is a multidisciplinary program that addresses the technical challenges of micro- and nano-systems. This multidisciplinary doctorate degree builds on the fundamentals of traditional engineering and science combined with curriculum and research activities addressing the numerous technical challenges of micro- and nano-systems. These include the manipulation of electrical, photonic, optical, mechanical, chemical, and biological functionality to process, sense, and interface with the world at a nanometer scale. This program provides a foundation to explore future technology through research in nano-engineering, design methods, and technologies and their integration into micro- and nano-scaled systems.

A combination of graduate course work and research is required for completion of the program, and the curriculum requires a combination of foundation courses, major and minor technical area courses, and electives. You must pass the qualifying exam, the candidacy exam, and the dissertation defense exam to complete the degree requirements.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
MCEE-601	Microelectronic Fabrication [1]	3
MCSE-702 or ENGR-701	Introduction to Nanotechnology and Microsystems or Interdisciplinary Research Methods	3
MCSE-795	Microsystems Ph.D. Seminar	1
MTSE-704	Theoretical Methods in Materials Science and Engineering [2]	3
	Hours	**10**
Spring		
MCSE-703	Material Science for Microsystems Engineering [3]	3
MCSE-795	Microsystems Ph.D. Seminar	1
MCSE (or equivalent) Major Technical Area Elective		3
MCSE (or equivalent) Major Technical Area Elective		3
	Hours	**10**
Summer		
MCSE-890	MCSE-Dissertation	1
	Hours	**1**
Second Year		
Fall		
MCSE-795	Microsystems Ph.D. Seminar	1
MCSE-892	Graduate Research	1
MCSE (or equivalent) Major Technical Area Elective		3
MCSE (or equivalent) Major Technical Area Elective		3
	Hours	**8**
Spring		
MCSE-795	Microsystems Ph.D. Seminar	1
MCSE-892	Graduate Research	1
MCSE (or equivalent) Minor Technical Area Elective		3
MCSE (or equivalent) Major Technical Elective		3
	Hours	**8**
Summer		
MCSE-892	Graduate Research	2
	Hours	**2**

Third Year		
Fall		
MCSE-795	Microsystems Ph.D. Seminar	1
MCSE-892	Graduate Research	2
MCSE (or equivalent) Technical Elective		3
	Hours	**6**
Spring		
MCSE-795	Microsystems Ph.D. Seminar	1
MCSE-892	Graduate Research	2
	Hours	**3**
Summer		
MCSE-890	MCSE-Dissertation	6
	Hours	**6**
Fourth Year		
Fall		
MCSE-890	MCSE-Dissertation	6
	Hours	**6**
Spring		
MCSE-890	MCSE-Dissertation (or Approved Graduate Course)	3
MCSE-890	MCSE-Dissertation	3
	Hours	**6**
	Total Hours	**66**

Foundation Course Electives

Code	Title	Hours
Mathematics Foundation Courses		
Select one of the following:		
EEEE-707	Engineering Analysis	
EEEE-709	Advanced Engineering Mathematics	
ENGR-707	Engineering Analysis	
ENGR-709	Advanced Engineering Mathematics	
MATH-601	Methods of Applied Mathematics	
MATH-712	Numerical Methods for Partial Differential Equations	
MATH-741	Partial Differential Equations I	
MATH-742	Partial Differential Equations II	
MECE-707	Engineering Analysis	
MECE-709	Advanced Engineering Mathematics	
MTSE-704	Theoretical Methods in Materials Science and Engineering	
PHYS-610	Mathematical Methods for Physics	
Microfabrication Foundation Courses		
Select one of the following:		
MCEE-601	Microelectronic Fabrication	
MCEE-602	Semiconductor Process Integration	
MCEE-605	Lithography Materials and Processes	
MCEE-704	Physical Modeling of Semiconductor Devices	
MCEE-732	Microelectronics Manufacturing	
MCEE-770	Microelectromechanical Systems	
MCSE-715	Photonic Integrated Circuits	
Materials Science Foundation Courses		
Select one of the following:		
IMGS-724	Introduction to Electron Microscopy	
MCEE-603	Thin Films	
MCSE-703	Material Science for Microsystems Engineering	
MCSE-705	Epitaxial Crystal Growth and Thin Film Science	
MCSE-707	Advanced Nanomaterials Characterization Methods	
MTSE-601	Materials Science	
MTSE-617	Material Degradation	
MTSE-632	Solid State Science	
MTSE-602	Polymer Science	
MTSE-705	Experimental Techniques	
MTSE-780	Theory of Microsensors and Actuators	

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: December 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Microsystems Engineering program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in the physical sciences or engineering. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete foundation courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#microsystems-engineering-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 94
IELTS: 7.0
PTE Academic: 66

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Additional Information

Foundation Courses

Taken in your first year of study, four foundation courses and the Microsystems Ph.D. Seminar (MCSE-795) are mandatory for all students. Foundation courses consist of Microelectronic Fabrication (MCEE-601), Introduction to Nanotechnology and Microsystems (MCSE-702), Material Science for Microsystems Engineering (MCSE-703), and Theoretical Methods in Materials Science and Engineering (MTSE-704).

Product Development MS

Plan Code: PRODDEV-MS | **HEGIS:** 0599.00

This program is available online.

Program Overview

The product development master's degree integrates engineering management and business courses to give you the skills you need to lead product development teams and organizations. The program was designed by academic and industry leaders to integrate formal education with state-of-the-art research and best practices from industry. The product development degree is a leadership program for experienced engineers and technical specialists who aspire to high-level positions associated with product innovation.

Electives and the capstone project provide flexibility to tailor the program's course work to your specific learning objectives and the goals of your sponsor organization. The year-long capstone project generates significant return on investment for sponsoring organizations and provides hands-on experience with real world impact.

Most students are sponsored by an employer who is committed to improving leadership capabilities in product development. Sponsorship includes financial support and a commitment to work with you to provide clear expectations and a well-articulated career development plan that builds upon the program. Candidates can also sponsor themselves.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
ISEE-771	Engineering of Systems I	3
ISEE-781 or MGMT-740	Excellence in New Product Development or Leading Teams in Organizations	3
	Hours	**6**
Spring		
ISEE-772	Engineering of Systems II	3
ISEE-751 or ISEE-752	Decision and Risk Benefit Analysis or Decision Analysis	3
	Hours	**6**
Summer		
DECS-743	Operations and Supply Chain Management	3
Select one of the following:		3
ISEE-750	Systems and Project Management	
PROF-710	Project Management	
PROF-714	Agile Project Management	
	Hours	**6**
Second Year		
Fall		
MKTG-761	Marketing Concepts and Commercialization	3
ACCT-603 or ACCT-794	Accounting for Decision Makers or Cost Management in Technical Organizations	3
	Hours	**6**
Spring		
ISEE Engineering or SCB Business Elective		3

ISEE-798 or ISEE-792	Product Development Capstone or Engineering Capstone	3
	Hours	**6**
	Total Hours	**30**

Electives

Code	Title	Hours
ACCT-745	Accounting Information and Analytics	3
BANA-680	Data Management for Business Analytics	3
DECS-750	Supply Chain Analytics	3
DECS-782	Statistical Analysis for Decision Making	3
ESCB-705	Economics and Decision Modeling	3
ESHS-620	Occupational Safety	3
ESHS-680	Environmental, Health and Safety Management	3
FINC-605	Financing New Ventures	3
FINC-721	Financial Analysis for Managers	3
HCIN-610	Foundations of Human-Computer Interaction	3
HLTH-710	Health Care Economics and Policy	3
HLTH-718	Evidence-Based Management in Health Care	3
HLTH-725	Health Care Strategic Marketing & Communications	3
HLTH-733	Health Systems Quality & Organizational Learning	3
HLTH-735	Management of Risk in Health Care	3
HLTH-736	Health Care Operations: Building High Reliability Systems	3
HLTH-760	Health Informatics and Decision Support	3
HLTH-796	Health Care Strategy: Analysis & Formulation	3
HRDE-710	Foundations in Human Resource Development	3
HRDE-712	Performance Analysis and Development	3
HRDE-715	Human Performance Design and Development	3
HRDE-721	Organizational Learning and Knowledge Management	3
HRDE-722	Talent Development	3
HRDE-726	Technology and the Future of Work	3
HRDE-742	Leading Change	3
IDAI-610	Fundamentals of Artificial Intelligence	3
IDAI-700	Ethics of Artificial Intelligence	3
INTB-710	Global Business Analytics	3
INTB-755	Export, Import, and Global Sourcing	3
INTB-780	Global Issues and Strategies	3
ISEE-601	Systems Modeling and Optimization	3
ISEE-626	Lean System Design	3
ISEE-661	Data Analytics and Predictive Modeling	3
ISEE-682	Lean Six Sigma Fundamentals	3
ISEE-720	Production Control	3
ISEE-723	Global Facilities Planning	3
ISEE-728	Production Systems Management	3
ISEE-732	Systems Safety Engineering	3
ISEE-734	Graduate Engineering Psychology	3
ISEE-741	3D Printing	3
ISEE-745	Manufacturing Systems	3
ISEE-760	Design of Experiments	3
ISEE-773	Engineering Value Creation	3
ISEE-782	Product Development in the Extended Enterprise	3
ISEE-783	Advanced Topics in New Product Development	3
ISEE-785	Fundamentals of Sustainable Engineering	3
ISEE-786	Lifecycle Assessment	3
ISEE-787	Design for the Environment	3
ISEE-789	Special Topics	3
ISTE-762	Software Economics	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGIS-720	Information Systems Design and Development	3
MGIS-725	Data Management and Analytics	3
MGIS-735	Design and Information Systems	3
MGIS-758	Seminar in Management Information Systems	3
MGIS-760	Integrated Business Systems	3
MGMT-610	Global Entrepreneurship	3
MGMT-710	Sustainable Business Innovation: Strategy and Practice	3
MGMT-720	Entrepreneurship and Technology Entrepreneurship	3
MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
MGMT-745	Business, Government, and Public Policy	3
MGMT-755	Negotiations	3
MGMT-761	Managing Research and Innovation	3
MGMT-765	Applied Venture Creation	3
MGMT-770	Business Research Methods	3
MGMT-775	Ethical Decision Making and Corporate Social Performance	3
MKTG-763	Buyer Behavior	3
MKTG-768	Marketing Analytics	3
MKTG-772	Internet Marketing: Strategy & Tactics	3
MKTG-776	Product and Brand Management	3
MKTG-778	Commercialization and Marketing of New Products	3
PROF-711	Advanced Project Management	3
PROF-712	International Project Management	3
PROF-713	Program Management for Product and Service Development	3
PROF-714	Agile Project Management	3
PROF-715	Agile Leadership and Self Organizing Teams	3
PROF-716	Agile and Design Thinking	3
PUBL-610	Technological Innovation and Public Policy	3
PUBL-630	Energy Policy	3
PUBL-700	Readings in Public Policy	3
PUBL-810	Technology, Policy and Sustainability	3
SERQ-710	Service Design Fundamentals	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
SERQ-720	Strategic Foresight and Innovation	3
SERQ-722	Customer Centricity	3
SERQ-723	Service Analytics	3
SERQ-747	Design Thinking and Creativity	3
SERQ-787	Service Design and Implementation	3
STAT-611	Statistical Software - R	3
STAT-614	Applied Statistics	3

STAT-621	Statistical Quality Control	3
STAT-631	Foundations of Statistics	3
STAT-641	Applied Linear Models - Regression	3
STAT-642	Applied Linear Models - ANOVA	3
STAT-670	Design of Experiments	3
STAT-672	Survey Design and Analysis	3
STAT-745	Predictive Analytics	3
STAT-747	Principles of Statistical Data Mining	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Product Development program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering (or a related scientific or technical field). A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Have at least two years of experience in product development or a related business environment.

Online Degree Information

The Product Development MS program is designed to be completed part-time (1 or 2 courses per term). Full-time options may be available with Graduate Program Director's approval. Your time to completion will depend on your plan of study, when your courses are offered, what electives you select, and if you choose to/are able to take a class for the summer term. Courses may be synchronous or asynchronous based on the preference of the course instructor. Academic advisors work with students on a study plan after admission to ensure classes fit student availability. Typically students finish this degree in 24-36 months. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Product Development MS is considered a professional degree that is billed at the standard (on campus) RIT graduate tuition rate. It is not billed at the designated online tuition rate. Scholarship is available off the standard tuition rate for this online program. View the current Graduate tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Vibrations Advanced Certificate

Plan Code: VIBRAT-ACT | **HEGIS:** 0910.00

Program Overview

The advanced certificate in vibrations is a collection of graduate level courses in which you will learn to use sophisticated software tools, analytical techniques, and experimental methods to design, develop, and implement solutions for problems of vibration control and minimization in engineering systems. Vibration engineering helps control vibration in engineering systems and in consumer product development and design, manufacturing, aerospace and automotive systems. You will also be exposed to modern technologies used in industry to ensure that you are prepared for today's highly specialized job market. The curriculum answers the need for graduate-level instruction for practicing engineers with skills in vibration engineering to create manufacturing production systems, aerospace systems, automotive engineering, medical product development, consumer product development, and a host of industrial equipment and process systems in which vibration must be minimized or controlled.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
MECE-658	Introduction to Engineering Vibrations	3
MECE-707	Engineering Analysis	3
	Hours	**6**
Spring		
MECE-709	Advanced Engineering Mathematics	3
MECE-758	Intermediate Engineering Vibrations	3
Select one of the following:		3
EEEE-602	Random Signals and Noise	
EEEE-678	Digital Signal Processing	
MECE-606	Systems Modeling	
	Hours	**9**
	Total Hours	**15**

Admission Requirements

This program is available on-campus only.

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Vibrations program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Kate Gleason College of Engineering Faculty

Dean's Office

Doreen Edwards, BS, South Dakota School of Mines and Technology; Ph.D., Northwestern University—Dean; Professor

Edward Hensel, BS, Clarkson University; Ph.D., New Mexico State University—Associate Dean of Graduate Studies

Matthew M. Marshall, BS, Rochester Institute of Technology; MS, Ph.D., University of Michigan—Associate Dean of Undergraduate Studies

Biomedical Engineering

Thomas Gaborski, BS, Cornell University; MS, Ph.D., University of Rochester—Department Head; Professor, Nanomaterials, Bioseparations, Cellular Mechanics

Vinay Abhyankar, BS, Binghamton University; MS, Ph.D., University of Wisconsin-Madison—Ph.D. Program Director; Associate Professor, Microfluidics, Tissue Engineering, Lab-On-Chip Platforms

Edward E. Brown, Jr., BS, University of Pennsylvania; MS, Ph.D., Vanderbilt University—Associate Professor, Rehabilitation, Robotics, Control Systems, Biomechatronics, Engineering Education

Steven Day, BS, Ph.D., University of Virginia—Professor, Bioengineering, Implantable Devices, Fluids in Biosystems

Zhongwang Dou, BE, University of Science and Technology of China; Ph.D., University at Buffalo—Assistant Professor, Cardiac Engineering, Biofluid Mechanics

Blanca Lapizco-Encinas, BS, Instituto Tecnologico de Sonora (Mexico); MS, Instituto Tecnologico de Celaya (Mexico); Ph.D., University of Cincinnati—Professor, Microfluidics, Microscale Electrokinetics and Bioseparations

Cristian Linte, BS, University of Windsor (Canada); MS, Ph.D., University of Western Ontario (Canada)—Professor, Biomedical Image Analysis, Image Computing, Modeling and Visualization

Travis Meyer, BE, Vanderbilt University; Ph.D., Georgia Institute of Technology—Lecturer, Nanomedicine, Polymer Synthesis and DNA Nanotechnology

Michael Richards, BS, University of Rochester; Ph.D., Boston University—Assistant Professor, Image Processing, Mechanical Properties and Interactions of Biological Tissues

Cory Stiehl, BS, University of Rochester; Ph.D., University of Massachusetts, Amherst—Graduate Program Director; Senior Lecturer, Systems Engineering

Karin Wuertz-Kozak, BS, MS, University of Regensburg (Germany); MBA, University of Cumbria (United Kingdom); Ph.D., University of Ulm (Germany)—Harvey J. Palmer Professor, Regenerative Medicine and Tissue Engineering, Inflammation, Mechanobiology

Chemical Engineering

Brian J. Landi, BS, MS, Ph.D., Rochester Institute of Technology—Department Head; Professor, Carbon Nanotubes, Batteries, Wires

Jairo A. Diaz, BSE, National University of Columbia; (Columbia); Ph.D., Purdue University—Assistant Professor, Macromolecular and Interfacial Phenomena; Optical, Acoustic and Magnetic Control of Matter

Matt Ganter, BS, St. John Fisher College; MS, Ph.D., Rochester Institute of Technology—Assistant Research Professor

Nicole Hill, BS, Ph.D., Rochester Institute of Technology—Lecturer

Karuna Koppula, B. Tech, Andhra University (India); MS, University of New Hampshire; Ph.D., Michigan State University—Principal Lecturer

Poornima Padmanabhan, B. Tech, Indian Institute of Technology Madras (India); Ph.D., Cornell University—Associate Professor, Molecular Simulation, Data-Driven Materials Design, Hierarchical Assemblies, Thermodynamics and Statistical Mechanics

Alexander D. Roth, BS, ME, Cornell University; MS, The Ohio State University; Ph.D., Cleveland State University—Senior Lecturer

Patricia Taboada-Serrano, BS, Mayor de San Andres University (Bolivia); MS, Simon Bolivar University (Bolivia); Ph.D., Georgia Institute of Technology—Graduate Program Director; Associate Professor, Electrochemical Energy Generation and Storage, Gas- Hydrates, Molecular Modeling, Monte Carlo Methods

Xiangcheng Sun, BE, Harbin Institute of Technology; MS, University of Chinese Academy of Sciences; Ph.D., University of Connecticut—Assistant Professor

Obioma Uche, BS, University of California, Berkeley; MS, Ph.D., Princeton University—Assistant Professor, Molecular Simulation, Heterogeneous Catalysis, Interfacial Dynamics

Steven J. Weinstein, BS, University of Rochester; MS, Ph.D., University of Pennsylvania—Harvey J. Palmer Professor, Interfacial Transport Processes, Hydrodynamic Wave Phenomena, Applied Mathematics

Computer Engineering

Amlan Ganguly, B. Tech, Indian Institute of Technology (India); MS, Ph.D., Washington State University—Department Head; Professor, Multi/Many-core Processors, Network-on-Chip, Interconnection Networks, Data Centers, Edge Computer, and 5G Communications, Novel Processor Architectures

Sathwika Bavikadi, B Tech., Jawaharlal Nehru Technological University (India); MS, Blekinge Institute of Technology (Sweden); Ph.D., George Mason University—Assistant Professor, Emerging AI Hardware, Software Systems, Edge AI

Andres Kwasinski, M.Sc., Ph.D., University of Maryland at College Park—Ph.D. Graduate Program Director; Professor, Wireless Networks, Digital Signal Processing, Machine Learning for Communications and Networking, and Smart Infrastructures

Dongfang Liu, Ph.D., Purdue University—Assistant Professor, Artificial Intelligence, Machine Learning, Deep Learning, Computer Vision, Human-Computer Interaction, and Medical Imaging

Sonia Lopez Alarcon, BS, Ph.D., Complutense University of Madrid (Spain)—Associate Professor, Quantum Computing, Heterogeneous Computing, High Performance Computing and Architecture

Alexander C. Loui, B.Sc., M.Sc., PhD, University of Toronto (Canada)—Professor of Practice, Computer Vision, Machine Learning, Image/Video Processing and Analysis

Marcin Lukowiak, BS, MS, Ph.D., Poznan University (Poland)—Professor, Reconfigurable Computing, Cryptographic Engineering

Roy W. Melton, BEE, MS, PhD, Georgia Institute of Technology—Associate Department Head; Principal Lecturer, Computer Architecture, Embedded, Mobile and Cloud Computing

Cory Merkel, BS, MS, Ph.D., Rochester Institute of Technology—Associate Professor, Artificial Intelligence, Memristive Devices, Neural Networks

Andreas Savakis, BS, MS, Old Dominion University; Ph.D., North Carolina State University—Professor, Digital Image Processing, Computer Vision

Michael Zuzak, BS, MS, Ph.D., University of Maryland at College Park—Assistant Professor, Hardware Security, Digital VLSI/CAD, and Computer Architecture

Electrical and Microelectronic Engineering

Ferat E. Sahin, BS, Istanbul Technical University (Turkey); MS, Ph.D., Virginia Polytechnic Institute and State University—Department Head; Professor, Artificial Intelligence, Control Systems Robotics, Human Robot Collaboration

Carlos Barrios, BS, MS Rochester Institute of Technology—Lecturer, Digital Systems

Tejasvi Das, MS, Ph.D., Rochester Institute of Technology—Associate Professor, Analog, RF and Mixed-Signal IC Domain such as IoT Sensing, Interference Robustness, Haptics, Audio Processing, Self-calibration, Adaptive Circuits, Back-end Algorithms

Sohail A. Dianat, BS, Aria-Mehr University of Technology (Iran); MS, Ph.D., George Washington University—Professor, Control Systems, Communications, Signal/ Image Processing

Lynn F. Fuller, BS, MS, Rochester Institute of Technology; Ph.D., State University of New York at Buffalo—Professor Emeritus, IC Design, Semiconductor Manufacturing, MEMS and Microsystems

Jamison Heard, BS, University of Evansville; MS, Ph.D., Vanderbilt University—Assistant Professor, Robotics, Human-Machine Systems, and Human-Robot Interaction

Karl D. Hirschman, BS, MS, Rochester Institute of Technology; Ph.D., University of Rochester—Associate Department Head; Director of Microelectronic Engineering Programs; Micron Professor, Semiconductor Process Integration, Photonic Devices

Christopher R. Hoople, BS, Union College; Ph.D., Cornell University—Senior Lecturer, Power Electronics, Device Physics

Jason Hoople, BS, MS, Rochester Institute of Technology; Ph.D., Cornell University—Senior Lecturer, Analog Circuits and Systems, Integrated Piezoelecric Transducers, Integrated CMOS Technology

Mark Indovina, BS, MS, Rochester Institute of Technology—Director of Outreach and Facilities; Senior Lecturer, Integrated Circuits Design and Digital Signal Processing

Michael A. Jackson, BS, MS, Ph.D., State University of New York at Buffalo—Associate Professor, Solid State Devices, IC Metrology, Electronic Materials and Processing, Photovoltaics

Mohammad Javad Khojasteh, BS, Sharif University of Technology (Iran); MS, Ph.D., University of California San Diego—Assistant Professor, Intelligent Systems, Robotics, Control Systems, and Unmanned Air Vehicles

Sunwoong Kim, BS, MS, Ph.D., Seoul National University (South Korea)—Assistant Professor, Custom Hardware Architectures for Cryptographic and Multimedia Systems, Approximate Computing Algorithms and Hardware Architectures, Privacy-Preserving Solutions for Cyber-Physical Systems, Lightweight Computer Vision Algorithms, Computer and Memory Architectures, Acceleration of Big Data Processing

Santosh Kurinec, BS, MS, Ph.D., University of Delhi (India)—Professor, Electronic Materials and Devices, IC Processing, Quantum and Nanoscale Devices, Non Volatile Memory, Photovoltaics

Sergey Lyshevski, MS, Ph.D., Kiev Polytechnic Institute (Ukraine)—Professor, Microsystems, Mechatronics, Control Systems, Non-Linear Control

Parsian Katal Mohseni, BS, Ph.D., McMaster University (Canada)—Associate Professor, Nanomaterials Growth and Characterization, III-V Epitaxy, Nanofabrication, Optoelectronics, Photovoltaics, MacEtch

Dorin Patru, BS, MS, Technical University of Cluj-Napoca (Romania); Ph.D., Washington State University—Associate Professor, Domain Specific Computing Architectures, Artificial Neural Networks, Artificial Intelligence

Dan Phillips, BS, State University of New York at Buffalo; MS, Ph.D., University of Rochester- Associate Professor, Biomedical Instrumentation, Signal Processing and Visualization, and Embedded Systems

Stefan Preble, BS, Rochester Institute of Technology; Ph.D., Cornell University—Ph.D., Program Director; Bausch and Lomb Professor, Quantum Silicon Photonics, Integrated Photonics, Hybrid Silicon Lasers

Ivan Puchades, BS, MS, Ph.D., Rochester Institute of Technology—Associate Professor, MEMS Design and Fabrication, Carbon Nanotubes and Nanomaterials

Majid Rabbani, BS, Aria-Mehr University of Technology (Iran); MS, Ph.D., University of Wisconsin-Madison—Professor of Practice, Signal and Video Processing, Pattern Recognition, Image Compression

Sean L. Rommel, BS, Ph.D., University of Delaware—Professor, Emerging Semiconductor Devices, Photonic Devices, Integration

Eli Saber, BS, State University of New York at Buffalo; MS, Ph.D., University of Rochester—Professor, Signal Image and Video Processing, Communications, Biomedical Imaging, Computer Vision

Gill R. Tsouri, B.Sc., M.Sc., Ph.D., Ben-Gurion University (Israel)—Professor, MIMO, OFDM/ OFDMA Systems, Wireless Sensor Networks, Diversity Methods

Alireza Vahid, B.S.c, Sharif University of Technology (Iran), M.Sc., Ph.D., Cornell University—Associate Professor, Wireless Communications, Networking Information, Coding Theory, Feedback Channel, Dynamic Spectrum Access, Physical-Layer Security, Coding for Storage, Sequence Assembly

Jayanti Venkataraman, BS, MS, Bangalore University (India); Ph.D., Indian Institute of Science (India)—Associate Department Head, Electrical Engineering Programs; Professor, Electromagnetics, Microwaves and Antennas

Bing Yan, BS, Renmin University of China; MS, Ph.D., University of Connecticut—Associate Professor, Power, Smart Power Systems, Intelligent Manufacturing Systems

Jing Zhang, BS, Huazhong University (China); Ph.D., Lehigh University—Associate Professor, Devices fabrication of III-Nitride semiconductors for photonics

Industrial and Systems Engineering

Katie McConky, BS, MS, Rochester Institute of Technology; Ph.D., State University of New York at Buffalo— Department Head; Associate Professor, Applied Statistics, Analytics, Operations Research, Optimization and Forecasting

Nasibeh Azadeh Fard, BS, Iran University of Science and Technology; MS, Ph.D., Virginia Polytechnic Institute and State University—Assistant Professor, Data Analytics, Healthcare Systems Engineering, Risk Analysis, Early Warning Systems, Performance Measurement and Analysis

Denis R. Cormier, BS, University of Pennsylvania; MS, State University of New York at Buffalo; Ph.D., North Carolina State University—Earl W. Brinkman Professor, Additive Manufacturing and Direct-Write Printing Technology, Rapid Prototyping

Zipeng Guo, BE, Hunan University (China); MS, Ph.D., University of New York at Buffalo—Assistant Professor, Metal Additive Manufacturing, Data-informed Smart Manufacturing, Sustainable Advanced Manufacturing

Michael E. Kuhl, BS, Bradley University; MS, Ph.D., North Carolina State University—Professor, Simulation Modeling and Analysis applied to Manufacturing, Intelligent Materials Handling, Supply Chain, and Healthcare Systems

Rui Liu, BS, Beijing University (China); MS, Northeastern University; Ph.D., Georgia Institute of Technology—Assistant Professor, Advanced Manufacturing, Machining Process Optimization, Machine Process Simulation

Ruben A. Proaño, BS, Universidad San Francisco de Quito (Ecuador); MS, Ph.D., University of Illinois at Urbana-Champaign—Graduate Program Director; Associate Professor, Operations Research, Logistics/ Supply Chain Management

Esa M. Rantanen, BS, MS, EmbryRiddle Aeronautical University; MS, Ph.D., Pennsylvania State University—Associate Professor Ehsan Rashedi, BS, MS, Sharif University of Technology (Iran); MS, Ph.D., Virginia Polytechnic Institute and State University— Assistant Professor, Biomechanics, Ergonomics, Human Factors

Yunbo "Will" Zhang, BS, Shandong University (China); MS, Huazhong University of Science and Technology (China); Ph.D., The Chinese University of Hong Kong—Associate Professor, Smart Manufacturing, Design for Additive Manufacturing, Geometric Processing, HumanComputer Interaction, Computeraided Design/Computer-aided Manufacturing

Mechanical Engineering

Byron Erath, BS, Brigham Young University; MS, Ph.D., Purdue University —Department Head; Professor, Fluid Mechanics, Human Phonation, Airborne transport of Infectious Diseases

Ali Baheri, BS, Sharif University of Technology (Iran); MS, University of Louisiana at Lafayette; Ph.D., University of North Carolina at Charlotte—Assistant Professor, Artificial intelligence, reinforcement learning

Stephen Boedo, BA, State University of New York at Buffalo; MS, Ph.D., Cornell University—Associate Professor, Tribology and Lubrication, Hip Joint Design, Computational Methods and Design Guidelines for Bearing Systems

Robert Carter, BS, University of Maine; Ph.D., Cornell University—Associate Department Head; Senior Lecturer

Anthony Chirico, BS, University at Buffalo; MS, Rochester Institute of Technology—Senior Lecturer, Control Systems

Agamemnon L. Crassidis, BS, MS, Ph.D., State University of New York at Buffalo—Associate Professor, Aerospace Engineering, Nonlinear Dynamics and Controls

Steven Day, BS, Ph.D., University of Virginia—Professor, Bioengineering, Implantable Devices, Fluids in Biosystems

Alfonso Fuentes-Aznar, MS, University of Murcia (Spain); Ph.D., National University of Distance Education (Spain)—Associate Professor, Gear Transmission, Enhanced Design Technologies for all Types of Gear Drives

Hany A. Ghoneim, BS, MS, Cairo University (Egypt); Ph.D., Rutgers University—Professor, Finite Elements, Vibrations

Mario W. Gomes, BsE, Cornell University; MS, Georgia Institute of Technology; Ph.D., Cornell University—Principal Lecturer, Sustainable Energy Systems

Phillip Hutton, BS, University of Pittsburgh, MS, Old Dominion University, MS, Carnegie Mellon University, Ph.D., University of North Dakota—Lecturer

William A. Humphrey, BS, MS, Case Western Reserve University—Senior Lecturer

Patricia Iglesias Victoria, BSE, Ph.D., Polytechnic University of Cartagena (Spain)—Associate Professor, Friction and Wear, Tribology, Material Science

Sarilyn Ivancic, BS, MS, Ph.D., University of Rochester—Graduate Program Director; Senior Lecturer

Satish G. Kandlikar, BE, Marathwada University (India); M.Tech., Ph.D., Indian Institute of Technology (India)—James E. Gleason Professor, Thermal Systems and Energy

Jason R. Kolodziej, BS, MS, Ph.D., State University of New York at Buffalo —Associate Professor, Hybrid Vehicle Technology and Renewable Energy

Margaretha J. Lam, BS, MS, State University of New York at Buffalo; Ph.D., Virginia Polytechnic Institute and State University—Undergraduate Program Director; Principal Lecturer, Vibrations, Optimization

Kathleen Lamkin-Kennard, BS, Worcester Polytechnic Institute; MS, Ph.D., Drexel University—Associate Professor, Biomedical Engineering, Multiphysics Systems Modeling

Kate Leipold, BS, MS, Rochester Institute of Technology—Principal Lecturer, CAD Design, Creo Parametric (ProEngineer), GD&T, New Product Development Processes

Rui Liu, BS, Beijing University (China); MS, Northeastern University; Ph.D., Georgia Institute of Technology—Associate Professor, Advanced Manufacturing, Machining Process Optimization, Machine Process Simulation

Howard Qingsong Tu, BS, MS, Beijing Institute of Technology (China); Ph.D., University of California, Berkeley—Assistant Professor

Risa J. Robinson, BS, MS, Rochester Institute of Technology; Ph.D., State University of New York at Buffalo—James E. Gleason Professor, Bioengineering, Respiratory Device Technologies, Aerosol Transport in Biological Systems

Michael Schertzer, B.Eng.Mgt., M.A.Sc., McMaster University (Canada); Ph.D., University of Toronto (Canada)—Associate Professor, Lab on a Chip, Medical Diagnosis Devices, Energy Harvesting

Michael Schrlau, BS, University of Pittsburgh; Ph.D., University of Pennsylvania—Associate Professor, Bioengineering and Microsystems, Nanobiotechnology

Qian Xue, BS, MS, Southeast University (Bangladesh); Ph.D., The John Hopkins University—Associate Professor, Flow-Structure Interaction

Xudong Zheng, Ph.D., George Washington University—Associate Professor, Biomechanics, Flow Physics

Emeritus Faculty

Mustafa Abushagur, Professor Emeritus
Margaret Bailey, Professor Emeritus
Donald Baker, Professor Emeritus
Thomas Barker, Professor Emeritus
David Borkholder, Professor Emeritus
Harold Brodie, Professor Emeritus
George Brown, Professor Emeritus
Richard G. Budynas, Professor Emeritus
Roy Czernikowski, Professor Emeritus
Joseph DeLorenzo, Professor Emeritus
Robert M Desmond, Professor Emeritus
Cyril Donaldson, Professor Emeritus
Robert Ellson, Professor Emeritus
Jon Freckleton, Associate Professor Emeritus
Lynn Fuller, Professor Emeritus
Surendra Gupta, Professor Emeritus
Sherman Hagberg, Professor Emeritus
Charles W. Haines, Professor Emeritus
William F. Halbleib, Professor Emeritus
Robert Hefner, Professor Emeritus
Richard Hetnarski, Professor Emeritus
Kenneth Hickman, Director Emeritus
John Hromi, Professor Emeritus
Kenneth Hsu, Professor Emeritus
Balwant Karlekar, Professor Emeritus
Richard Kenyon, Dean Emeritus and Professor Emeritus
Richard Lane, Professor Emeritus
George H. LeCain, Professor Emeritus
Swaminathan Madhu, Professor Emeritus
Douglas M. Marshall, Associate Professor Emeritus
Norman Miller, Senior Lecturer Emeritus
Earle M. Morecock, Dean Emeritus
Ponnathpur (PR) Mukund, Professor Emeritus
Chris Nilsen, Professor Emeritus
Sudhakar Paidy, Professor Emeritus
Harvey Palmer, Dean Emeritus
James Palmer, Professor Emeritus
David Perlman, Professor Emeritus
Paul Petersen, Dean Emeritus
George W. Reed, Professor Emeritus
Richard Reeve, Professor Emeritus
Donald C. Robinson, Professor Emeritus
Edward Salem, Professor Emeritus
Edward G. Schilling, Professor Emeritus
Jasper Shealy, Professor Emeritus
Paul Shuleshko, Professor Emeritus
Bruce Smith, Professor Emeritus
Robert Snyder, Professor Emeritus
Brian Thorn, Professor Emeritus
Fung-I Tseng, Professor Emeritus
Watson "Jim" Walker, Professor Emeritus
Wayne Walter, Professor Emeritus
Mason E. Wescott, Professor Emeritus

COLLEGE OF ENGINEERING TECHNOLOGY

Overview

The diverse, graduate-level programs offered by the College of Engineering Technology represent RIT's commitment to curricular innovation, program flexibility, and academic rigor. The college is committed to advancing the state of the education we provide through research, the latest uses of technology, and current management theories and educational philosophies.

Please visit the college's website at **www.rit.edu/engineeringtechology (https://www.rit.edu/engineeringtechnology/)** for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarship

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Doctoral Degrees

Master's Degrees

Communication Networks MS

Plan Code: CNET-MS | **HEGIS:** 0925.00

Program Overview

The master of science in communication networks prepares you to become an expert in fiber-optic and photonic communications, wireless communications, as well as network design and management. You'll develop the necessary skills to lead the ever-changing telecommunications industry with a focus on the new services and products being created and offered through the internet, mobility via wireless technology, extreme capacity created by fiber optics, as well as the evolution of policy and regulation which are are all shaping the telecommunication industry and networks of the future. The program is designed for individuals who seek advancement into managerial roles in the dynamic, evolving communications environment. Courses cover converged and IP networks, fiber optic communications, wireless networks, and network design and management. The program offers three options: fiber-optic and photonic communications, wireless communications, and network design and management. In place of an option you may select specific electives from a number or RIT's graduate programs to achieve more specific career goals.

Cooperative education is optional but strongly encouraged for graduate students in the communication networks MS degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
GRCS-701	Research Methods	3
TCET-601	Programming & Problem Solving in Python [1]	3
TCET-615	Converged Network Concepts	3
TCET-651	Wireless Communications	3
TCET-740	Fiber Optic Communications	2
TCET-741	Fiber Optic Communications Lab	1
	Hours	**12**
Spring		
Electives		12
	Hours	**12**
Second Year		
Fall		
Select one of the following:		6
TCET-788 & TCET-790	Thesis Planning and Thesis	
TCET-795	TCET Comprehensive Exam (and two Electives)	
TCET-797	Graduate Project (and one Elective)	
	Hours	**6**
	Total Hours	**30**

1 TCET-601 Programming & Problem Solving in Python is a bridge course that can be waived by qualification exam. If completed, credits do not count toward degree.

Options

Students must use the curriculum electives to complete at least 9 credits from a list of courses approved by the faculty to earn an Option. Students may complete courses listed in any Option or choose courses from a list of approved elective courses to complete the required number of electives. A student is not required to complete any Option but may select courses that fulfill their education objectives from any of the listed Option or approved elective courses. The currently-approved courses by Option are:

Code	Title	Hours
Fiber-Optic and Photonic Communications Option		
Select three of the following:		9
EEEE-771	Optoelectronics	
RMET-645	Surface Mount Electronics Manufacturing	
TCET-745	Advanced Fiber-Optic Communications	
TCET-748	Fiber Optic Test & Measurement	
Wireless Communications Option		
Select three of the following:		9
TCET-750	Wireless Systems Regulation	
TCET-752	Advanced Wireless Communication	
TCET-753	Wireless Networks	
Network Design and Management Option		
Select three of the following:		9
TCET-620	Applied Machine Learning	
TCET-723	Telecommunications Network Engineering	
TCET-747	Next Generation Networks	
TCET-760	Network Planning & Design	

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall or Spring. Closed for new applications for Fall 2025.
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part#time
Part-time Admit Term(s): Fall or Spring. Closed for new applications for Fall 2025.
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Communication Networks program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in engineering technology, engineering, or a related area. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.

- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

Applicants with a bachelor's degree in fields outside of engineering technology, engineering, or related fields may be considered for admission, however, bridge courses in Computer Programming may be required to ensure the student is adequately prepared for the program.

Environmental Health and Safety Management MS

Plan Code: EHSM-MS | **HEGIS:** 0420.00

This program is available online.

Program Overview

The environmental health and safety management MS program provides a strong foundation in developing and implementing environmental health and safety management systems to help companies meet sustainability and safety standards. In addition, you'll gain a solid technical foundation in air emissions, wastewater, solid and hazardous waste, occupational safety, and occupational health (industrial hygiene). The degree may be completed entirely online or via a combination of online and traditional on-campus courses. The curriculum includes core courses, professional electives, and a choice of a thesis, capstone project, or comprehensive exam. Professional electives can include courses in topics as diverse as fire protection, occupational health, solid and hazardous waste management, industrial wastewater management, air emissions management, occupational safety, mechanical and electrical controls and standards, environmental health and safety law, accounting and finance, project management, and organizational behavior and leadership. Additional professional electives are available in topics such as business management, quality, sustainability, and other areas.

Full-time students are eligible to participate in RIT's cooperative education program. After completing two semesters (a minimum of 18 credit hours), students may request approval to complete up to one year of cooperative education employment related to their field of study.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ESHS-680	Environmental, Health and Safety Management	3
ESHS-755	Corporate Social Responsibility	3
GRCS-701	Research Methods	3
Professional Elective		3
	Hours	**12**
Spring		
ESHS-740	EHS Management System Design	3
ESHS-760	Integrating EHS Management	3
Professional Elective		3
	Hours	**9**
Second Year		
Fall		
ESHS-780	EHS Internal Auditing	3
Select one of the following:		6
ESHS-795	Comprehensive Exam (and two Professional Electives)	
ESHS-797	Graduate Project (and one Professional Elective)	
ESHS-788 & ESHS-790	Thesis Planning and Thesis	
	Hours	**9**
	Total Hours	**30**

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Fall - February 1 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Environmental, Health and Safety Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

- Applicants without formal academic training or documented experience in air emissions, waste water, solid and hazardous waste, occupational health, or occupational safety may be required to take professional electives in these areas.
- Applicants must have completed at least 9 semester hours of college-level course work in the sciences, with at least 3 semester credit hours in each of the following categories: chemistry, biology, and physics.
- Applicants with acceptable professional certification(s) and/or work experience may have prerequisite science course work waived.

Online Degree Information

The online program may be completed entirely through online asynchronous or synchronous courses, or a blend of both. There are no in-person requirements. All core courses are asynchronous and offer flexibility for students in different time zones and varying work schedules. Any synchronous courses would be clearly conveyed at the time of enrollment/registration. The EHS Management degree can be culminated by a thesis, capstone project, or exam. Most students complete the comprehensive examination. Some are able to complete a capstone project or a thesis with program permission. You do not need to choose your completion option at the time of enrollment. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Environmental, Health and Safety Management MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Manufacturing and Mechanical Systems Integration MS

Plan Code: MMSI-MS | **HEGIS:** 0913.00

Program Overview

The MS in manufacturing and mechanical systems integration is a manufacturing engineering degree designed for individuals who wish to achieve a high level of aptitude, competence, and skill in mechanical or manufacturing engineering or advanced mechanical systems. The degree combines engineering, business, and management to effectively guide and lead in a range of manufacturing enterprises. The curriculum includes core courses that cover manufacturing and mechanical systems fundamentals, project management, advanced mechanical systems, integrated mechanical systems, manufacturing process improvements and efficiencies, as well as the business and financial aspects of manufacturing. You'll also complete a three-course option, elective courses, and your choice of a capstone project, thesis, or comprehensive exam. Options are available in advanced mechanics, electronics packaging, polymer engineering and technology, product design, quality, and robotics, and advanced manufacturing systems. You may be required to take additional prerequisite courses depending on your background and the option selected. The number of electives needed to complete the degree is based on whether you choose to complete a thesis, capstone project, or comprehensive exam.

Full-time students are eligible to participate in RIT's cooperative education program. After completing two semesters (a minimum of 18 credit hours), students may request approval to complete up to one year of cooperative education employment related to their field of study.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
RMET-600	MMSI Graduate Seminar	0
RMET-650	Mechatronics and Mechanical Systems Fundamentals	3
STAT-670	Design of Experiments	3
MMSI Option Course 1		3
	Hours	**9**
Spring		
ACCT-603	Accounting for Decision Makers	3
RMET-730 or ISEE-682	Six Sigma for Design and Manufacturing or Lean Six Sigma Fundamentals	3
MMSI Option Course 2		3
Select one of the following:		3
RMET-788	Thesis Planning	
Elective (Capstone Project)		
Elective (Comprehensive Exam)		
	Hours	**12**
Second Year		
Fall		
DECS-744 or PROF-710	Project Management or Project Management	3
MMSI Option Course 3		3
Elective		3
Select one of the following:		3
RMET-790	Thesis	
RMET-797	Capstone Project	
RMET-795	Comprehensive Exam (and one Elective)	
	Hours	**12**
	Total Hours	**33**

MMSI Options

Students must complete at least one option from the table below.

Product Design

Code	Title	Hours
Select three of the following:		9
MCET-620	Robust Design & Production Systems	
MCET-670	Concept/Product Design Management	
MCET-683	Plastics Product Design	
MCET-720	Product and Production System Development and Integration	

Robotics and Advanced Manufacturing Systems

Code	Title	Hours
Select three of the following:		9
ISEE-708	Simulation Analysis	
MECA-672	Biomechatronic Systems Design	
RMET-671	Advanced Automation Systems and Control [1]	
RMET-685	Robotics & Automation	
RMET-687	Robotics: Sensors & Vision	
TCET-620	Applied Machine Learning	

Electronics Packaging

Code	Title	Hours
Select three of the following:		9
ISEE-740	Design for Manufacture and Assembly	
RMET-645	Surface Mount Electronics Manufacturing	
RMET-656	Advanced Concepts in Semiconductor Packaging	
TCET-740	Fiber Optic Communications	
TCET-741	Fiber Optic Communications Lab	

Quality

Code	Title	Hours
MCET-620	Robust Design & Production Systems	3
STAT-621	Statistical Quality Control	3
STAT-641	Applied Linear Models - Regression	3

Polymer Engineering & Technology

Code	Title	Hours
MCET-630	Polymer Engineering Research	3
Select two of the following:		6
MCET-674	Plastics and Composites Materials	
MCET-675	Plastics and Composites Materials Laboratory	
MCET-680	Plastics Manufacturing Technology	
MCET-683	Plastics Product Design	

Advanced Mechanics

Code	Title	Hours
Select three of the following:		9
MCET-661	Multiphysics Modelling: Materials, Components, and Systems	
MCET-662	Advanced Fluid Mechanics and Modeling	

MCET-683	Plastics Product Design
MCET-692	Spray Theory and Application
MCET-695	Applied Finite Element Analysis [2]

[1] A student coming in with no/limited PLC programming and automation system design knowledge will need to take RMET-340 Automation Control Systems/ RMET-341 Automation Control Systems Lab as a bridge course.

[2] A student coming in with no/limited mechanical knowledge will need to take MCET-220 Principles of Statics & MECA-290 Mechanics for Mechatronics as a bridge course.

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Manufacturing and Mechanical Systems Integration program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in the field of engineering, engineering technology, or computing. Students with degrees in other disciplines will be considered on an individual basis. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: GRE required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Bridge Courses

- Applicants without a robotics background who want to do the robotics concentration will be assigned additional bridge courses.
- Applicants without a modeling background who want to do the advanced mechanics concentration will be assigned additional bridge courses.

Packaging Science MS

Plan Code: PACK-MS | **HEGIS:** 4999.00

Program Overview

The packaging science MS degree focuses on selecting raw materials, developing environmentally friendly packaging solutions, and creating functional packaging that withstands environmental, chemical, and physical stresses during distribution and transportation. Keeping these functional aspects in mind, you will develop attractive packaging designs that are aesthetically pleasing and pique consumer interest. This master's degree combines theoretical and hands-on learning experiences that enable you to gain comprehensive knowledge related to packaging design, package testing, product marketing, project management, and quality control. The curriculum consists of core courses, elective courses, and your choice of a comprehensive exam, capstone project, or thesis. Core courses cover topics such as packaging dynamics, packaging and the environment, product packaging for end use, and distribution systems including supply chain management. Elective courses are approved by your advisor and must meet degree requirements. With advisor permission, you may include independent study as part of your elective credits. Courses selected for elective credit may be combined to create special areas of focus with the program chair's approval. The total number of elective courses depends on your choice of the exam, project, or thesis option. You may elect to pursue a Green Belt certificate in Lean Six Sigma with the completion of the thesis or capstone project.

Full-time students may choose to complete cooperative education. After completing two semesters of study (a minimum of 18 credit hours), students may request approval to complete up to one year of cooperative education related to packaging.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
GRCS-701	Research Methods	3
PACK-742	Distribution Systems	3
Packaging Graduate Electives		9
	Hours	**15**
Spring		
PACK-730	Packaging and the Environment	3
PACK-763	Packaging for End Use	3
PACK-783	Advanced Packaging Dynamics	3
Select one of the following:		6
PACK-790	Research Thesis	
PACK-797	Graduate Project (and one Packaging Graduate Elective)	
PACK-795	Comprehensive Examination (and two Packaging Electives)	
	Hours	**15**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Packaging Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have completed at least one semester of physics (mechanics focus), one semester of calculus, one year of chemistry (including organic chemistry), statistics, and basic computer literacy.

Bridge Courses

Applicants who do not have an equivalent bachelor's degree in packaging science will be evaluated and the appropriate undergraduate bridge courses will be prescribed. These courses may not be used for credit toward the MS degree.

Print and Graphic Media Science MS

Plan Code: PRNTMED-MS | **HEGIS:** 0699.00

Program Overview

The print and graphic media science MS offers you an opportunity to explore new areas of research in the graphic communications field. The program's faculty and curriculum focus on establishing quality and efficiencies pertaining to business, technology, and processes in graphic communications. Faculty members are experts in print, business, color management, web and IT, digital publishing, imaging, and typography. You will have the opportunity to get hands-on experience by working with them as graduate assistants either in the classroom or assisting with their faculty research. The degree includes core courses, electives, and a thesis. You may choose electives from a variety of courses offered in the department of graphic media science and technology or with other graduate departments and programs at RIT, with approval of the graduate director. The program encourages cross-disciplinary and interdepartmental collaboration. You must complete a capstone project, a research option, or a thesis. This choice of option provides flexibility for students to choose the path that best aligns with their career goals.

Co-op is optional but strongly encouraged for graduate students in the MS in print and graphic media science.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
GRCS-701	Research Methods	3
PPRT-600	Graduate Seminar	0
PPRT-641	Digital Printing and Publishing	3
PPRT-751	Advanced Materials in Graphic Communication	3
Technical Elective		3
	Hours	**12**
Spring		
PPRT-602	Tone and Color Analysis	3
PPRT-703	Cross Media Workflow	3
PPRT-705	Graphic Standards and Specifications	3
Technical Elective		3
	Hours	**12**
Summer		
Select one of the following:		6
Thesis Option:		
PPRT-790	Thesis	
Capstone Options:		
Option A:		
PPRT-797	Capstone	
Technical Elective		
Option B:		
PPRT-796	Research Applications and Problem Solving	
Technical Elective		
	Hours	**6**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full-time

Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Print and Graphic Media Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have two semesters of undergraduate statistics courses.

Bridge Courses

Applicants must complete one semester of graduate statistics if the prerequisite has not been met.

Smart Cities Construction Management MS

Plan Code: CONSMGT-MS | **HEGIS:** 0510.00

This program is available online.

Program Overview

Smart cities construction management is specifically designed for experienced construction management professionals interested in advancing into leadership positions within the field and may also accommodate recent graduates of undergraduate programs in construction management or related disciplines. The program is offered 100% online to accommodate working professionals. It's a flexible degree that provides depth and breadth in the managerial, technological, economic, and environmental aspects of construction as well as the requisite strategic skills to lead and advance in the industry. With an emphasis on operations and company-level management, this advanced degree offers courses to enhance understanding in construction, facilities management, and related fields. You will develop competencies in leadership, innovative technology, cost analysis and control, operations management and productivity, business development, and client relationship building. The curriculum includes core courses, professional electives, and a choice of a thesis, capstone project, or comprehensive exam. The degree focuses on developing the skills that are most in-demand for construction managers and yield premium salaries for positions in contract management, project management, facilities management, quality and more.

Cooperative education is optional but strongly encouraged for graduate students in the construction management MS degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
CONM-650	Transportation and Construction Leadership and Management	3
CONM-710	Smart Cities, Transportation, and Construction Seminar	3
Concentration Course 1		3
Concentration Course 2		3
	Hours	**12**
Spring		
CONM-620	Transportation and Construction Industry Dynamics	3
CONM-743	Smart Cities Infrastructure Monitoring	3
Concentration Course 3		3
Select one of the following:		3
Project Experience: Professional Elective		
CONM-744	Smart Cities Infrastructure Data Analytics (Thesis Experience)	
	Hours	**12**
Second Year		
Fall		
Professional Elective		3
Select one of the following:		3
CONM-797	Graduate Project (Project Experience)	
CONM-790	Thesis (Thesis Experience)	
	Hours	**6**
	Total Hours	**30**

Concentrations

Students are required to complete one of the concentrations listed below.

Code	Title	Hours
Built Environment (Subplan Code: BUILT-ENV)		
CONM-630	Advanced Construction Scheduling Techniques	3
CONM-661	Construction Cost Analysis and Management	3
CONM-690	Sustainable Building Design and Construction	3
Transportation (Subplan Code: TRANSPORT)		
CONM-640	Economics of Transportation and Supply Chains	3
CONM-641	Geographic Information Systems for Smart Transportation Infrastructure	3
CONM-742	Remote Sensing and Image Analysis for Smart Transportation Infrastructure Application	3

Professional Electives

Students can select professional elective courses from any other concentration or from the courses listed below.

Code	Title	Hours
CONM-718	Construction Operations and Productivity	3
CONM-744	Smart Cities Infrastructure Data Analytics [1]	3
CONM-745	Transportation Systems Management and Operations	3
PROF-710	Project Management	3
PROF-711	Advanced Project Management	3
PROF-712	International Project Management	3
RIT MicroMasters Project Management Certificate [2]		

1 Required for Thesis Culminating Experience
2 up to two courses can count as professional electives

Admission Requirements

This program is available on-campus or online. The following admissions details apply to the on-campus program.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Smart Cities Construction Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in construction management, civil engineering, civil engineering technology, or a related program that includes at least 15 semester hours of college-level math and science. Applicants holding other bachelor's degrees with appropriate, related work experience will be considered for admission on an individual basis. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Additional English Language Test Score Accepted

TOEFL, IELTS, or CET-4 is accepted. For CET-4, an overall score of 530 is required (Reading ≥ 180, Writing ≥ 160, Listening ≥190).

Bridge Courses

If academic and/or work preparation is needed before being admitted and beginning graduate studies, applicants are encouraged to develop a plan with the program chair. Preparatory course(s) may be completed at RIT, or with pre-approval may be completed at other universities. Each course must be completed with a grade of B or higher.

Using edX MicroMasters Credit

Upon successful completion of your RITx Project Management MicroMasters program certificate and acceptance to RIT, you need only complete eight courses (graduate project option) at RIT's online or on campus program to earn an accelerated MS degree in Smart Cities Construction Management. Applicants interested in leveraging their edX MicroMasters for credit (https://www.rit.edu/online/pathways/ritx-project-management/) should send their edX MicroMasters program record to RIT using these instructions (https://help.edx.org/edxlearner/s/article/Viewing-and-sharing-your-program-record/) and we will add the credential to their application for review.

Online Degree Information

Courses are a blend of synchronous and asynchronous, depending on the preference of the instructor. Synchronous courses are offered in the evening, between 5-8 pm, ET. For students who are unable to attend courses during this time due to their work schedule and/or time zone, sessions will be recorded and shared by request and faculty will work with students to be sure material is not missed. Full-time students can take 3 or 4 courses each semester, allowing them to graduate in 1.5 years. Part-time students usually take two courses each semester and can graduate in 2.5 years. Students need to take 6 required courses and 2 to 4 professional electives depending on the exit strategy they choose. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. The program offers two exit strategies: capstone project or thesis. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Smart Cities Construction Management MS is a designated online degree program that is billed at a 43% discount from our on campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

College of Engineering Technology Faculty

Dean's Office

S. Manian Ramkumar, BE, PSG, College of Technology-Bharathiar (India); ME, Rochester Institute of Technology; Ph.D., State University of New York at Binghamton—Dean

Linda A. Tolan, BS, State University College at Geneseo; MS, Rochester Institute of Technology; Ph.D., Andrews University; NCC—Senior Associate Dean for Curriculum Innovation, Human Resources and Engagement; Professor Emerita

Michael Eastman, BS, MS, Rochester Institute of Technology, Ph.D., University at Buffalo—Sr. Associate Dean of Academic Affairs; Professor

Rebecca L. Sumner, AB, Franklin and Marshall College; MA, Ph.D., University of Rochester—Assistant Dean for Research Development

Melissa Aponte, BA, Ithaca College; MA, Teachers College, Columbia University; Ed.D., St. John Fisher College—Assistant Dean of Students

Rachel Mathews, BS, Siena College, MS, State University College at Plattsburgh—Assistant Dean of Academic Operations

School of Engineering Technology

Civil Engineering Technology

Lu Sun, BS, Ph.D., Southeast University (China); Ph.D., University of Texas at Austin—Civil Engineering Technology, Environmental Management and Safety; Professor

Yewande Abraham, BS, MS, Cardiff University (United Kingdom); Ph.D., Pennsylvania State University—Associate Professor; Professor Emeritus

Amanda Bao, PE, BS, MS, Tianjin University (China); Ph.D., University of Colorado at Boulder—Interim Department Chair; Professor

Lucio Salles de Salles, BS, Federal University of Santa Maria (Brazil); MS, Doctor of Science, University of São Paulo (Brazil)—Associate Professor

Todd Dunn, PE, BS, Dartmouth College; MSCE, University of California—Associate Professor

Abdullah Faruque, PE, B.Sc., Bangladesh University of Engineering and Technology (India); M.A.Sc., Ph.D., University of Windsor (Canada)—Associate Professor

Robert E. McGrath Jr., PE, BCE, Rensselaer Polytechnic Institute; MSCE, Syracuse University—Professor Emeritus

Mark Piterman, MCE, Odessa Marine Engineers Institute (Ukraine)—Professor Emeritus

Rizk Sinada, BS, MS, Rochester Institute of Technology—Senior Lecturer

Yi Su, Bachelor of Management, East China University of Science and Technology (China); ME, Chongqing Jiaotong University (China); Ph.D., The Catholic University of America—Construction Management Graduate Program Director; Visiting Lecturer

Maureen S. Valentine, PE, BSCE, Tufts University; MECE, Virginia Polytechnic Institute—Professor Emerita

Teresa Wolcott, BS, State University of New York at Buffalo; MS, Rochester Institute of Technology—Principal Lecturer

Environmental, Healthy and Safety Management

Lisa Greenwood, BS, Rochester Institute of Technology; MS, University of New Haven; Ph.D., State University of New York College of Environmental Science and Forestry—Associate Professor

John Morelli, PE, BS, Syracuse University; MS, Ph.D., State University of New York College of Environmental Science and Forestry—Professor Emeritus

Joseph M. Rosenbeck, CSP, BS, MS, Central Missouri State University—Graduate Program Director; Professor

Jennifer L. Schneider, CIH, BA, Roberts Wesleyan College; MS, University of Rochester; Ph.D., University of Massachusetts—Eugene H. Fram Chair in Applied Critical Thinking; Professor

Electrical and Computer Engineering Technology

Miguel Bazdresch, BE, Western Institute of Technology and Higher Studies (Mexico); ME, National Polytechnic Institute (Mexico); Ph.D., National Higher School of Telecommunications (France)—Associate Professor

Mark J. Indelicato, BEEE, Manhattan College; MS, Polytechnic University —Associate Professor

William P. Johnson, BA, Kings College; BSEE, MSEE, Syracuse University; JD, University at Buffalo Law School—Professor Emeritus

Warren L. G. Koontz, BSEE, University of Maryland; MSEE, Massachusetts Institute of Technology; Ph.D., Purdue University—Professor Emeritus

Drew Maywar, BS, MS, Ph.D., University of Rochester—Professor

Jorge Carlos Mex-Perera, BS, Technological Institute of Merida (Mexico); M.Sc., National Polytechnic Institute (Mexico); Ph.D., University of Bradford (United Kingdom)—Assistant Professor

Manufacturing and Mechanical Engineering Technology

Ronald F. Amberger, PE, BME, Rensselaer Polytechnic Institute; ME, Pennsylvania State University—Professor Emeritus

Martin Anselm, BS, State University College at Geneseo; MS, Clarkson University; Ph.D., Binghamton University—Associate Professor

Jun Han Bae, BS, Yonsei University (South Korea); MS, Ph.D., Purdue University—Assistant Professor

Beth A. Carle, BSE, University of Pittsburgh; MS, Ph.D., University of Illinois; EIT Professional Certification—Interim Department Chair; Professor

Elizabeth M. Dell, BSME, General Motors Institute; MS, University of Michigan—Professor

Robert D. Garrick, BSEE, GMI Engineering and Management Institute; MBA, Rochester Institute of Technology; MS, University of Rochester; Ph.D., University of South Carolina—Professor

Martin Gordon, PE, BSME, MSME, MBA, State University of New York at Buffalo—Director of External Academic Relations; Professor

Krittika Goyal, BS, MS, Thapar University (India); Ph.D., Rochester Institute of Technology—Assistant Professor

MD Ahasan Habib, BSc, MSc, Bangladesh University of Engineering and Technology (India); Ph.D., North Dakota State University—Assistant Professor

Seung H. Kim, BS, Hanyang University (South Korea); MS, Ph.D., University of Illinois—Associate Professor

Christopher Lewis, BS, Pennsylvania College of Technology; MS, University of Texas; Ph.D., University of Rochester—Russell McCarthy Endowed Professor; Assistant Professor

Carl A. Lundgren, BS, Rensselaer Polytechnic Institute; MBA, University of Rochester—Professor Emeritus

Jennifer A. O'Neil, BS, Rochester Institute of Technology; Ph.D., Purdue University—Associate Professor

Brian Rice, BS, University of Buffalo; MS, Ph.D., University of Rochester—Associate Professor

John A. Stratton, PE, BS, Rochester Institute of Technology; MS, Rensselaer Polytechnic Institute—Professor Emeritus

Larry A. Villasmil, BSME, Universidad del Tachira (Venezuela); MSME, Ph.D., Texas A&M University—Associate Professor

Packaging and Graphic Media Science

Bilge N. Altay, BS, MS, Marmara University (Turkey); MS, Ph.D., Western Michigan University—Assistant Professor

Carlos A. Diaz-Acosta, BS, MS, Universidad de los Andes (Colombia); Ph.D., Michigan State University—Faculty Associate for Scholarship Advancement; Professor

Kyle Dunno, BS, MS, Ph.D., Clemson University—Department Chair; Associate Professor

Robert J. Eller, AB, MA, University of Missouri—Professor Emeritus

Changfeng Ge, BSME, MSME, Tongji University (China); Ph.D., University of Dortmund (Germany)—Graduate Program Director; Professor

Daniel L. Goodwin, BS, MS, Ph.D., Michigan State University—Professor Emeritus

Deanna M. Jacob, BS, State University College at Plattsburgh; MA, State University College at Geneseo; MS, Rochester Institute of Technology—Professor Emerita

Daniel P. Johnson, BS, MS, Rochester Institute of Technology; M.Ed., University of Buffalo—Professor

Irma Abu-Jumah, BS, Dr. Jose Matias Delgado University (El Salvador); MS, Rochester Institute of Technology—Lecturer

Malcolm Keif, BS, California Polytechnic State University; MA, California State University; Ph.D., University of Missouri—Professor of Practice

Bruce Myers, BFA, Montclair State University; MS, Ph.D., New York University—Associate Professor

Karen L. Proctor, BS, Michigan State University; MBA, Rochester Institute of Technology—Professor Emeritus

Alexis Rich, BS, ME, Rochester Institute of Technology—Enterprise Lab Manager; Senior Lecturer

Environmental, Healthy and Safety Management

Lisa Greenwood, BS, Rochester Institute of Technology; MS, University of New Haven; Ph.D., State University of New York College of Environmental Science and Forestry—Assistant Professor

John Morelli, PE, BS, Syracuse University; MS, Ph.D., State University of New York College of Environmental Science and Forestry—Professor Emeritus

Joseph M. Rosenbeck, CSP, BS, MS, Central Missouri State University—Graduate Program Director; Professor

Jennifer L. Schneider, CIH, BA, Roberts Wesleyan College; MS, University of Rochester; Ph.D., University of Massachusetts—Eugene H. Fram Chair in Applied Critical Thinking; Professor

Emeritus Faculty

Ronald F. Amberger, Professor Emeritus
Donald Baker, Professor Emeritus
Rodger W. Baker, Professor Emeritus
Hans J. Barschel, Professor Emeritus
Norm Bate, Professor Emeritus
Lawrence Belle, Professor Emeritus
Harry Cooke, Professor Emeritus
Henry Cooke, Professor Emeritus
Lawrence A. Coon, Professor Emeritus
David Crumb, Associate Professor Emeritus
Twyla Cummings, Professor Emeritus
Silvio DeCristofaro, Professor Emeritus
Charles DeRoller, Associate Professor Emeritus
Thomas Dingman, Professor Emeritus
Todd Dunn, Associate Professor Emeritus
Robert Eastman, Professor Emeritus
Robert Eller, Research Professor Emeritus
James D. Forman, Professor Emeritus
Louis Gennaro, Professor Emeritus
Daniel Goodwin, Professor Emeritus
Ronald Hilton, Professor Emeritus
James Hurny, Associate Professor Emeritus
Deanna Jacobs, Professor Emeritus
James Jacobs, Senior Lecturer Emeritus
William Johnson, Professor Emeritus
Harold Kenter, Professor Emeritus
Warren Koontz, Professor Emeritus
David Krispinsky, Associate Professor Emeritus
William C.Larsen, Professor Emeritus
Bernard Logan, Professor Emeritus
Carl Lundgren, Professor Emeritus
Robert McGrath, Professor Emeritus
Robert Merrill, Professor Emeritus
John Morelli, Professor Emeritus
Russell A. Norton, Professor Emeritus
David Olsson, Professor Emeritus
Robert D. Pease, Dean Emeritus
Mark Piterman, Professor Emeritus
Karen Proctor, Professor Emeritus
Harold Raphael, Professor Emeritus
Carol Richardson, Professor Emeritus
Warren Sackler, Professor Emeritus
Edward A. Steffens, Professor Emeritus
John Stratton, Professor Emeritus
Linda Tolan, Professor Emeritus

Maureen Valentine, Professor Emeritus
Norman J. Weinreber, Associate Professor Emeritus

COLLEGE OF HEALTH SCIENCES AND TECHNOLOGY

Overview

The United States faces a looming shortage of many types of health care professionals, including nurses, physicians, dentists, pharmacists, and allied health workers. The college, housed in the Institute of Health Sciences and Technology, serves as an independent academic and research entity designed to provide a focused, interdisciplinary, and systems approach to innovative health care education, applied/translational research, and community outreach. The institute incorporates three major thrusts: the College of Health Sciences and Technology, a Health Science Research Center, and a Health Science Community Collaboration and Outreach Center.

The college offers clinically related and biomedical research- based programs to meet both the present and future needs of the health care system. The college's faculty and staff are committed to delivering high quality educational programs. Building on a foundation of liberal arts and basic sciences, students will gain advanced knowledge in theoretical science and practical applications in experiential learning environments. These experiences prepare students to serve as practitioners, scientists, and leaders through their contribution to, and the provision of, high-quality patient care, health care service, and/or applied, translational biomedical research.

Please visit the college's website–**www.rit.edu/healthsciences (https://www.rit.edu/healthsciences/)**– for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarships

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Doctoral Degrees

- Occupational Therapy OTD (p. 144)

Dual Degrees

- Nutritional Sciences BS / Dietetics and Nutrition MS Dual Degree (https://academiccatalog.rit.edu/programs/nutritional-sciences-bs-dietetics-nutrition-ms-dual-degree/)
- Nutritional Sciences BS / Sustainable Systems MS Dual Degree (https://academiccatalog.rit.edu/programs/nutritional-sciences-bs-sustainable-systems-ms-dual-degree/)
- Physician Assistant BS / MS Dual Degree (p. 145)

Master's Degrees

- Dietetics and Nutrition MS (p. 138)
- Health and Well-Being Management MS (p. 140)
- Medical Illustration MFA (p. 142)

Dietetics and Nutrition MS

Plan Code: DIET-MS | **HEGIS:** 1306.00

Program Overview

RIT's dietetics and nutrition graduate degree emphasizes new connections between technology and health and prepares you to become a Registered Dietitian Nutritionist (RDN). RDNs are skilled health care professionals who apply the art and science of food and nutrition to a variety of demographics at individual, institutional, organizational, community, and population levels. From hospitals, universities, and marketing firms to research facilities, public health organizations, and corporations, the MS in dietetics and nutrition will prepare you to practice in a variety of settings. You will learn from expert program faculty who all hold doctorates and are RDNs with professional expertise in a wide range of topics. In addition to meeting all competencies for entry-level practice as an RDN by the Accreditation Council for Education in Nutrition and Dietetics (ACEND)–the accreditation body for programs in nutrition and dietetics–the program requires you to complete a thesis that includes technology as an aspect of nutrition and dietetics practice. Successful completion of the degree also meets the course work and supervised experiential learning requirements to sit for the RDN examination.

Students complete three Supervised Experiential Learning (SEL) courses providing practical, hands-on learning in culinary and food service operations, community, and clinical settings. SEL course activities are integrated with concurrent classroom-based courses to translate knowledge into practice, preparing graduates to pass the RDN credentialling exam and start careers in dietetics and nutrition.

Accreditation

Rochester Institute of Technology's dietetics and nutrition graduate program has been granted candidacy status by the Accreditation Council for Education in Nutrition and Dietetics (ACEND) of the Academy of Nutrition and Dietetics. Candidacy status is granted to academic institutions who have demonstrated the ability to house a dietetics program.

Students in a candidacy-status program are considered graduates of an accredited program and are eligible to sit for the National Registration Examination for Dietitians, upon successful program completion.

More information on ACEND and its accreditation standards are available at:

Accreditation Council for Education in Nutrition and Dietetics
www.eatrightpro.org/acend (https://www.eatrightpro.org/acend/)
120 South Riverside Plaza, Suite 2190
Chicago, IL 60606-6995
312-899-0040 ext. 5400 or 800-877-1600

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
NUTR-625	Medical Nutrition Therapy I	3
WSHN-624	Advanced Nutrition Science	3
WSHN-700	Research Methods in Health and Well-being	3
Program Elective [1]		3
	Hours	**12**
Spring		
NUTR-626	Medical Nutrition Therapy II	3
NUTR-655	Nutrition Throughout the Lifecycle	3
WSHN-710	Population Health, Risk Identification & Management	3
WSHN-770	Community and Public Health Nutrition Supervised Experiential Learning	3
	Hours	**12**
Summer		
WSHN-715	Culinary and Food Systems Management	3
WSHN-775	Culinary and Food Systems Management Supervised Experiential Learning	3
	Hours	**6**
Second Year		
Fall		
HLTH-706	Leading Health Systems I	3
WSHN-790	Health & Well-being Management Thesis	6
Select one of the following Statistics Electives:		3
BIOL-672	Computational Statistics and Data Science Methods	
MATH-655	Biostatistics	
PSYC-640	Graduate Statistics	
STAT-614	Applied Statistics	
	Hours	**12**
Spring		
WSHN-702	Dissemination and Implementation Science for Health and Well-being	3
WSHN-730	Nutritional Assessment and Counseling	3
WSHN-780	Clinical Nutrition Supervised Experiential Learning	6
	Hours	**12**
	Total Hours	**54**

1 Students must select one (1) of the Program Electives from the list below (p. 138).

Program Electives

Code	Title	Hours
BIOL-625	Ethics in Bioinformatics	3
BIOL-630	Bioinformatics Algorithms	3
CINT-628	Introduction to Applied Informatics	3
EXSC-650	Exercise Physiology	4
EXSC-690	Exercise Science Research	3
HCIN-610	Foundations of Human-Computer Interaction	3
HLTH-725	Health Care Strategic Marketing & Communications	3
HLTH-730	Health Care Financial Management I: Principles & Practice	3
HLTH-733	Health Systems Quality & Organizational Learning	3
HRDE-726	Technology and the Future of Work	3
HRDE-735	Leading Human Resources	3
HRDE-742	Leading Change	3
HRDE-765	Diversity in Global Workplace	3
ISTE-764	Project Management	3
MEDI-701	Introduction to Health Informatics	3
MEDI-704	Practice of Health Care	3
MEDI-735	Clinical Information Systems	3
MGMT-740	Leading Teams in Organizations	3
MKTG-761	Marketing Concepts and Commercialization	3

MKTG-772	Internet Marketing: Strategy & Tactics	3
NUTR-610	Integrative Approaches to Health	1
NUTR-650	Community Nutrition	3
NUTR-680	Global Food and Nutrition Perspectives	3
PROF-710	Project Management	3
PSYC-713	Graduate Developmental Psychology	3
PSYC-716	Graduate Social Psychology	3
PUBL-700	Readings in Public Policy	3
PUBL-701	Graduate Policy Analysis	3
PUBL-702	Graduate Decision Analysis	3
PUBL-703	Evaluation and Research Design	3
SERQ-720	Strategic Foresight and Innovation	3
SERQ-722	Customer Centricity	3
SERQ-723	Service Analytics	3
SERQ-740	Leading Innovation	3
SERQ-747	Design Thinking and Creativity	3
STAT-641	Applied Linear Models - Regression	3
STAT-672	Survey Design and Analysis	3
STAT-775	Design and Analysis of Clinical Trials	3
STAT-784	Categorical Data Analysis	3
WSHN-701	Health and Nutrition Education and Evaluation	3
WSHN-799	Independent Study	1-4

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 28 priority deadline, rolling thereafter
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Dietetics and Nutrition program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
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PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must show evidence of course work in the natural sciences (e.g., biology and biochemistry) and in courses related to nutrition and dietetics covering topics such as techniques of dietetics education, nutrition and integrative medicine, community nutrition, customer experience management, and microbiology of health and disease. Applicants holding a Verification Statement from an ACEND-accredited program in didactics are considered to have met these requirements.

Scholarships

Students interested in cultural competence, social determinants of health, behavioral health integration, and interprofessional care coordination are encouraged to apply for scholarships reserved for RIT M.S. in Dietetics and Nutrition students in the AHEC Scholars Program (https://www.r-ahec.org/education/ahec-scholars/). Selected students may apply their RIT Experiential Learning hours toward fellowship requirements. Benefits of participation include a financial stipend, access to current, research-based, non-clinical online learning materials, and more.

Transportation Requirement

The Dietetics and Nutrition MS program requires Supervised Experiential Learning (SEL) experiences that are off site and not on the RIT campus. Students are responsible for their own transportation to and from any off-campus activities including their supervised experiential learning hours, practice assignments, research, and travel to professional meetings. All transportation and parking costs are the responsibility of the student. Public transportation and/or ride share are typically not available.

Health and Well-Being Management MS

Plan Code: HLTHWB-MS | **HEGIS:** 1299.00

Program Overview

The MS in health and well-being management prepares you for a career in health and well-being program design, administration, and research. The program provides the skills health care workers require, including the ability to apply systems thinking, design interventions, practice dissemination and implementation science, understand negotiation, advocacy, and team dynamics, and engage with communities. The degree offers two options. The content development, implementation and evaluation option focuses on learning to design and execute health and well-being programs with an emphasis on a singular area of health or wellness, such as exercise, behavior, or nutrition. The health and well-being program management option focuses on leading health and wellness or employee assistance programs for organizations. The program's overall curriculum is designed to help you gain the following abilities: design, deliver and evaluate interventions; assist with health, physical, nutrition, behavioral screenings or policy analysis to plan and manage safe and effective health promotion programs for healthy and health-impaired individuals; acquire a knowledge base in nutrition, physical activity, and health law; categorize subsets of a population and create tailored programming; collaborate to promote and administer health related research, activities, and policy at the organizational, community, state, and federal levels; and design and execute a comprehensive project or research-based inquiry relevant to the health promotion industry.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
WSHN-700	Research Methods in Health and Well-being	3
WSHN-701	Health and Nutrition Education and Evaluation	3
Select one of the following:		3
Professional Elective (Emphasis Plan 1)		
HLTH-710	Health Care Economics and Policy (Emphasis Plan 2)	
Select one of the following Statistics Electives:		3
MATH-655	Biostatistics	
PSYC-640	Graduate Statistics	
STAT-614	Applied Statistics	
	Hours	**12**
Spring		
WSHN-702	Dissemination and Implementation Science for Health and Well-being	3
Professional Electives		9
Select one of the following:		3
WSHN-710	Population Health, Risk Identification & Management (Emphasis Plan 1)	
Professional Elective (Emphasis Plan 2)		
	Hours	**15**
Summer		
Select one of the following:		6
WSHN-797	Health & Well-being Management Project (plus 1 Professional Elective for Option 1)	
WSHN-790	Health & Well-being Management Thesis (Option 2)	
	Hours	**6**
	Total Hours	**33**

Emphasis Plan 1- Content Development, Implementation & Evaluation

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Recommended Electives (selected in consultation with advisor):
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Code	Title	Hours
EXSC-650	Exercise Physiology	4
EXSC-689	Topics in Exercise Science	3
EXSC-690	Exercise Science Research	3
HRDE-726	Technology and the Future of Work	3
NUTR-610	Integrative Approaches to Health	1
NUTR-650	Community Nutrition	3
NUTR-655	Nutrition Throughout the Lifecycle	3
NUTR-680	Global Food and Nutrition Perspectives	3
PHYA-729	Clinical Epidemiology	3
PSYC-713	Graduate Developmental Psychology	3
PSYC-716	Graduate Social Psychology	3
SERQ-723	Service Analytics	3
SERQ-747	Design Thinking and Creativity	3
STAT-672	Survey Design and Analysis	3
WSHN-720	Topics in Health and Nutrition	3
WSHN-799	Independent Study	1-4

Emphasis Plan 2- Health & Well-being Program Management

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Recommended Electives (selected in consultation with advisor):
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Code	Title	Hours
EDLI-733	Instructional Design	3
EXSC-689	Topics in Exercise Science	3
HLTH-706	Leading Health Systems I	3
HLTH-718	Evidence-Based Management in Health Care	3
HLTH-725	Health Care Strategic Marketing & Communications	3
HLTH-730	Health Care Financial Management I: Principles & Practice	3
HLTH-732	Health Insurance and Reimbursement	3
HLTH-733	Health Systems Quality & Organizational Learning	3
HLTH-736	Health Care Operations: Building High Reliability Systems	3
HLTH-746	Leading Health Systems II	3
HRDE-726	Technology and the Future of Work	3
HRDE-735	Leading Human Resources	3
HRDE-742	Leading Change	3
HRDE-765	Diversity in Global Workplace	3
MKTG-761	Marketing Concepts and Commercialization	3
MKTG-772	Internet Marketing: Strategy & Tactics	3
PROF-710	Project Management	3
SERQ-720	Strategic Foresight and Innovation	3
SERQ-722	Customer Centricity	3
SERQ-723	Service Analytics	3

SERQ-740	Leading Innovation	3
SERQ-747	Design Thinking and Creativity	3
STAT-672	Survey Design and Analysis	3
WSHN-720	Topics in Health and Nutrition	3
WSHN-799	Independent Study	1-4

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Health and Well-Being Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have completed an accredited college-level nutrition course with a B or better.

Medical Illustration MFA

Plan Code: ILLM-MFA | **HEGIS:** 1299.00

Program Overview

In RIT's medical illustration MFA degree you will become a highly skilled medical illustrator who can transform complex medical information into visual images that are used in education, research, patient care, public relations, legal cases, and health care marketing. The program combines training in human anatomy (with complete cadaver dissection in RIT's Cadaver Lab), immunology, histology (the cellular structure of organs), and pathophysiology (the study of disease) with extensive training in 2D and 3D digital graphics, interactive media, and animation. Designed for those with exceptional illustration skills and artistic ability, the degree emphasizes visual problem solving to determine the best approach to communicate complex medical information. Students gain real world experience by collaborating with medical researchers and observing live surgeries to acquire in depth knowledge in operating rooms. Beyond illustration and knowledge in the biomedical sciences, the comprehensive curriculum also prepares you to communicate effectively orally and in writing, understand production techniques for a variety of media, demonstrate knowledge of professional ethics and an awareness of business practices and management, and to exhibit competency in the academic research process. The program culminates with the production of a thesis project, which requires extensive background research and an original body of artwork on a complex medical topic. Since the MFA is considered the terminal degree in the arts, graduates may also teach in academic institutions or in a wide range of computer graphics, scientific illustration, or art programs.

Accreditation

RIT's master of fine arts program in medical illustration is one of five accredited graduate programs for medical illustration in North America. Programmatic accreditation by Commission on Accreditation of Allied Health Education Programs (CAAHEP) ensures the standards by which RIT's program is measured have been developed by professionals in our discipline. The rigorous process of CAAHEP accreditation as well as annual oversight ensures that our program meets or exceeds these industry standards.

Commission on Accreditation of Allied Health Education Programs
25400 U.S. Highway 19 North, Suite 158
Clearwater, FL 33763
Phone: 727-210-2350
Fax: 727-210-2354

www.caahep.org (http://www.caahep.org/)
mail@caahep.org

The master of fine arts program in medical illustration is also accredited by the National Association of Schools of Art and Design (NASAD), nasad.arts-accredit.org (https://nasad.arts-accredit.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ILLM-601	Human Gross Anatomy	6
ILLM-602	Anatomic Studies	3
ILLM-603	3D Modeling of Biomedical Forms	3
MEDS-630	Human Immunology	3
	Hours	**15**
Spring		
ILLM-606	3D Animation of Biomedical Forms	3
ILLM-607	Computer Applications in Medical Illustration	3
ILLM-608	Scientific Visualization	3
MEDS-615	Medical Pathophysiology	3
Studio Elective		3
Select one of the following:		1
ILLM-890	Thesis	
ILLM-897	Graduate Capstone	
	Hours	**16**
Second Year		
Fall		
ILLM-612	Surgical Illustration	3
ILLM-615	Interactive Media I	3
MEDS-620	Histology and Histopathology	4
Select one of the following:		5
ILLM-890	Thesis	
ILLM-897	Graduate Capstone	
	Hours	**15**
Spring		
ILLM-616	Interactive Media II	3
ILLM-617	Portfolio and Business Practices	3
Studio Elective		3
Select one of the following:		4
ILLM-890	Thesis	
ILLM-897	Graduate Capstone	
	Hours	**13**
	Total Hours	**59**

Studio Electives

Students will choose from any of the following:

Code	Title	Hours
ILLM courses not included in the table above, such as:		
ILLM-618	Eye Ear and Nose Prosthetics	
ILLM-627	Advanced Digital Technology for Medical Instruction	
ILLM-628	Medical and Scientific Animation	
ILLM-689	Special Topics	
ILLM-799	Independent Study	
Any graduate studio course offered in the College of Art and Design (CAD)		
Any of the following courses from the Golisano College of Computing and Information Sciences (GCCIS):		
HCIN-610	Foundations of Human-Computer Interaction	
HCIN-620	Information and Interaction Design	
HCIN-660	Fundamentals of Instructional Technology	

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline, rolling thereafter

Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Medical Illustration program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have one year of general or introductory biology (for biology majors), and a minimum of three advanced biology courses, such as vertebrate anatomy, physiology, neurobiology, cell biology, molecular biology, immunology, microbiology, genetics, developmental biology, or pathology.

Occupational Therapy OTD

Plan Code: OCCTHR-OTD | **HEGIS:** 1208.00

Pending Approval by the Middle States Commission on Higher Education.

Overview

The occupational therapy doctorate enables students to study at the intersection of healthcare and technology. The program blends a traditional occupational therapy curriculum with technological innovations to create a clinical doctoral degree that prepares you to leverage technology for your future practice, fostering creative problem-solving and forward-thinking approaches.

A significant portion of the occupational therapy doctorate program is dedicated to clinical education and practice. You will participate in multiple fieldwork experiences in various care settings, such as hospitals, outpatient clinics, rehabilitation centers, schools, community agencies, and skilled nursing facilities.

Accreditation

The entry-level occupational therapy doctoral degree program has applied for accreditation and has been granted Candidacy Status by the Accreditation Council for Occupational Therapy Education (ACOTE) of the American Occupational Therapy Association (AOTA), located at 7501 Wisconsin Avenue, Suite 510E, Bethesda, MD 20814. ACOTE's telephone number c/o AOTA is (301) 652-AOTA and its web address is www.acoteonline.org (http://www.acoteonline.org). The program must have a preaccreditation review, complete an on-site evaluation, and be granted Accreditation Status before its graduates will be eligible to sit for the national certification examination for the occupational therapist administered by the National Board for Certification in Occupational Therapy (NBCOT). After successful completion of this exam, the individual will be an Occupational Therapist, Registered (OTR). In addition, all states require licensure to practice; however, state licenses are usually based on the results of the NBCOT Certification Examination. A felony conviction may affect a graduate's ability to sit for the NBCOT certification examination or attain state licensure.

For further information on these limitations, students may contact NBCOT at:

National Board for Certification in Occupational Therapy
One Bank Street, Suite 300
Gaithersburg, MD 20878
(301) 990-7979

Students must complete 24 weeks of Level II fieldwork and an individual 14-week capstone experience within 24 months following the completion of the didactic portion of the program. The doctoral capstone experience must be started after completion of all course work, Level II fieldwork, and preparatory activities defined in 2023 ACOTE OTD Standard D.1.3.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		Hours
Summer		
OCTH-603	Occupational Sciences and Occupational Therapy	3
OCTH-604	Clinical Human Anatomy	4
OCTH-703	Professional Practice and Formation I	3
	Hours	**10**
Fall		
OCTH-613	Clinical Neuroanatomy	3
OCTH-622	Research Inquiry in Occupational Therapy	2
OCTH-643	Health Conditions and Occupational Therapy Performance	3
OCTH-683	Occupational Therapy Practice in Mental Health	3
OCTH-801	Clinical Seminar and Level I Fieldwork A: Mental Health	1
	Hours	**12**
Spring		
OCTH-633	Occupational Therapy Practice in Pediatrics I	3
OCTH-663	Applied Kinesiology and Movement Analysis	3
OCTH-723	Occupational Therapy Evaluation in Physical Rehabilitation	3
OCTH-743	Occupations, Wellness and Population Health	3
OCTH-811	Clinical Seminar & Level I Fieldwork B: Pediatrics	1
WSHN-700	Research Methods in Health and Well-being	3
	Hours	**16**
Second Year		
Summer		
OCTH-733	Occupational Therapy Practice in Pediatrics II	3
OCTH-762	Introduction to Innovative Technology in Rehabilitation	2
OCTH-821	Clinical Seminar & Level I Fieldwork C: Physical Rehab	1
OCTH-823	Occupational Therapy Intervention in Physical Rehabilitation	3
	Hours	**9**
Fall		
OCTH-623	Occupational Therapy Practice with Older Adults	3
OCTH-711	Research Implementation I	1
OCTH-753	Professional Practice and Formation II	3
OCTH-783	Physical Agent and Mechanical Modalities I	3
OCTH-831	Clinical Seminar & Level I Fieldwork D: Emerging Practice	1
OCTH-843	Occupational Therapy Practice Application in Physical Rehabilitation	3
	Hours	**14**
Spring		
OCTH-722	Research Implementation II	2
OCTH-772	Clinical Seminar Capstone Planning	2
OCTH-773	OT Program Development and Grant Writing	3
OCTH-853	Health Care Management and Leadership	3
OCTH-862	Innovative Technology in Rehabilitation II: Implementation	2
OCTH-863	Physical Agent and Mechanical Modalities II	3
	Hours	**15**
Third Year		
Summer		
OCTH-872	Clinical Level II A Fieldwork	12
	Hours	**12**
Fall		
OCTH-761	Professional Practice and Formation III	1
OCTH-882	Clinical Level II B Fieldwork	12
	Hours	**13**
Spring		
OCTH-884	Capstone Project	14
	Hours	**14**
	Total Hours	**115**

Admission Requirements

To be considered for admission to the Occupational Therapy OTD program, candidates must fulfill the following requirements:

- Received a Baccalaureate degree with an overall GPA of 3.0/4 from a regionally accredited institution
- A minimum of three (3) completed recommendation forms submitted by individuals familiar with the applicant's academic, professional, or clinical qualifications;
- Documented a minimum of 40 hours of clinical observation or comparable experience under the supervision of an occupational therapy practitioner
- Completed all the following prerequisite courses (24 credit hours) and received a grade of "B" or above in each course:
  - Elementary Statistics (3 credit hours)
  - Anatomy and Physiology I with labs (4 credit hours)
  - Anatomy and Physiology II with lab (4 credit hours)
  - Human Growth and Development (3 credit hours)
  - General Psychology (3 credit hours)
  - Anthropology/Sociology (3 credit hours)
  - Lab Science (Physics or Chemistry, 4 credit hours)
- Successful completion of a virtual or in-person interview
- A satisfactory score (determined by the RIT Admissions Office) on the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS) within two years of enrollment is required for most international students.

Physician Assistant BS / MS Dual Degree

Plan Code: PHYA-MS | **HEGIS:** 1299.10
Plan Code: PHYA-BS | **HEGIS:** 1299.10

Program Overview

RIT's physician assistant program is a five-year, dual degree program where you'll earn both your bachelor's and your master's degrees. The program prepares you to elicit medical histories, conduct physical examinations, order laboratory and radiological testing, diagnose common illnesses, determine treatment, provide medical advice, counsel and educate patients, promote wellness and disease prevention, assist in surgery, and perform casting and suturing. A physician assistant's duties vary depending on the state and specialty in which they practice. In most states, including New York, physician assistants may prescribe medication. Examples of specialties include (but are not limited to): internal medicine, family medicine, emergency medicine, geriatrics, pediatrics, women's health, behavioral health, general surgery, orthopedics, neurosurgery, and neonatology. Clinical rotations (internships) during students' last year of study provide the opportunity to explore these varied disciplines.

Accreditation

Physician Assistant Accreditation Update

The RIT physician assistant program had an accreditation site visit in June 2019 and the Accreditation Review Commission on Education for Physician Assistants (ARC-PA) met in late September 2019. The following is the official ARC-PA announcement regarding RIT's accreditation status:

The Accreditation Review Commission on Education for the Physician Assistant, Inc. (ARC-PA) has granted Accreditation-Continued status to the Rochester Institute of Technology Physician Assistant Program sponsored by Rochester Institute of Technology. Accreditation-Continued is an accreditation status granted when a currently accredited program is in compliance with the ARC-PA Standards.

Accreditation remains in effect until the program closes or withdraws from the accreditation process or until accreditation is withdrawn for failure to comply with the Standards. The approximate date for the next validation review of the program by the ARC-PA will be September 2027. The review date is contingent upon continued compliance with the Accreditation Standards and ARC-PA policy.

The program's accreditation history can be viewed on the ARC-PA website, www.arc-pa.org/Accreditation-History-Rochester-Inst-of-Tech (https://www.arc-pa.org/Accreditation-History-Rochester-Inst-of-Tech/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
BIOL-101	General Biology I (General Education – Elective)	3
BIOL-103	General Biology I Lab (General Education – Elective)	1
CHMG-141	General & Analytical Chemistry I (fulfills General Education: Natural Science Inquiry Perspective)	3
CHMG-145	General & Analytical Chemistry I Lab (fulfills General Education: Natural Science Inquiry Perspective)	1

General Education: Artistic Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/artistic/)		3
General Education: Ethical Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/ethical/)		3
General Education: Elective		3
YOPS-10	RIT 365: RIT Connections	0
	Hours	**17**
Spring		
BIOL-102	General Biology II (General Education – Elective)	3
BIOL-104	General Biology II Lab (General Education – Elective)	1
CHMG-142	General & Analytical Chemistry II (fulfills General Education: Scientific Principles Perspective)	3
CHMG-146	General & Analytical Chemistry II Lab (fulfills General Education: Scientific Principles Perspective)	1
MATH-161	Applied Calculus (fulfills General Education: Mathematical Perspective A)	4
General Education: First Year Writing (WI) (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/firstyearwriting/)		3
General Education: Global Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/global/)		3
	Hours	**18**
Second Year		
Fall		
CHMB-240	Biochemistry for Health Sciences (General Education – Elective)	3
MEDS-250	Human Anatomy and Physiology I (General Education – Elective)	4
General Education: Immersion		3
General Education: Social Perspective (https://academiccatalog.rit.edu/undergraduate-catalog/course-lists-by-attribute/social/)		3
Open Elective		3
	Hours	**16**
Spring		
MEDS-251	Human Anatomy and Physiology II (General Education – Elective)	4
MEDS-417	Clinical Microbiology	3
STAT-145	Introduction to Statistics I (fulfills General Education: Mathematical Perspective B)	3
General Education: Immersion		3
General Education: Immersion		3
	Hours	**16**
Third Year		
Fall		
PHYA-401	History & Physical Diagnosis I	4
PHYA-405	Pathophysiology I	2
PHYA-415	Pharmacology I	1
PHYA-420	PA Seminar	1
PHYA-422	Clinical Medicine I	5
	Hours	**13**
Spring		
PHYA-402	History & Physical Diagnosis II	4
PHYA-406	Pathophysiology II	2
PHYA-416	Pharmacology II	2
PHYA-419	Advanced Gross Anatomy	2
PHYA-423	Clinical Medicine II	5
PHYA-430	Clinical Genetics	2
	Hours	**17**
Fourth Year		
Fall		
PHYA-409	Clinical Lab Medicine	1
PHYA-417	Pharmacology III	2
PHYA-424	Clinical Medicine III	5
PHYA-440	Society and Behavioral Medicine	3
PHYA-510	Hospital Practice	4
Open Elective		3
	Hours	**18**
Spring		
PHYA-421	Diagnostic Imaging	2
PHYA-520	Clinical Integration	4
PHYA-530	Clinical Research Methods (WI-PR)	2
PHYA-550	Procedural Clinical Skills	3
PHYA-560	Healthcare Policy & Law	2
Open Elective		3
	Hours	**16**
Summer		
PHYA-710	Graduate Project I (WI-PR)	2
PHYA-750	Pediatrics	4
PHYA-751	Internal Medicine	4
PHYA-752	Women's Health	4
PHYA-761	Professional Practice I	2
	Hours	**16**
Fifth Year		
Fall		
PHYA-720	Graduate Project II [1]	2
PHYA-753	Emergency Medicine	4
PHYA-754	Surgery	4
PHYA-755	Orthopedics	4
PHYA-762	Professional Practice II	2
	Hours	**16**
Spring		
PHYA-757	Behavioral Health	4
PHYA-758	Family Medicine	4
PHYA-759	Elective Rotation	4
PHYA-759	Elective Rotation	4
PHYA-763	Professional Practice III	2
	Hours	**18**
	Total Hours	**181**

Notes:

- All students pursuing a bachelor's degree are also required to complete two different Wellness courses

[1] PHYA-720 Graduate Project II is required to complete graduate degree.

Admission Requirements

The physician assistant program is a highly competitive. The number of openings for all students is limited by accreditation standards.

In addition to the university's general admission procedures, the physician assistant major requires the completion of a supplemental data packet, application, and a personal admission interview (by invitation). The program requires a personal interview prior to admission. Interviews are by invitation only. Not all applicants are extended an invitation and not all applicants who are invited to interview are accepted into the program. The interview performance is viewed as one of the most important aspects of your application to the program. Careful attention is given to ranking and interviewing first-year and transfer applicants in comparison to their peers. In addition, the program strongly encourages applicants to have participated in some degree of patient care experience and/or shadowing of physician assistants.

There are approximately 30-36 students enrolled in each class year of the program. Therefore, the number of openings for all students is limited and competitive. All prospective applicants must have a minimum cumulative

GPA of 3.0 (on a 4.0 scale) to qualify for admission and must maintain a minimum GPA of 3.0 once enrolled in the program.

It also is important to note that the minimum grade point average for acceptance into the physician assistant major is 3.0 (on the basis of a 4.0 maximum) for both high school and transfer students. In order to graduate from the major, a GPA of 3.0 or better must be maintained.

Health Care Experience

While health care experience is not an absolute requirement for admission, the program faculty highly suggest that candidates volunteer in hospitals, nursing homes, hospice and/or health care facilities, as applicable. In addition, shadowing health care professionals (PAs, MDs) in clinical arenas is highly suggested as a means of observing the role of PAs and other members of the health care team in providing care to patients.

Transfer Admission

Qualified transfer students are accepted into the major, on a space available basis. Prior health care experience and/or shadowing are strongly recommended. Transcript evaluations and rendering of transfer credit are addressed at the time of admission only. Anatomy and physiology courses must be taken within the last five years prior to matriculation to be eligible for transfer. All pre-professional course work must be completed to continue on, or to be considered for entry, into the professional phase of the major. Please contact the Office of Undergraduate Admissions for information on transfer requirements (https://www.rit.edu/admissions/transfer/apply/#degree-specific-requirements).

Advanced Placement

In the pre-professional phase, advanced placement (AP) credit for general education courses is evaluated and approved by the academic advisors. AP credit for calculus, statistics, and university electives is awarded, as applicable, within the major. AP credit is not accepted for biology and chemistry as course substitutions. Advanced placement or credit for experiential learning is not awarded for courses in the professional phase of the major.

Physician Assistant Student Employment and Co-Curricular Activities

Many PA students work during the first two years of the program. Most of these students find that balancing academics, co-curricular activities, and working 8-10 hours/week is possible. Nonetheless, attention must always remain focused on the academic expectations of the PA program, which require students to maintain a minimum term and cumulative GPA of 3.0 (BS/MS degree) throughout the program. Given the rigorous program of study, students in the professional phase of the program are strongly advised meet with their academic advisor to discuss their participation in outside employment and co-curricular activities. Students in the professional phase, including clinical rotations, must ensure that employment and/or co-curricular activities do not interfere with academic preparation, performance, clinical responsibilities, and scheduling as per clinical affiliates and program requirements. Outside commitments that are not managed effectively can dramatically affect successful progression within the program and on clinical rotations. Given the rapidly changing environment in day-to-day clinical activities and responsibilities, patient cases and/or clinical responsibilities must be given paramount priority.

Service Work

PA students participating in clinical service work are responsible for ensuring that those with whom they come into contact understand their role as PA students. At no time should PA students, participating in clinical service work, represent themselves, take the responsibility of, or the place, of qualified staff. The exception is when the student is under the guidance and direction of their instructor/preceptor for that given rotation block in which students' status must be disclosed. PA students are never to serve as substitutions for regular staff and/or health professionals.

Summary of Costs

- RIT tuition (https://www.rit.edu/sfs/tuition-and-fees/) and student fees
  - Refund policy (https://www.rit.edu/fa/sfs/refund/) for RIT tuition and student fees
- Additional physician assistant program costs and fees (https://academiccatalog.rit.edu/web/sites/default/files/inline-files/2024-2025%20Summary%20of%20Costs%20Form_0.pdf)

Financial Aid and Scholarships

100% of all incoming first-year and transfer students receive aid.

RIT's personalized and comprehensive financial aid program includes scholarships, grants, loans, and campus employment programs. When all these are put to work, your actual cost may be much lower than the published estimated cost of attendance.

Financial Aid Changes During the Program

Financial aid will change over the course of the Physician Assistant BS/MS program. When you are enrolled as an undergraduate student, you will be billed undergraduate tuition and fee rates, and receive undergraduate financial aid. Once you advance to graduate status, your tuition, fees, and financial aid switch to graduate tuition and aid and your undergraduate financial aid will no longer apply.
Learn more about this change (https://www.rit.edu/admissions/aid/policies/physician-assistant-bsms/)

College of Health Sciences and Technology Faculty

Dean's Office

Yong "Tai" Wang, BS, MS, Wuhan Sports University; MA, Ball State University at Muncie; Ph.D., University of Illinois at Urbana- Champaign, FACSM—Professor; Dean

Department of Clinical Health Professions

Hamad Ghazle, BS, Rochester Institute of Technology; MS, Ed.D., University of Rochester, RDMS, RVT, APS—Professor; Head, Department of Clinical Health Professions

Celeste Sangiorgio, BA, Hunter College CUNY; MA, Ph.D., St. John's University; LCP—Research Assistant Professor; Interim Program Director, Rochester Psychology Internship Consortium

Department of Medical Sciences, Health, and Management

Todd Camenisch, BS, University of Arizona; Ph.D., University of North Carolina at Chapel Hill—Professor; Head, Department of Medical Sciences, Health, and Management; Program Director, Biomedical Sciences

Craig Foster, BFA, University of Michigan; MS, Medical College of Georgia —Assistant Professor, Medical Illustration

Mark Herzog, BA, St. Lawrence University; MHSA, University of Michigan —Professor of Practice, Health Systems Management

James Perkins, BA, Cornell University; MFA, Rochester Institute of Technology; ABD, University of Rochester, CMI, FAMI—Distinguished Professor; Graduate Program Director, Medical Illustration

Patricia Poteat, BA, University of Rochester; MS, Rochester Institute of Technology; Ph.D., University of Rochester—Senior Lecturer; Interim Program Director, Health Systems Management

Wegmans School of Health and Nutrition

Elizabeth H. Ruder, BS, Cornell University; RDN, Cleveland Clinic Foundation; Ph.D., Pennsylvania State University; MPH, Johns Hopkins Bloomberg School of Public Health—Associate Professor; Head, Wegmans School of Health and Nutrition

Brenda Ariba Zarhari Abu, BSc, University for Development Studies (Ghana); MPhil, University of Ghana (Ghana); Ph.D., University of the Free State (South Africa); RDN, Iowa State University—Associate Professor, Dietetics and Nutrition

Christopher J. Alterio, BS, State Universoty of New York at Buffalo; OTD, Nova Southeastern University; OTR/L—Professor of Practice; Director, Occupational Therapy Doctoral Program

William S. Brewer, BS, State University College at Cortland; MS, Empire State College—Senior Lecturer; Program Director, Exercise Science

Connie Chau, BS, MS, McGill University (Canada); Ph.D., University of Montreal (Canada)—Associate Professor; Director, Doctor of Physical Therapy Program

Renee Gosselin, BS, MS, RDN, D'Youville University; MS, Capella University; MBA, Purdue University—Lecturer, Dietetics and Nutrition

Barbara A. Lohse, BS, University of Wisconsin-Eau Claire; MS, RDN, University of Wisconsin-Stout; Ph.D., University of Wisconsin-Madison—Professor; Program Director, Health and Well-Being Management

Kristie O'Connor, BS, State University College at Fredonia; BS, Rochester Institute of Technology; RDN, Cleveland Clinic Foundation; MLA, Harvard University—Lecturer; Program Director, Dietetics and Nutrition

Jason Rich, BA, Binghamton University; MA, Concordia University Irvine; Ed.D., University of Western States, CMPC, CSCS, CPSS—Lecturer, Exercise Science

Marcia N. Shea, BS, University of Southern Indiana; OTD, University of Toledo; OTR/L—Lecturer; Academic Fieldwork Coordinator, Occupational Therapy Doctoral Program

Nicole Trabold, BA, University at Buffalo; MS, University of Michigan; Ph.D., University at Buffalo—Professor of Practice

Stephen Van Lew, BS, Keuka College; MS, Ph.D., Seton Hall University; OTR/L—Assistant Professor; Capstone Coordinator, Occupational Therapy Doctoral Program

Emeritus Faculty

Barbara Cerio-Iocco, Associate Professor Emeritus
Richard Doolittle, Professor Emeritus
Elizabeth Kmiecinski, Associate Professor Emeritus
Douglas Merrill, Professor Emeritus
Daniel Ornt, Profesor Emeritus
Lawrence Sugarman, Professor Emeritus
Nancy Valentage, Professor Emeritus
Kristen Waterstram-Rich, Professor Emeritus

COLLEGE OF LIBERAL ARTS

Overview

The College of Liberal Arts offers master of science degrees in a range of disciplines. Elective graduate courses complement the professional emphasis of our degree programs by exploring the broader knowledge and social implications embodied in these areas of study. By providing this humanistic perspective, these courses play an integral role in professional education, making a direct and distinct contribution to the student's preparation for a specialized career. The college also provides a number of graduate courses that serve as electives for graduate degree programs offered by other RIT colleges.

Please visit the college's website–**www.rit.edu/liberalarts (https://www.rit.edu/liberalarts/)**–for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarships

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Doctoral Degrees

Master's Degrees

Advanced Certificates

Cognitive Science Ph.D.

Plan Code: COGS-PHD | **HEGIS:** 2002.00

Program Overview

RIT's cognitive science Ph.D. provides an interdisciplinary study of the human mind that combines insights from psychology, computer science, linguistics, neuroscience, augmented reality, and philosophy. Students conduct research on human perception, cognition, action, and language with a focus on the representation and processing of information within biological and computational frameworks. This Ph.D. prepares students for careers in academia or industry and develops abilities to analyze data, grasp complex concepts, and interpret and communicate concepts for a wider audience. The degree is jointly adminstered by faculty experts from six RIT colleges, allowing students to develop valuable, career-enhancing interdisciplinary skills and communication competency as part of the program experience.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
COGS-600	Foundations in Research	3
COGS-610	Laboratory Methods	3
COGS-780	Cognitive Science Research	3
COGS-801	Cognitive Science Research Colloquium	0
PSYC-640	Graduate Statistics	3
	Hours	**12**
Spring		
COGS-711	Philosophical Foundations in Cognitive Science	3
COGS-780	Cognitive Science Research	3
COGS-800	Cognitive Science Qualifying Examination	0
COGS-801	Cognitive Science Research Colloquium	0
PSYC-712	Graduate Cognition [1]	3
Elective		3
	Hours	**12**
Second Year		
Fall		
COGS-621	Foundations of Scientific Computing	3
COGS-801	Cognitive Science Research Colloquium	0
COGS-880	Cognitive Science Dissertation Research	3
Elective		3
Elective		3
	Hours	**12**
Spring		
COGS-720	Teaching Practicum	3
COGS-801	Cognitive Science Research Colloquium	0
COGS-880	Cognitive Science Dissertation Research	3
PSYC-717	Advanced Graduate Statistics [1]	3
Elective		3
	Hours	**12**
Third Year		
Fall		
COGS-801	Cognitive Science Research Colloquium	0
COGS-880	Cognitive Science Dissertation Research	6
	Hours	**6**
Spring		
COGS-801	Cognitive Science Research Colloquium	0
COGS-880	Cognitive Science Dissertation Research	6
COGS-887	Cognitive Science Dissertation Proposal	0
	Hours	**6**
Fourth Year		
Fall		
COGS-801	Cognitive Science Research Colloquium	0
COGS-888	Continuation of Dissertation	0
	Hours	**0**
Spring		
COGS-801	Cognitive Science Research Colloquium	0
COGS-888	Continuation of Dissertation	0
	Hours	**0**
	Total Hours	**60**

[1] Students may need to take PSYC-717 Advanced Graduate Statistics in Spring 1 and PSYC-712 Graduate Cognition in Spring 2 depending on course availability.

Program Electives

Code	Title	Hours
CGNS-601	Cognitive Neuroscience	3
CGNS-710	Design Thinking and Cognition	3
CLRS-820	Modeling Visual Perception	3
CMPE-677	Machine Intelligence	3
CMPE-765	Brain Inspired Computing	3
COGS-760	Foundations of Cognitive Modeling	3
COGS-761	Graduate Psycholinguistics	3
COGS-762	Animal Cognition	3
COGS-765	Psycholinguistics of Signed Languages	3
COGS-766	Neuroplasticity in Deaf and Blind Individuals	3
COGS-768	Deaf Vision	3
CSCI-630	Foundations of Artificial Intelligence	3
CSCI-631	Foundations of Computer Vision	3
CSCI-633	Biologically Inspired Intelligent Systems	3
CSCI-635	Introduction to Machine Learning	3
CSCI-736	Neural Networks and Machine Learning	3
IMGS-620	The Human Visual System	2
IMGS-624	Interactive Virtual Env	3
IMGS-684	Deep Learning for Vision	3
PHIL-604	Philosophy of Mind	3
PHIL-790	Philosophy of Action	3
PSYC-681	Natural Language Processing and Large Language Models I	3
PSYC-682	Natural Language Processing and Large Language Models II	3
PSYC-684	Graduate Speech Processing	3
PSYC-711	Graduate Biopsychology	3
PSYC-714	Graduate Engineering Psychology	3
PSYC-715	Graduate Perception	3
STAT-670	Design of Experiments	3

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall

Full-time Application Deadline: January 15 priority deadline; rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Cognitive Science program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. Since the program encompasses a wide variety of disciplines, students with diverse backgrounds are encouraged to apply. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#cognitive-science-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit one writing sample (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials). This may be an example of your research, publications, project, or other scholarly written work.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Communication MS

Plan Code: COMMTCH-MS | **HEGIS:** 0601.00

Program Overview

RIT's communication MS degree combines the latest research technology with essential communication expertise. Communication in all its forms is at the center of our personal lives and professional careers, so whether it's interpersonal or mediated communication, professional communicators need to know how to develop creative and impactful messaging to successfully engage their audiences. This program will prepare you to leverage the latest in tech in the dynamic and ever-changing field of communication. The curriculum is grounded in today's social sciences and humanities concepts and applications. With communication courses spanning artificial intelligence, digital storytelling, digital advertising, social media analytics, and strategic communication, this master's degree prepares you to excel in the ever-changing fields of communication, public relations, marketing, and branding. You'll learn how to leverage technology to reach and engage audiences, craft compelling messages that stand out, analyze media content, and understand how analytics and big data drive smart decision-making. You'll become an effective content, brand, or marketing manager, a social media strategist, or a public relations/communication officer. If pursuing a doctoral degree is a future career aspiration, RIT's communications MS will help you grow into an accomplished researcher as you develop an in-depth understanding of the communication field.

Cooperative education is strongly encouraged for graduate students in the communication master's degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
COMM-702	Communication Theories	3
COMM-714	Strategic Communication	3
Professional Core [1]		3
Select one of the following Communication Electives:		3
COMM-605	Social Media Analytics and Research	
COMM-709	Digital Advertising	
COMM-710	Visual Communication	
COMM-716	Communication and Identity	
COMM-717	Artificial Intelligence and Communication	
	Hours	**12**
Spring		
COMM-703	Research Methods in Communication	3
COMM-720	Thesis Preparation Seminar	0
Professional Core [1]		3
Professional Core [1]		3
Select one of the following Communication Electives:		3
COMM-605	Social Media Analytics and Research	
COMM-709	Digital Advertising	
COMM-710	Visual Communication	
COMM-716	Communication and Identity	
COMM-717	Artificial Intelligence and Communication	
	Hours	**12**
Summer		
Select one of the following:		6
COMM-800	Communication Thesis/Project	

COMM-800	Communication Thesis/Project (plus 1 elective (can be Professional Core or Communication Elective)	
COMM-801	Comprehensive Exam (plus two electives (can be Professional Core or Communication Elective, or a combination of both))	
	Hours	**6**
	Total Hours	**30**

[1] Professional Core courses are chosen by students based on their professional interests. In consultation with their academic advisor, students will choose from graduate courses offered across the university to round out their coursework.

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Fall - February 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: No

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Communication program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Writing samples (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) are optional.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88

IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Criminal Justice MS

Plan Code: CRIM-MS | **HEGIS:** 2209.00

Program Overview

RIT's MS in criminal justice is a dynamic degree where you'll develop problem-solving and critical thinking skills as well as engage in applied research that contributes to the creation and dissemination of criminal justice knowledge and policy analysis. This program fosters the formation of new knowledge through active research in agencies and the community. You will learn and apply problem-solving skills rooted in the areas of your individual interests with an emphasis on applied research. The criminal justice curriculum also emphasizes a multidisciplinary approach to urban studies with a focus on public safety. The program stresses training in policy analysis and practice, particularly as it is relevant to the community and urban issues. It builds on a foundation of locally relevant policy research by providing you with the critical skills necessary to carry out such work. This master's program provides you with a strong foundation in criminological, criminal justice theory, and social science research skills.

Cooperative education is strongly encouraged for graduate students in the criminal justice master's degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CRIM-700	Pro-Seminar in Criminal Justice Theory	3
CRIM-701	Statistics	3
CRIM-702	Pro-Seminar in Research Methods	3
Elective		3
	Hours	**12**
Spring		
CRIM-703	Advanced Criminology	3
CRIM-704	Crime, Justice and Community	3
CRIM-705	Interventions and Change in Criminal Justice	3
Elective		3
	Hours	**12**
Second Year		
Fall		
Select one of the following:		6
CRIM-775	Criminal Justice Capstone (plus 1 Elective)	
CRIM-800	Thesis in Criminal Justice	
	Hours	**6**
	Total Hours	**30**

Criminal Justice Graduate Electives

Code	Title	Hours
CRIM-650	AI, Policy and Law	3
CRIM-660	Project Based Learning in Criminal Justice	3
CRIM-706	Current Issues In CJ	3
CRIM-711	Directed Readings in Criminal Justice	3
CRIM-712	Crime And Media	3

Non-Criminal Justice Electives

Any of these courses can substitute for graduate program electives

Code	Title	Hours
COMM-605	Social Media Analytics and Research	3
COMM-717	Artificial Intelligence and Communication	3
IGME-770	Spatial Data Science	3
IGME-771	Introduction To Geographic Information Systems	3
IGME-772	Geographic Visualization	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGIS-725	Data Management and Analytics	3
PSYC-716	Graduate Social Psychology	3
PSYC-717	Advanced Graduate Statistics	3
PUBL-609	Public Management and Governance	3
PUBL-610	Technological Innovation and Public Policy	3
PUBL-700	Readings in Public Policy	3
PUBL-701	Graduate Policy Analysis	3
PUBL-702	Graduate Decision Analysis	3
STSO-750	Graduate Sustainable Communities	3

Criminal Justice Graduate Elective Tracks

Students may choose to complete a 9 credit hour elective concentration in one of the following tracks:

Spatial Data Analytics

Code	Title	Hours
IGME-770	Spatial Data Science	3
IGME-771	Introduction To Geographic Information Systems	3
IGME-772	Geographic Visualization	3
Total Hours		**9**

Emerging Technology, Security, and Policy

Code	Title	Hours
COMM-717	Artificial Intelligence and Communication	3
CRIM-650	AI, Policy and Law	3
PUBL-610	Technological Innovation and Public Policy	3
Total Hours		**9**

Public Policy

Code	Title	Hours
Select three of the following:		9
PUBL-609	Public Management and Governance	
PUBL-689	Public Policy Graduate Topics	
PUBL-700	Readings in Public Policy	
PUBL-701	Graduate Policy Analysis	
PUBL-702	Graduate Decision Analysis	
Total Hours		**9**

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part#time
Part-time Admit Term(s): Fall or Spring

Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Criminal Justice program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit one writing sample (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials). This may be an example of your research, publications, project, or other scholarly written work.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Engineering Psychology Advanced Certificate

Plan Code: ENGPSY-ACT | **HEGIS:** 2099.00

Program Overview

RIT's advanced certificate in engineering psychology provides you with formal recognition of your knowledge in engineering psychology and establishes a credential for seeking a career in the human factors or ergonomics fields. The advanced certificate is a selection of up to five graduate-level courses in a particular area of study. It can serve as a stand-alone credential that provides expertise in a specific topic that enhances your professional knowledge base, or it can serve as the entry point to a master's degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
PSYC-714	Graduate Engineering Psychology	3
PSYC Elective or Open Elective [1]		3
	Hours	**6**
Spring		
PSYC-712	Graduate Cognition	3
PSYC-715	Graduate Perception	3
PSYC Elective or Open Elective [1]		3
	Hours	**9**
	Total Hours	**15**

1 PSYC Electives include any graduate level course except PSYC-640 Graduate Statistics or PSYC-642 Graduate Research Methods

Admission Requirements

This program is available on-campus only.

Offered Part#time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Engineering Psychology program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.

- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Letters of recommendation are optional.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Experimental Psychology MS

Plan Code: EXPSYC-MS | **HEGIS:** 2099.00

Program Overview

The experimental psychology MS degree allows you to contribute meaningful work to multiple fields of psychology while you explore and apply scientific methods to human development, social interactions, and behavioral relationships. Tailored to your career aspirations, this degree includes core courses, elective courses, and a thesis. It offers two tracks to choose from: experimental psychology and engineering psychology. The experimental psychology track embraces the application of the scientific method to the study of behavior in a variety of fields including addiction, attention, cognition, development, evolutionary psychology, forensic psychology, perception, psychopathology, and social psychology, among others. The engineering psychology track examines human capabilities to sense, perceive, store, and process information and reveals how these human factors impact interactions with technology. Courses emphasize the role of human behavior and performance in both simple and complex human-machine systems. You will be trained in both research methods of experimental psychology and the application of the results to contemporary problems in industry. For both tracks you will choose either a capstone project or a thesis. Students who select the capstone project will embark on a range of projects to demonstrate their ability to apply acquired knowledge in various assignments. For the thesis, students select a thesis advisor in the first year, followed in the second year by a thesis topic and a subsequent research proposal.

The experimental psychology master's degree includes an optional cooperative education component. Co-op is generally completed in the summer after the first year of the program. The co-op experience provides experiential learning that integrates with classroom education and allows students to apply psychological principles to problems in a variety of work environments. Co-op may be completed in any business or industrial setting.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
PSYC-640	Graduate Statistics	3
PSYC-751	Graduate Research Seminar	0
Institute Elective		3
Select one of the following:		3
PSYC-714	Graduate Engineering Psychology (Engineering Psychology Track)	
PSYC Elective (Experimental Track and Non-Thesis Option)		
	Hours	**9**
Spring		
PSYC Elective		3
Institute Elective		3
Select one of the following:		3
PSYC-641	Applied Psychology Methods	
PSYC-642	Graduate Research Methods	
Select one of the following:		3
PSYC-752	Thesis Proposal (Thesis Option)	
Specialized PSYC Elective (Non-Thesis Option)		
	Hours	**12**

Second Year		
Fall		
PSYC Elective		3
PSYC or Institute Elective		3
Select one of the following:		3
PSYC-753	Thesis (Thesis Option)	
PSYC-754	Graduate Psychology Capstone (Non-Thesis Option)	
	Hours	**9**
	Total Hours	**30**

PSYC Electives

Code	Title	Hours
PSYC-681	Natural Language Processing and Large Language Models I	3
PSYC-682	Natural Language Processing and Large Language Models II	3
PSYC-684	Graduate Speech Processing	3
PSYC-711	Graduate Biopsychology	3
PSYC-712	Graduate Cognition	3
PSYC-713	Graduate Developmental Psychology	3
PSYC-715	Graduate Perception	3
PSYC-716	Graduate Social Psychology	3
PSYC-717	Advanced Graduate Statistics	3
PSYC-718	Clinical and Experimental Neuropsychology	3
PSYC-719	Human Factors in Artificial Intelligence	1-4
PSYC-757	Graduate Special Topics in Psychology	3
PSYC-798	Advanced Research in Psychology	3

Institute Electives

Code	Title	Hours
BIOL-673	Marine Biology	4
BIOL-675	Advanced Conservation Biology	3
COGS-600	Foundations in Research	3
COGS-610	Laboratory Methods	3
COGS-621	Foundations of Scientific Computing	3
COGS-711	Philosophical Foundations in Cognitive Science	3
COGS-760	Foundations of Cognitive Modeling	3
COGS-761	Graduate Psycholinguistics	3
COGS-762	Animal Cognition	3
HCIN-600	Research Methods	3
HCIN-610	Foundations of Human-Computer Interaction	3
HCIN-620	Information and Interaction Design	3
HCIN-630	Usability Testing	3
HCIN-661	Interactive Courseware	3
HCIN-700	Current Topics in HCI	3
HCIN-705	Topics in HCI for Biomedical Informatics	3
HCIN-715	Agent-Based and Cognitive Modeling	3
HCIN-720	Prototyping Wearable and Internet of Things Devices	3
HCIN-722	Human-Computer Interaction with Mobile, Wearable, and Ubiquitous Devices	3
HCIN-730	User-Centered Design Methods	3
HCIN-735	Collaboration, Technology, and the Human Experience	3
HRDE-711	Program Evaluation and Design	3
ISEE-730	Data-Driven Human Biomechanics	3
ISEE-731	Advanced Topics in Human Factors and Ergonomics	3
ISEE-732	Systems Safety Engineering	3
MATH-655	Biostatistics	3
MKTG-761	Marketing Concepts and Commercialization	3
MSSE-704	Teaching Deaf and Hard of Hearing Learners with Special Educational Needs	3
PSYC-631	Cognitive Assessment	3
PSYC-632	Social-Emotional Assessment	3
PSYC-650	Applied Behavior Analysis	3
PSYC-720	Advanced Consultation	3
PSYC-721	Academic Intervention	3
PSYC-723	Systems and Organizational Interventions	3
STAT-611	Statistical Software - R	3
STAT-641	Applied Linear Models - Regression	3
STAT-642	Applied Linear Models - ANOVA	3
STAT-756	Multivariate Analysis	3
STAT-775	Design and Analysis of Clinical Trials	3
STSO-621	Graduate Biodiversity and Society	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Fall - February 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Experimental Psychology program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.

- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants should have completed at least 15 semester hours of coursework in undergraduate psychology or a related field (e.g., engineering, computer science, information technology), including one course in experimental psychology and one course in statistics.

Science, Technology, and Public Policy MS

Plan Code: STPP-MS | **HEGIS:** 2102.00

Program Overview

With a science, technology, and public policy MS from RIT, you will learn how to make a significant impact on public policy that affects transportation, science, emerging technologies, scientific developments, and the environment. This master's degree enables you to work at the intersection of engineering, science, and technology while contributing to important policy issues in the private, public, and not-for-profit sectors. Understanding how to create effective public policy takes both an awareness of the science and technology behind a topic as well as a grounding in the system of laws, regulatory measures, and courses of action that affect it. With a focus on policy areas that have a strong science or technology element (energy, health systems, technology innovation, environment, and cybersecurity), our degree builds on RIT's strengths as a technological university. Core courses emphasize analysis, problem-solving, and interdisciplinary approaches, which are required in this program. Elective courses are selected with an advisor and allow you to focus your studies on a personal interest or career area, such as environmental policy, climate change policy, health care policy, STEM education policy, telecommunications policy, biotechnology policy, environmental policy, communications policy, or energy policy. Electives are offered in various colleges throughout the university, including the colleges of Engineering, Business, Engineering Technology, and Science. In the thesis and capstone options, you will work with a faculty advisor on an independent research project in your area of interest.

Co-ops and internships are optional but strongly encouraged for graduate students in the MS in science, technology, and public policy.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
PUBL-700	Readings in Public Policy	3
PUBL-701	Graduate Policy Analysis	3
PUBL-703	Evaluation and Research Design	3
Graduate Elective [1]		3
	Hours	**12**
Spring		
PUBL-702	Graduate Decision Analysis	3
Graduate Elective [1]		3
Graduate Elective [1]		3
Select one of the following:		3
PUBL-610	Technological Innovation and Public Policy	
STSO-710	Graduate Science and Technology Policy Seminar	
	Hours	**12**
Second Year		
Fall		
Select one of the following:		6
PUBL-785	Capstone Experience	
PUBL-790	Public Policy Thesis	

PUBL-798	Comprehensive Exam (plus 2 Graduate Electives) [1]	
	Hours	**6**
	Total Hours	**30**

[1] Graduate Electives are chosen by students based on their professional interests. In consultation with their academic advisor, students will choose from graduate courses offered across the university to round out their coursework.

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Science, Technology, and Public Policy program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

College of Liberal Arts Faculty

Dean's Office

Kelly Norris Martin, BA, John Carroll University; MS, Ph.D., North Carolina State University—Dean; Professor

Kirsten Condry, BA, Swarthmore College; Ph.D., University of Minnesota—Associate Dean; Associate Professor

Lauren Hall, BA, State University of New York at Binghamton; MA, Ph.D., Northern Illinois University—Associate Dean; Professor

School of Communication

Arianna Alsop, BA, State University College at Fredonia; MA, State University College at Brockport—Lecturer

Keri Barone, BA, MA, State University College at Brockport—Undergraduate Program Director, Communication; Principal Lecturer

Claudia Bucciferro, BA, MA, University of Concepcion (Chile); Ph.D.,University of Colorado at Boulder—Associate Professor

Kari Cameron, BS, M.Ed., Nazareth College of Rochester; MS, Rochester Institute of Technology—Undergraduate Program Director, Advertising and Public Relations; Principal Lecturer

Grant C. Cos, BA, University of Massachusetts at Amherst; MA, Emerson College; Ph.D., Kent State University—Professor

Rebecca DeRoo, BA, Bryn Mawr College; MA, Ph.D., University of Chicago—Director, Visual Culture Program; Professor

Thomas Dooley, BA, State University College at Geneseo, MA, University of Bolton (United Kingdom)—Undergraduate Option Director, Journalism; Senior Lecturer

Keith B. Jenkins, BA, University of Arkansas; MA, Ph.D., Florida State University—Vice President and Associate Provost for Access, Engagement, and Success; Professor

Hinda Mandell, BA, Brandeis University; MA, Harvard University; Ph.D., Syracuse University—Professor

Julie Napieralski, BS, Kent State University; MS, Syracuse University—Principal Lecturer

Eugene Jang, BA, MA, Seoul National University (South Korea); Ph.D., University of Southern California—Assistant Professor

Eun Sook Kwan, BA, Hannam University (Korea); MA, University of Texas at Austin; Ph.D., University of Georgia—Associate Professor

David R. Neumann, BA, Ithaca College; MA, Ph.D., Bowling Green State University—Professor

Kelly Norris Martin, BA, John Carroll University; MS, Ph.D., North Carolina State University—Dean; Professor

Katrina Overby, BA, Rust College; MS, Oklahoma State University; Ph.D., Indiana University, Bloomington—Assistant Professor

Elizabeth Reeves O'Connor, BS, MS, Rochester Institute of Technology—Principal Lecturer

Tracy R. Worrell, BA, Otterbein College; MA, University of Cincinnati; Ph.D., Michigan State University—Professor

Criminal Justice

Irshad Altheimer, BA, Alabama State University; MA, Ph.D., Washington State University—Ellen M. Granberg Endowed Professor

Charlie Lofaso, BA, Indiana University, MS, Northeastern University, JD, State University of New York at Buffalo; MS, Michigan State University; MA, Ph.D., The Ohio State University—Lecturer

John McCluskey, BA, MA, Ph.D., State University of New York at Albany—Professor

LaVerne McQuiller Williams, BS, Rochester Institute of Technology; MS, State University of New York College at Buffalo; JD, Albany Law School; Ph.D., University at Buffalo—Associate Provost for Faculty Affairs; Professor

Judy Porter, BA, University of Northern Colorado; MA, New Mexico State University; Ph.D., University of Nebraska at Omaha—Undergraduate Director; Professor

Divya Ramjee, BA, The Ohio State University; MS, Johns Hopkins University; Ph.D., American University—Assistant Professor

O. Nicholas Robertson, BA, State University College at Geneseo; MA, State University College at Brockport; Ph.D., State University of New York at Buffalo—Associate Professor

Tony Smith, BA, MA, Ph.D., State University of New York at Albany—Graduate Program Director; Associate Professor

Joe Williams, BS, Rochester Institute of Technology; MA, State University College at Brockport—Field Experience Coordinator; Principal Lecturer

Modern Languages and Cultures

Zhong Chen, BA, Nanjing Normal University (China); MA, Ph.D., Cornell University—Associate Professor

Philosophy

Jesús Aguilar, BA, Hampshire College and Universidad Veracruzana (Mexico); MA, Universidad Nacional Autónoma de México (Mexico); Ph.D., McGill University (Canada)—Professor

Mark Ornelas, BA, Gonzaga University; MS, University of Edinburgh (Scotland); MA, Ph.D., University of Cincinnati—Assistant Professor

Katie Terezakis, BA, Central Connecticut State University and Heidelberg University (Germany); MA, Ph.D., New School for Social Research—Professor

Psychology

Joseph Baschnagel, BA, MA, Ph.D., State University of New York at Buffalo—Department Chair; Professor

Christian Bean, BS, College of William and Mary; MA, Ph.D., Kent State University—Assistant Professor

A. Eleanor Chand-Matzke, BA, State University College at Geneseo; MA, The New School for Social Research; Ph.D., University of Massachusetts—Senior Lecturer

Kirsten Condry, BA, Swarthmore College; Ph.D., University of Minnesota—Associate Dean; Associate Professor

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Science, Technology and Society

Christine Keiner, BA, Western Maryland College; Ph.D., Johns Hopkins University—Department Chair; Professor

Deborah Blizzard, BA, Smith College; MS, Ph.D., Rensselaer Polytechnic Institute—Professor

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Kristoffer J. Whitney, BS, Rochester Institute of Technology; Ph.D., University of Pennsylvania—Associate Professor

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Thomas O'Brien, Professor Emeritus
Egidio Papa, Assistant Professor Emeritus
Robert Paradowski, Professor Emeritus
Daniel Petrizzi, Professor Emeritus
James Philbin, Professor Emeritus
Mark Price, Professor Emeritus
Rudolph Pugliese, Professor Emeritus
Margery Reading-Brown, Associate Professor Emeritus
John Roche, Associate Professor Emeritus
Michael Rogers, Professor Emeritus
Sandra Saari, Professor Emeritus
Julian Salisnjak, Professor Emeritus
Jack Sanders, Professor Emeritus
Patrick Scanlon, Professor Emeritus
Edward Schell, Associate Professor Emeritus
Norris Shea, Professor Emeritus
Murli Sinha, Professor Emeritus
Marshall Smith, Professor Emeritus
Caroline Snyder, Professor Emeritus
David Suits, Professor Emeritus
Mary Sullivan, Dean Emeritus and Professor Emeritus
U.T. Summers, Associate Professor Emeritus
Elaine Thiesmeyer, Professor Emeritus
James Troisi, Associate Professor Emeritus
Robert Ulin, Professor Emeritus
Michael Vernarelli, Professor Emeritus
Helen Wadsworth, Assistant Professor Emeritus
Andrea Walters, Professor Emeritus
Charles Warren, Professor Emeritus
Houghton Wetherald, Professor Emeritus
Wilma V. Wierenga, Associate Professor Emeritus
Fred Wilson, Professor Emeritus
Jamie Winebrake, Dean Emeritus and Professor Emeritus
Hiroko Yamashita Butler, Professor Emeritus
Hans Zandvoort, Professor Emeritus
Janet Zandy, Professor Emeritus

NATIONAL TECHNICAL INSTITUTE FOR THE DEAF

Overview

The National Technical Institute for the Deaf is one of the nine colleges of Rochester Institute of Technology, and is home to the world's first and largest technological college for deaf and hard-of- hearing students. RIT/NTID serves more than 1,100 deaf and hard- of-hearing students from across the United States and the world.

Please visit the college's website—**rit.edu/ntid (https://www.rit.edu/ntid/)**—for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Graduate Programs

Doctoral Degrees

- Cognitive Science Ph.D. (p. 150)

Master's Degrees

- Health Care Interpretation MS (p. 163)
- Secondary Education of Students who are Deaf or Hard of Hearing MS (p. 164)

Health Care Interpretation MS

Plan Code: HLTHINT-MS | **HEGIS:** 1199.00

This program is available exclusively online.

Program Overview

The MS in health care interpretation is specifically designed for nationally certified ASL-English interpreters interested in advancing their education through specialized training in health care interpreting. The National Technical Institute for the Deaf's department of American Sign Language and Interpreting Education administers the program, with some course work from RIT's College of Health Sciences and Technology. The program begins with the Professional Seminar course created to establish the theoretical parameters you are expected to follow in case analysis, establish a framework for conducting online discussions in safe and confidential ways, and create connections among classmates that build trust and rapport. This initial connection promotes your engagement in the reflection-based components of the program. The curriculum employs an online pedagogical approach, including accelerated courses as its primary delivery system. Each course will require an estimated 9-12 hours per week for class assignments, and course materials will be delivered asynchronously. In the final semester, you will complete a capstone course consisting of a research paper or a project. The program is offered exclusively online, and it is currently offered part-time for two academic years (including two summers).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

Full Time

First Year		
Summer		**Hours**
HCIA-610	Interpreting Research Setting	3
HCIA-705	Professional Seminar	3
HCIA-719	Theories of Translation and Interpretation	3
	Hours	**9**
Fall		
HCIA-720	Health Care Practical Interpreting I [1]	3
HCIA-740	Health Care Practical Interpreting II [2]	3
HLTH Graduate Elective		3
	Hours	**9**
Spring		
HCIA-715	Human Body Systems/Diseases I [1]	3
HCIA-730	Human Body Systems/Diseases II [2]	3
HCIA-760	Research Methods in Interpreting	3
	Hours	**9**
Second Year		
Summer		
HCIA-750	Health Care Interpreting Within a Diverse Deaf Community	3
HCIA-770	Capstone Prof Proj/Rsrch Paper	3
	Hours	**6**
	Total Hours	**33**

Part Time

First Year		
Summer		**Hours**
HCIA-705	Professional Seminar	3
HCIA-719	Theories of Translation and Interpretation	3
	Hours	**6**
Fall		
HCIA-720	Health Care Practical Interpreting I [1]	3
HCIA-740	Health Care Practical Interpreting II [2]	3
	Hours	**6**
Spring		
HCIA-715	Human Body Systems/Diseases I [1]	3
HCIA-730	Human Body Systems/Diseases II [2]	3
	Hours	**6**
Second Year		
Summer		
HCIA-610	Interpreting Research Setting	3
HCIA-750	Health Care Interpreting Within a Diverse Deaf Community	3
	Hours	**6**
Fall		
HCIA-760	Research Methods in Interpreting	3
HLTH Graduate Elective		3
	Hours	**6**
Spring		
HCIA-770	Capstone Prof Proj/Rsrch Paper	3
	Hours	**3**
	Total Hours	**33**

1. HCIA-720 Health Care Practical Interpreting I and HCIA-715 Human Body Systems/Diseases I are taken in session 1 (first 7 weeks) of the semester.
2. HCIA-740 Health Care Practical Interpreting II and HCIA-730 Human Body Systems/Diseases II are taken in session 2 (last 7 weeks) of the semester.

Admission Requirements

This program is available on-campus or online. The following admissions details apply to the on-campus program.

Offered Part-time
Part-time Admit Term(s): Summer
Part-time Application Deadline: March 1
Part-time STEM Designated: No

Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Health Care Interpretation program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.

- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Letters of recommendation should come from interpreter colleagues, mentors, or Deaf community members who have had the opportunity to observe the applicant's interpreting work.
- Submit current national ASL/English certification, Board for Evaluation of Interpreters (BEI), or state licensure. Applicants must email a copy of their credentials to the NTID Office of Admissions at ntidadmissions@ntid.rit.edu.
- Submit an ASL interpretation sample (https://www.rit.edu/ntid/aslie/mshci-interpretation-sample/).
- Submit an audiogram (applies to Deaf and hard-of-hearing applicants).
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 0
IELTS: 0.0
PTE Academic: 0

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. Because RIT receives federal support, students in the Health Care Interpretation MS program pay less than RIT's regular tuition rate. View the Deaf and Hard-of-Hearing and Hearing NTID-Supported Students tuition section in cost of attendance (https://www.rit.edu/admissions/tuition-and-fees/)

A combination of sources can help fund your graduate degree. Learn how to fund your degree (https://www.rit.edu/admissions/financial-aid/graduate-funding-sources/)

Additional Information

Medical Terminology Course Requirement

Applicants accepted into the program must complete The Language of Medicine, a self-paced online course in medical terminology, before the beginning of the summer term. Acceptance materials will include instructions for accessing the course.

Secondary Education of Students who are Deaf or Hard of Hearing MS

Plan Code: SEDDEAF-MS | **HEGIS:** 0803.00

This program is available online.

Program Overview

The master of science degree in secondary education of students who are deaf or hard of hearing is designed for deaf, hard-of-hearing, and hearing students with a passion for teaching. As a teacher-candidate in the program, you will earn dual certification to teach a secondary school content area for students who are hearing impaired or deaf as well as in deaf education for grades K-12. You can also earn a dual NYS certification in deaf education and in a secondary content area such as math, science, social studies, or English. RIT and NTID have created a rich, inclusive communication environment that prepares you for the broad array of communication styles you will encounter in your future classroom. Faculty members are international leaders in research and are highly skilled in the education of deaf students. A carefully designed system of faculty advisement is a prominent feature of the program. On-campus facilities, state-of-the-art technology, and a well-established system of educational access services combine to make this a vital program for both deaf and hearing students who desire careers as professional educators of deaf students. This program is offered on-campus or online.

Accreditation

The master of science program in secondary education of students who are deaf or hard of hearing maintains Initial Program accreditation from the Council for the Accreditation of Educator Preparation (CAEP), www.caepnet.org (https://caepnet.org/). The program's most recent CAEP accreditation approval was spring 2021. Reporting outcomes and student achievement data are available for review on the National Technical Institute for the Deaf website (https://www.rit.edu/ntid/msse-accreditation/).

Educator Preparation Program: Master of Science in Secondary Education of Students who are Deaf or Hard of Hearing
Level: Initial
Date Reviewed/Next Review: Spring 2021/Fall 2028

The master of science program in secondary education of students who are deaf or hard of hearing is also accredited by the Council on Education of the Deaf (CED), www.councilondeafed.org (https://councilondeafed.org/).

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
MSSE-700	History of Deaf Educational Thought and Practice	3
MSSE-701	Psychology and Human Development	3
MSSE-702	Educational and Cultural Diversity	3
MSSE-710	General Instructional Methods	3
	Hours	**12**
Spring		
MSSE-703	Special Education in the Social Context	3
MSSE-712	Practicum [1]	2

MSSE-713	Assessment Principles and Practices	3
MSSE-725	Structures of American Sign Language and English	3
MSSE-785	Foundations of Educational Research	3
	Hours	**14**
Summer		
MSSE-704	Teaching Deaf and Hard of Hearing Learners with Special Educational Needs [2]	3
MSSE-726	Language Acquisition and Learning [2]	3
MSSE-727	Sign Language in Instructional Delivery [2]	3
	Hours	**9**
Second Year		
Fall		
MSSE-714	Curriculum Content and Methods of Instruction	3
MSSE-715	Issues in Mainstreamed Education	3
MSSE-722	Educational Audiology and Spoken Language Development	3
MSSE-728	Literacy and the Deaf Adolescent	3
	Hours	**12**
Spring		
MSSE-760	Student Teaching I	6
MSSE-761	Student Teaching II	6
MSSE-790	Professional Portfolio	3
MSSE-794	Inquiry in Teaching (elective) [3]	3
	Hours	**15**
	Total Hours	**62**

1 DASA Training required by accrediting body for teaching certification is offered during MSSE-712 Practicum.
2 Two week on-campus summer residency required in summer between Year One and Year Two.
3 MSSE-794 Inquiry in Teaching is an optional elective course. Students who complete MSSE-794 Inquiry in Teaching will exceed 62 credits.

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Online

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Secondary Education of Students Who Are Deaf or Hard of Hearing program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required for students who have a GPA below 3.0. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. Because RIT receives federal support, students in the MSSE program pay less than RIT's regular tuition rate. View the Deaf and Hard-of-Hearing and Hearing NTID-Supported Students tuition section in cost of attendance (https://www.rit.edu/admissions/tuition-and-fees/)

A combination of sources can help fund your graduate degree. Learn how to fund your degree (https://www.rit.edu/admissions/financial-aid/graduate-funding-sources/)

Additional Information

New York State Certification Prerequisites

For Dual Certification: 30 semester credit hours in a content area are required by the New York State Education Department for initial certification to teach a secondary content area (grades 7-12). Students who do not have the required number of hours must complete the additional credits before applying for New York State certification. Secondary academic subjects include American Sign Language, English, mathematics, social studies, or science. Please note: The social studies content area includes economics and government, and requires at least 21 semester hours in the history and geography of the United States and the world.

National Technical Institute for the Deaf Faculty

NTID President's Office

Caroline M. Solomon, BA, Harvard University; MS, University of Washington; Ph.D., University of Maryland—President, National Technical Institute for the Deaf; Vice President, Rochester Institute of Technology

Academic Affairs

Gary W. Behm, AAS, BS, Rochester Institute of Technology; MS, Lehigh University—Interim Dean; Associate Professor

Jessica A. La Sala, BS, MS, Rochester Institute of Technology; MSW, East Carolina University; Ed.D., University of Rochester—Associate Dean for Academic Administration; Professor

Matthew A. Lynn, BS, The Ohio State University; MS, Indiana University; Ph.D., University of Arizona—Associate Dean for Curricular Affairs; Professor

Stacey M. Davis, BA, Colgate University; BS, MS, Rochester Institute of Technology—Director for Cross-Registered Academic Services; Principal Lecturer

Health Care Interpretation

Jason Listman, BS, MS, Rochester Institute of Technology; Ed.D., St. John Fisher College—Chairperson; Professor

Jeni Rodrigues, BA, California State University; M.Ed., Northeastern University; Ph.D., Gallaudet University—Program Director; Assistant Professor

Robyn K. Dean, BA, Maryville College; MA, Colgate Rochester Crozer Divinity School; Ph.D., Heriot-Watt University (United Kingdom)—Associate Professor

Rachel Rosenstock, BA, University of Hamburg (Germany); MA, Ph.D., Gallaudet University—Program Director

Deaf Education

Patrick J. Graham, BS, MS, Rochester Institute of Technology; Ph.D., University of Georgia—Chairperson; Professor

Thomas Devine, BA, Western Governors University; MS, Rochester Institute of Technology

Raelyn Fuechtmann, BS, Gallaudet University; MS, Rochester Institute of Technology—Lecturer

Jennifer Gentzke, BS, State University College at Geneseo; MS, Nazareth College—Lecturer

Nathan Harrison, BA, Gallaudet University; MS, Rochester Institute of Technology—Lecturer

Christopher A. N. Kurz, BS, Rochester Institute of Technology; MS, Ph.D., University of Kansas—Professor, Special Education: Education of Deaf Students

Gina Pennington, BS, Ithaca College; M.Ed., Utah State University; Ed.D., University of New Mexico—Lecturer

Ruth Reyes, BS, Miriam College; MA, University of Philippines- Diliman; MS, Rochester Institute of Technology—Lecturer

Julie Russotto, BS, MS, Rochester Institute of Technology—Lecturer

Suryo Sahetapy, BS, MS, Rochester Institute of Technology—Visiting Lecturer

TJ Sanger II, BS, Rochester Institute of Technology; MS, Ottawa University; MS, Arizona State University—Lecturer; Coordinator Graduate Advising, Engagement and Retention

J. Sarchet, BA, Waynesburg University; MA, Simpson University—Visiting Lecturer

Thomastine Sarchet-Maher, BS, MS, Rochester Institute of Technology; Ed.D., University of Rochester—Assistant Dean for International Educational Outreach; Assistant Professor

Russell West, BS, Gallaudet University; MS, Texas State University San Marcos—Visiting Assistant Professor

Emeritus Faculty

John Albertini, Professor Emeritus
Frank Argento, Associate Professor Emeritus
Gerald Bateman, Professor Emeritus
Donald Beil, Professor Emeritus
Gerald Berent, Professor Emeritus
Dominic Bozzelli, Associate Professor Emeritus
Laurie Brewer, Vice Dean Emeritus and Professor Emeritus
Julie Cammeron, Associate Professor Emeritus
Karen Christie, Associate Professor Emeritus
John Cox, Professor Emeritus
Vincent Daniele, Professor Emeritus
James DeCaro, Dean Emeritus and Professor Emeritus
Judy Egelston-Dodd, Professor Emeritus
Susan Fischer, Professor Emeritus
Susan Foster, Professor Emeritus
Robert D. Frisina, Professor Emeritus and Director Emeritus
Loy Golladay, Professor Emeritus
Paula Grcevic, Professor Emeritus
Marianne Gustafson, Professor Emeritus
Peter Haggerty, Associate Professor Emeritus
Kenneth Hoffmann, Professor Emeritus
T. Alan Hurwitz, President Emeritus and Dean Emeritus
Jane Jackson, Associate Professor Emeritus
Donald Johnson, Professor Emeritus
Ronald Kelly, Professor Emeritus
Harry Lang, Professor Emeritus
Marc Marschark, Professor Emeritus
Edward Maruggi, Professor Emeritus
Bonnie Meath-Lang, Professor Emeritus
Christine Monikowski, Professor Emeritus
Jean-Guy Naud, Professor Emeritus
Elizabeth O'Brien, Professor Emeritus
Robert Panara, Professor Emeritus
Ila Parasnis, Professor Emeritus
John-Allen Payne, Associate Professor Emeritus
Tom Policano, Associate Professor Emeritus
Geoff Poor, Professor Emeritus
Thomas Raco, Professor Emeritus
Marilu Raman, Associate Professor Emeritus
Sidonie Roepke, Professor Emeritus

Marvin Sachs, Associate Professor Emeritus
Vincent Samar, Professor Emeritus
Edward Scouten, Professor Emeritus
Michael Stinson, Professor Emeritus
E. Ross Stuckless, Professor Emeritus
Robert WW Taylor, Associate Professor Emeritus
Antonio Toscano, Professor Emeritus
Rosemarie Toscano, Professor Emeritus

COLLEGE OF SCIENCE

Overview

The College of Science offers a unique complement of graduate programs featuring curricula designed with sufficient flexibility to prepare students for direct entry into a variety of careers or further study toward a more advanced graduate degree in a chosen discipline. Please visit the college's website–**www.rit.edu/science (https://www.rit.edu/science/)**–for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarship

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Doctoral Degrees

Master's Degrees

Advanced Certificates

Applied and Computational Mathematics MS

Plan Code: ACMTH-MS | **HEGIS:** 1799.00

Program Overview

The applied and computational mathematics master's degree refines your capabilities in applying mathematical models and methods and prepares you to develop and implement computable solutions to real-world problems. Sophisticated mathematical tools are increasingly used to develop new models, modify existing ones, and analyze system performance. This includes applications of mathematics to problems in management science, biology, financial portfolio planning, facilities planning, control of dynamic systems, and design of composite materials.The reasoning, deduction, and logic skills you will develop will make you more competitive in a vast array of positions and industries. You may tailor the applied and computational mathematics master's degree to fit your career goals by selecting electives in the School of Mathematics and Statistics or from other RIT graduate programs, with approval from the graduate program director. You may also opt to complete a thesis, which includes the presentation of original ideas and solutions to a specific mathematical problem.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Thesis Track

First Year		
Fall		**Hours**
MATH-606	Graduate Seminar I	1
MATH Graduate Core One		3
MATH Graduate Core Two		3
MATH Graduate Elective One		3
	Hours	**10**
Spring		
MATH-607	Graduate Seminar II	1
MATH Graduate Core Three		3
MATH Graduate Elective Two		3
MATH Graduate Elective Three		3
	Hours	**10**
Second Year		
Fall		
MATH-790	Research & Thesis	3
MATH Graduate Elective Four		3
	Hours	**6**
Spring		
MATH-790	Research & Thesis	4
	Hours	**4**
	Total Hours	**30**

Project Track

First Year		
Fall		**Hours**
MATH-606	Graduate Seminar I	1
MATH Graduate Core One		3
MATH Graduate Core Two		3
MATH Graduate Elective One		3
	Hours	**10**
Spring		
MATH-607	Graduate Seminar II	1
MATH Graduate Core Three		3
MATH Graduate Elective Two		3
MATH Graduate Elective Three		3
	Hours	**10**
Second Year		
Fall		
MATH-790	Research & Thesis	4
MATH Graduate Elective Four		3
MATH Graduate Elective Five		3
	Hours	**10**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Offered Part#time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Applied and Computational Mathematics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores.

Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicant must have college-level credit or practical experience in a programming language.

Astrophysical Sciences and Technology Ph.D.

Plan Code: ASTP-PHD | **HEGIS:** 1912.00

Program Overview

The doctoral program in astrophysical sciences and technology focuses on the underlying physics of phenomena beyond the Earth, and on the development of technologies, instruments, data analysis, and modeling techniques. You may select one of three tracks: astrophysics, astroinformatics and computational astrophysics (with the option of a concentration in general relativity), or astronomical instrumentation. The remaining course credits are comprised of specialty track courses and electives, including additional courses in astrophysics and a wide selection of courses offered in other RIT graduate programs, such as detector development, digital image processing, computational techniques, optics, and entrepreneurship, among others. You must pass a qualifying examination, which consists of completing and defending a master's-level research project, prior to embarking on the dissertation research project. All doctoral candidates must maintain continuous enrollment during the research phase of the program, in addition to spending at least one year (summer term excluded) in residence as full-time students to be eligible to receive the doctorate degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ASTP-601	Graduate Seminar I	1
ASTP-608	Fundamental Astrophysics I	3
ASTP-790	Research & Thesis	2
Specialty Track Course		3
	Hours	**9**
Spring		
ASTP-602	Graduate Seminar II	1
ASTP-609	Fundamental Astrophysics II	3
ASTP-790	Research & Thesis	2
Specialty Track Course		3
	Hours	**9**
Second Year		
Fall		
ASTP-790	Research & Thesis	3
Specialty Track Course		3
Specialty Track Course or Elective		3
	Hours	**9**
Spring		
ASTP-790	Research & Thesis	3
Specialty Track Course		3
Specialty Track Course or Elective		3
	Hours	**9**
Third Year		
Fall		
ASTP-890	Research & Thesis	4
	Hours	**4**
Spring		
ASTP-890	Research & Thesis	4
	Hours	**4**

Fourth Year		
Fall		
ASTP-890	Research & Thesis	4
	Hours	**4**
Spring		
ASTP-890	Research & Thesis	4
	Hours	**4**
Fifth Year		
Fall		
ASTP-890	Research & Thesis	4
	Hours	**4**
Spring		
ASTP-890	Research & Thesis	4
	Hours	**4**
	Total Hours	**60**

Notes:

A minimum of 24 semester credits of courses are required. A minimum of 24 semester credits of research are required. The remaining credits (12) can be either elective courses or research. Also required are a Qualifying Examination, Candidacy Examination, and Research Dissertation.

AST Recommended Course Sequences Appendix

Observational Astrophysics

Code	Title	Hours
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
ASTP-730	Stellar Atmospheres & Evolution	3
ASTP-740	Galactic Astrophysics	3
ASTP-750	Extragalactic Astrophysics	3

+ 2 other electives (such as ASTP-720 Computational Methods for Astrophysics,ASTP-835 High-Energy Astrophysics, ASTP-841 The Interstellar Medium, ASTP-851 Cosmology, PHYS-616 Data Analysis for the Physical Sciences)

Theoretical Astrophysics

Code	Title	Hours
ASTP-612	Mathematical and Statistical Methods for Astrophysics	3
ASTP-618	Fundamentals of Theoretical Astrophysics I	3
ASTP-619	Fundamentals of Theoretical Astrophysics II	3
ASTP-851	Cosmology	3

+ 2 other electives (such as ASTP-660 Introduction to Relativity and Gravitation, MATH-751 High-performance Computing for Mathematical Modeling, PHYS-611 Classical Electrodynamics I)

Gravitational Wave Astronomy

Code	Title	Hours
ASTP-612	Mathematical and Statistical Methods for Astrophysics	3
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-730	Stellar Atmospheres & Evolution	3
ASTP-740	Galactic Astrophysics	3

+ 1 other elective (such as ASTP-711 Advanced Statistical Methods for Astrophysics, ASTP-720 Computational Methods for Astrophysics, PHYS-616 Data Analysis for the Physical Sciences)

Numerical Relativity

Code	Title	Hours
ASTP-612	Mathematical and Statistical Methods for Astrophysics	3
ASTP-618	Fundamentals of Theoretical Astrophysics I	3
ASTP-619	Fundamentals of Theoretical Astrophysics II	3
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-720	Computational Methods for Astrophysics	3
or MATH-751	High-performance Computing for Mathematical Modeling	
ASTP-861	Advanced Relativity and Gravitation	3

+ optional electives (MATH-602 Numerical Analysis IPHYS-611 Classical Electrodynamics I, PHYS-614 Quantum Theory)

Instrumentation

Code	Title	Hours
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
IMGS-616	Fourier Methods for Imaging	3
PHYS-616	Data Analysis for the Physical Sciences	3

+ 3 other electives (such asASTP-730 Stellar Atmospheres & Evolution, ASTP-750 Extragalactic Astrophysics, , IMGS-628 Design and Fabrication of Solid State Cameras, EEEE-610 Analog IC Design, PHYS-611 Classical Electrodynamics I)

Astroinformatics

Code	Title	Hours
ASTP-711	Advanced Statistical Methods for Astrophysics	3
ASTP-720	Computational Methods for Astrophysics	3
or MATH-751	High-performance Computing for Mathematical Modeling	
PHYS-616	Data Analysis for the Physical Sciences	3

+ 2 other electives (such as ASTP-613 Astronomical Observational Techniques and Instrumentation, ASTP-730 Stellar Atmospheres & Evolution, ASTP-750 Extragalactic Astrophysics)

Electives

Code	Title	Hours
ASTP-612	Mathematical and Statistical Methods for Astrophysics	3
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
ASTP-618	Fundamentals of Theoretical Astrophysics I	3
ASTP-619	Fundamentals of Theoretical Astrophysics II	3
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-711	Advanced Statistical Methods for Astrophysics	3
ASTP-720	Computational Methods for Astrophysics	3
ASTP-730	Stellar Atmospheres & Evolution	3
ASTP-740	Galactic Astrophysics	3
ASTP-750	Extragalactic Astrophysics	3
ASTP-835	High-Energy Astrophysics	3

ASTP-841	The Interstellar Medium	3
ASTP-851	Cosmology	3
ASTP-861	Advanced Relativity and Gravitation	3
IMGS-628	Design and Fabrication of Solid State Cameras	3
IMGS-639	Principles of Solid State Imaging Arrays	3
IMGS-642	Testing of Focal Plane Arrays	3
MATH-602	Numerical Analysis I	3
MATH-751	High-performance Computing for Mathematical Modeling	3
PHYS-611	Classical Electrodynamics I	3
PHYS-612	Classical Electrodynamics II	3
PHYS-614	Quantum Theory	3
PHYS-616	Data Analysis for the Physical Sciences	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Astrophysical Sciences and Technology program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#astrophysical-sciences-and-technology-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Applied Statistics Advanced Certificate

Plan Code: SMPPI-ACT | **HEGIS:** 1702.00

This program is available online.

Program Overview

RIT's advanced certificate in applied statistics is a flexible, graduate-level credential. It is designed for working professionals, from a variety of disciplines, who want to add statistical analysis skills to apply to your current job, or to increase your value and marketability in today's data-rich environment. The curriculum requires two core courses and two electives which can be taken on-campus or online.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
STAT-641	Applied Linear Models - Regression	3
Elective		3
	Hours	**6**
Spring		
STAT-642	Applied Linear Models - ANOVA	3
Elective		3
	Hours	**6**
	Total Hours	**12**

Notes:

This represents the typical sequence for a student taking two courses per semester. The program is also offered for part time study only. Students typically take one or two courses per semester, and will take one to two years to finish the certificate. This schedule is only one example since courses are offered on campus and online and many possible scenarios are possible.

Program Electives

Code	Title	Hours
ISEE-682	Lean Six Sigma Fundamentals	3
STAT-611	Statistical Software - R	3
STAT-621	Statistical Quality Control	3
STAT-670	Design of Experiments	3
STAT-672	Survey Design and Analysis	3
STAT-675	Data Visualization & Storytelling	3
STAT-745	Predictive Analytics	3
STAT-747	Principles of Statistical Data Mining	3
STAT-753	Nonparametric Statistics and Bootstrapping	3
STAT-756	Multivariate Analysis	3
STAT-773	Time Series Analysis and Forecasting	3
STAT-775	Design and Analysis of Clinical Trials	3
STAT-776	Causal Inference	3
STAT-784	Categorical Data Analysis	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part#time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Applied Statistics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicant must have college-level credit or practical experience in mathematics and statistics (two courses in probability and statistics).

Online Degree Information

The online applied statistics advanced certificate can only be completed part-time, taking one or two courses per term. The average time to completion is one year. All courses are asynchronous and your academic advisor will work with you to select courses that meet your degree requirements and your schedule. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. A successfully completed applied statistics advanced certificate can be “stacked,” and will award 12 credits toward our applied statistics MS. For specific details about the delivery format and learning experience, contact the program contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online applied statistics advanced certificate is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Applied Statistics MS

Plan Code: APPSTAT-MS | **HEGIS:** 1702.00

This program is available online.

Program Overview

The master of science in applied statistics focuses on data mining, designing experiments, health care applications, and the application of statistics to imaging and industrial environments. The program provides instruction in statistical analysis and enables students to solve complex problems for a variety of industries, including insurance, marketing, government, education, health care, and more. The curriculum is packed with high-demand skills such as software and programming, data science, experimental design, and modeling techniques. You may choose from clinical trials, data mining/machine learning, industrial statistics, or informatics as an area of concentration. With the guidance of an advisor, you may also select elective courses including up to six credit hours from other departments. A capstone project, taken near the end of your course of study, allows you to dive deeper into a complex statistical problem.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
STAT-631	Foundations of Statistics	3
STAT-641	Applied Linear Models - Regression	3
Elective 1		3
	Hours	**9**
Spring		
STAT-642	Applied Linear Models - ANOVA	3
Elective 2		3
Elective 3		3
	Hours	**9**
Second Year		
Fall		
Elective 4		3
Elective 5		3
Elective 6		3
	Hours	**9**
Spring		
STAT-790	Capstone Thesis/Project	3
	Hours	**3**
	Total Hours	**30**

Notes:

This represents the typical sequence for a full-time on-campus student with an assistantship. The program may be shortened by one semester if the student chooses to take summer courses and finish in the fall of the 2nd year. Full-time students not on assistantship can finish in one calendar year if they take four courses per semester.

Program Electives

Code	Title	Hours
ISEE-682	Lean Six Sigma Fundamentals	3
STAT-611	Statistical Software - R	3
STAT-621	Statistical Quality Control	3
STAT-670	Design of Experiments	3
STAT-672	Survey Design and Analysis	3
STAT-675	Data Visualization & Storytelling	3
STAT-745	Predictive Analytics	3
STAT-747	Principles of Statistical Data Mining	3
STAT-753	Nonparametric Statistics and Bootstrapping	3
STAT-756	Multivariate Analysis	3
STAT-773	Time Series Analysis and Forecasting	3
STAT-775	Design and Analysis of Clinical Trials	3
STAT-776	Causal Inference	3
STAT-784	Categorical Data Analysis	3
STAT-787	Advanced Statistical Computing	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall, Spring, or Summer
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Applied Statistics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Have college-level credit or practical experience in a programming language.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

- Applicant must have college-level credit or practical experience in mathematics (two-course sequence in calculus) and one course in applied statistics.
- Applicant must have college-level credit or practical experience in a programming language.

Online Degree Information

The online Applied Statistics MS program can only be completed part-time, taking one or two courses per term. The average time to completion is two and a half to three years. Courses in the online program can all be completed asynchronously. They are designed to accommodate working professionals and students in various time zones to provide the greatest amount of flexibility. Program electives are slightly more limited than courses available in the on-campus program. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. The online program does not have any in-person requirements. Your academic advisor will work with you to select courses that meet your degree requirements and your schedule. Both the online and on-campus program culminates with a final capstone project. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Applied Statistics MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Astrophysical Sciences and Technology MS

Plan Code: ASTP-MS | **HEGIS:** 1912.00

Program Overview

RIT's master of science in astrophysical sciences and technology offers a wide range of research topics including multi-wavelength astrophysics, instrumentation and detector technology, computational astrophysics, and gravitational wave astronomy and numerical relativity. RIT's guiding principle is to provide an intellectually demanding program within an informal, student-centered, supportive environment. You have the flexibility to tailor your plan of study to emphasize astrophysics (including observational and theoretical astrophysics), computational and gravitational astrophysics (including numerical relativity and gravitational wave astronomy), or astronomical technology (including detector and instrumentation research and development). You may also pursue research interests in a wide range of topics, including design and development of novel detectors, multiwavelength studies of proto-stars, active galactic nuclei and galaxy clusters, gravitational wave data analysis, and theoretical and computational modeling of astrophysical systems including galaxies and compact objects such as binary black holes. The degree consists of core courses, elective courses, graduate seminar, and a research project culminating in a thesis. During the first year, you will begin a research project under the guidance of a faculty research advisor, and during the second year, after the courses have been completed, the research project will become your focus.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ASTP-601	Graduate Seminar I	1
ASTP-608	Fundamental Astrophysics I	3
ASTP-790	Research & Thesis	2
Elective		3
	Hours	**9**
Spring		
ASTP-602	Graduate Seminar II	1
ASTP-609	Fundamental Astrophysics II	3
ASTP-790	Research & Thesis	2
Elective		3
	Hours	**9**
Second Year		
Fall		
ASTP-790	Research & Thesis	3
Elective		3
	Hours	**6**
Spring		
ASTP-790	Research & Thesis	3
Elective		3
	Hours	**6**
	Total Hours	**30**

Approved Electives

Code	Title	Hours
ASTP-612	Mathematical and Statistical Methods for Astrophysics	3
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
ASTP-618	Fundamentals of Theoretical Astrophysics I	3
ASTP-619	Fundamentals of Theoretical Astrophysics II	3
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-711	Advanced Statistical Methods for Astrophysics	3
ASTP-720	Computational Methods for Astrophysics	3
ASTP-730	Stellar Atmospheres & Evolution	3
ASTP-740	Galactic Astrophysics	3
ASTP-750	Extragalactic Astrophysics	3
ASTP-835	High-Energy Astrophysics	3
ASTP-841	The Interstellar Medium	3
ASTP-851	Cosmology	3
ASTP-861	Advanced Relativity and Gravitation	3
IMGS-616	Fourier Methods for Imaging	3
IMGS-628	Design and Fabrication of Solid State Cameras	3
IMGS-639	Principles of Solid State Imaging Arrays	3
IMGS-642	Testing of Focal Plane Arrays	3
MATH-602	Numerical Analysis I	3
MATH-751	High-performance Computing for Mathematical Modeling	3
PHYS-611	Classical Electrodynamics I	3
PHYS-612	Classical Electrodynamics II	3
PHYS-614	Quantum Theory	3
PHYS-616	Data Analysis for the Physical Sciences	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Astrophysical Sciences and Technology program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.

- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in the physical sciences, mathematics, computer science, or engineering. A minimum cumulative GPA of 3.2 (or equivalent) n course work in mathematical, science, engineering, and computing subject areas is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Bioinformatics MS

Plan Code: BIOINFO-MS | **HEGIS:** 0499.00

Program Overview

Bioinformatics is a discipline that represents a marriage between biotechnology and computer technologies, and RIT's bioinformatics master's degree is focused on cutting-edge computational techniques to understand biomedical data. The program prepares students to use computers to organize, link, analyze, and visualize complex sets of biological data to discover, treat, and cure a range of medical illnesses. The curriculum is designed to fulfill the needs of students with diverse educational and professional backgrounds, and individuals entering the program typically have degrees in biology, biotechnology, chemistry, statistics, computer science, information technology, or a related field. To prepare applicants from various backgrounds, the curriculum includes a comprehensive bridge program that includes courses in biology, mathematics, computer science, statistics, or other related fields. The program offers two tracks, one for students with backgrounds in the life sciences and one for those with backgrounds in the computational sciences. All students will learn to sequence DNA and use computer programs to analyze DNA sequences and predict molecular models. You are also encouraged to pursue cooperative education opportunities to gain hands-on career experience in industry.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
BIOL-635	Bioinformatics Seminar	3
BIOL-672	Computational Statistics and Data Science Methods	3
Graduate Elective [1]		3
Graduate Elective [1]		3
	Hours	**12**
Spring		
BIOL-630	Bioinformatics Algorithms	3
BIOL-694	Molecular Modeling and Proteomics	3
Graduate Elective [1]		3
Graduate Elective [1]		3
Select one of the following:		1
BIOL-780	Bioinformatics Project (Professional Pathway)	
BIOL-790	Research and Thesis (Research Pathway)	
	Hours	**13**
Second Year		
Fall		
Select one of the following:		3
Graduate Elective (Professional Pathway) [1]		
BIOL-790	Research and Thesis (Research Pathway)	
	Hours	**3**
Spring		
Select one of the following:		2
BIOL-780	Bioinformatics Project (Professional Pathway)	

BIOL-790	Research and Thesis (Research Pathway)	
	Hours	**2**
	Total Hours	**30**

[1] Any graduate level course deemed related to the field of Bioinformatics by the Program Director

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Bioinformatics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in biology, biotechnology, biochemistry, chemistry, computer science, information technology, statistics, or a related discipline. A minimum cumulative GPA of 3.2 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Chemistry MS

Plan Code: CHEM-MS | **HEGIS:** 1905.00

Program Overview

RIT's master of science in chemistry prepares practicing chemists for the next phase of their career by focusing on independent research with faculty mentors and improving written and oral scientific communication skills. The program consists of core and focus area course work.
You may select a concentration in materials scienc; biochemistry; or organic, analytical, inorganic, physical, and polymer chemistry. Or you may customize your own to meet your professional goals. To fulfill a graduation requirement, you may also choose between a thesis option or a capstone project. If you select the thesis option, you will be expected to complete an independent research thesis and pass an oral defense. Courses are offered in the late afternoons and evenings to encourage practicing chemists to pursue the MS degree without interruption to employment. Students employed full-time normally take one course each semester. At this pace, course work can be completed within four to five years.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Thesis Option

First Year		
Fall		**Hours**
CHEM-670	Graduate Chemistry Writing	1
CHEM-771	Graduate Chemistry Seminar I	1
Graduate Chemistry Focus Course 1		3
Graduate Chemistry Focus Course 2		3
	Hours	**8**
Spring		
CHEM-772	Graduate Chemistry Seminar II	1
CHEM-790	Research & Thesis	1
Graduate Chemistry Focus Course 3		3
Graduate Chemistry Focus Course 4		3
	Hours	**8**
Summer		
CHEM-790	Research & Thesis	4
	Hours	**4**
Second Year		
Fall		
CHEM-773	Graduate Chemistry Seminar III	1
CHEM-790	Research & Thesis	2
Graduate Chemistry Focus Course 5		3
	Hours	**6**
Spring		
CHEM-774	Graduate Chemistry Seminar IV	1
CHEM-790	Research & Thesis	3
	Hours	**4**
	Total Hours	**30**

Project Option

First Year		
Fall		**Hours**
CHEM-670	Graduate Chemistry Writing	1
CHEM-771	Graduate Chemistry Seminar I	1
Graduate Chemistry Focus Course 1		3
Graduate Chemistry Focus Course 2		3
	Hours	**8**
Spring		
CHEM-772	Graduate Chemistry Seminar II	1
Graduate Chemistry Focus Course 3		3
Graduate Chemistry Focus Course 4		3
	Hours	**7**
Second Year		
Fall		
CHEM-773	Graduate Chemistry Seminar III	1
Graduate Chemistry Focus Course 5		3
Graduate Chemistry Focus Course 6		3
	Hours	**7**
Spring		
CHEM-774	Graduate Chemistry Seminar IV	1
CHEM-780	Chemistry Project [1]	1
Graduate Chemistry Focus Course 7		3
Graduate Chemistry Focus Course 8 [1]		3
	Hours	**8**
	Total Hours	**30**

[1] Student must complete at least 1 credit of CHEM-780 Chemistry Project, but may elect to complete 4 credits of CHEM-780 Chemistry Project and not complete Chemistry Focus Course 8.

Focus Courses

The courses listed below represent the potential Focus Courses of the MS Chemistry Program

Code	Title	Hours
CHMA-621	Advanced Instrumental Analysis Lab	3
CHMA-650	Chemical Separations and Mass Spectrometry	3
CHMA-670	Advanced Concepts of Environmental Chemistry	3
CHMA-711	Advanced Instrumental Analysis	3
CHMA-725	The Magnetic Resonance Family	3
CHMA-740	Practical NMR	3
CHMA-750	NMR Spectrometer Maintenance	3
CHMB-610	Advanced Protein Biochemistry: Structure and Function	3
CHMB-702	Protein Conformation and Dynamics	3
CHMB-704	Advanced Nucleic Acids Biochemistry; Structure and Function	3
CHMI-664	Modern Inorganic Chemistry	3
CHMO-636	Spectrometric Identification of Organic Compounds	3
CHMO-637	Advanced Organic Chemistry	3
CHMO-640	Mechanisms of Drug Interactions	3
CHMO-710	Literature Exploration of Organic Synthesis	1
CHMO-739	Advanced Physical Organic Chemistry	3
CHMP-747	Principles of Magnetic Resonance	3
CHMP-751	Colloid & Interface Science	3

CHMP-752	Molecular Photophysics and Photochemistry	3
CHMP-753	Computational Chemistry	3
CHPO-706	Polymer Synthesis	3
CHPO-707	Polymer Chemistry II	3
CHPO-708	Polymer Synthesis & Characterization Lab	3
IMGS-730	Magnetic Resonance Imaging	3
MTSE-602	Polymer Science	3

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Fall - February 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Chemistry program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in chemistry. Applicants with an undergraduate degree in another scientific discipline and the equivalent of a full year of work in analytical chemistry, organic chemistry, physical chemistry, physics, and calculus will also be considered for admission. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE required. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Color Science MS

Plan Code: CLRS-MS | **HEGIS:** 1999.20

Program Overview

RIT's color science MS degree provides graduate-level study in both scientific theory and practical application of color science, as well as how to do research in the field and present it successfully. The curriculum is a combination of required courses in color science, elective courses appropriate for the candidate's background, and either a research thesis or graduate project. The degree is designed for students from a wide range of undergraduate degrees, including physics, biology, chemistry, mathematics, computer science, engineering, neuroscience, experimental psychology, imaging, or any applied discipline pertaining to the quantitative description of color. Those with adequate undergraduate work in related sciences start the program as matriculated graduate students. Students without adequate undergraduate work in related sciences must take foundation courses prior to matriculation into the graduate program. A written agreement between the candidate and the program coordinator will identify the required foundation courses. The program may be completed on a full- or part-time basis. For full-time students, the program requires three to four semesters of study, and part-time students generally require two to four years of study.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CLRS-601	Principles of Color Science	3
CLRS-720	Computational Vision Science	3
CLRS-750	Historical Research Perspectives	1
Graduate Elective One		3
	Hours	**10**
Spring		
CLRS-602	Color Physics and Applications	3
CLRS-751	Research and Publication Methods	2
CLRS-820	Modeling Visual Perception	3
Graduate Elective Two		3
	Hours	**11**
Second Year		
Fall		
CLRS-890	Research & Thesis	3
Graduate Elective Three		3
	Hours	**6**
Spring		
CLRS-890	Research & Thesis	3
	Hours	**3**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Offered Part#time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1#8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Color Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Color Science Ph.D.

Plan Code: CLRS-PHD | **HEGIS:** 1999.20

Program Overview

RIT's color science Ph.D. program allows you to contribute to knowledge creation and practical application of color science by conducting extensive research that encompasses diverse fields and multiple disciplines of science. The curriculum is a combination of required courses in color science, elective courses appropriate for the candidate's background and interests, a research project during the second year of study, and a research dissertation. You must pass a qualifying examination during the second year of study and a candidacy examination at least one year prior to completing your dissertation. If you wish to enter the program, but lack adequate preparation, you might be required to complete undergraduate foundation courses in mathematics, statistics, computer science, and general science before matriculating with graduate status.

During the second year, you will engage in graduate-level research under the supervision of a graduate program faculty member. After completing the required courses, you will follow the study plan which consists of research, thesis, and elective courses. You must also serve as a teaching assistant for a minimum of one course and must present research in a public forum before scheduling the final examination of the dissertation. Prior to scheduling the dissertation defense (final examination), you must have at least two refereed journal publications on the dissertation research accepted for publication (or published). You must also spend at least two consecutive semesters (summer may be excluded) as resident full-time student to be eligible to receive a doctoral degree and maintain continuous enrollment during the research phase of the program. Requirements for the degree must be completed within seven years of the date students pass the qualifying examination.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
CLRS-601	Principles of Color Science	3
CLRS-720	Computational Vision Science	3
CLRS-750	Historical Research Perspectives	1
Graduate Elective One		3
	Hours	**10**
Spring		
CLRS-602	Color Physics and Applications	3
CLRS-751	Research and Publication Methods	2
CLRS-820	Modeling Visual Perception	3
Graduate Elective Two		3
	Hours	**11**
Second Year		
Fall		
CLRS-890	Research & Thesis (and/or Electives)	9
	Hours	**9**
Spring		
CLRS-890	Research & Thesis (and/or Electives)	9
	Hours	**9**
Third Year		
Fall		
CLRS-890	Research & Thesis (and/or Electives)	6
	Hours	**6**
Spring		
CLRS-890	Research & Thesis (and/or Electives)	6
	Hours	**6**
Fourth Year		
Fall		
CLRS-890	Research & Thesis (and/or Electives)	9
	Hours	**9**
	Total Hours	**60**

Notes:

A minimum of 24 semester credits of courses are required. A minimum of 24 semester credits of research are required. The remaining credits (12) can be either elective courses or research. Also required are a Qualifying Examination, 2nd-Year Research Project, Candidacy Examination, and Research Dissertation.

Admission Requirements

This program is available on-campus only.

Offered Full#time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full#time.

Application Details

To be considered for admission to the Color Science program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete foundation courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#color-science-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Additional Information

Foundation Courses

Candidates without adequate undergraduate work in related sciences must take foundation courses prior to matriculation into the graduate program. A written agreement between the candidate and the program director will identify the required foundation courses. Foundation courses must be completed with an overall B average before a student can matriculate into the graduate program.

The foundation courses, representative of those often required, are as follows: one year of calculus, one year of college physics (with laboratory), one course in computer programming, one course in matrix algebra, one course in statistics, and one course in introductory psychology. Other science courses (with laboratory) might be substituted for physics.

Environmental Science MS

Plan Code: ENVS-MS | **HEGIS:** 0420.00

Program Overview

RIT's environmental science master's degree provides a deep understanding of the science behind environmental problems, the complex set of circumstances that impact environmental issues, and how environmental decisions and policies must attempt to find a balance between environmental conservation, human well-being, and economic development. The practice of environmental science demands that you become a well-rounded specialist, and to accomplish this, you may choose a concentration in one of the following areas: chemistry, ecology and field biology, economics, environmental microbiology/molecular biology, Geographic Information Systems (GIS), organismal biology and evolution, public policy, remote sensing, or statistics. You also may develop a self-designed concentration in an area of personal interest, subject to approval from an environmental science review committee. The program also incorporates intensive fieldwork, policy implications, sustainable practices, and remote sensing into the curriculum. You will benefit from collaboration with experts from RIT's College of Science, the Chester F. Carlson Center for Imaging Science, and the Golisano Institute for Sustainability. As you progress through the curriculum, you will choose either the research path, which includes research and a thesis, or the professional path which includes course work and a project supervised by a faculty advisor.

Cooperative education is optional for environmental science majors, however, it offers students a great way to get a head start on their career with paid, professional work experience. Students can participate in cooperative education as soon as the summer after their second year of study. Co-op placements are typically with local, state, or federal government agencies, nonprofit environmental organizations, and a host of environmental consulting firms.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
ENVS-601	Environmental Science Graduate Studies I	2
Graduate Statistics Elective		3
Graduate Public Policy/STS Elective		3
Graduate Science Core Elective		3
	Hours	**11**
Spring		
ENVS-602	Environmental Science Graduate Studies II	1
Graduate GIS Elective		3
Professional Elective		3
Professional Elective		3
Select one of the following:		3
Professional Elective (Professional Pathway)		
ENVS-795	Environmental Science Graduate Research (Research Pathway)	
	Hours	**13**
Second Year		
Fall		
Select one of the following:		3
Professional Elective (Professional Pathway)		

ENVS-790	Environmental Science Thesis (Research Pathway)	
	Hours	**3**
Spring		
Select one of the following:		3
ENVS-780	Environmental Science Project (Professional Pathway)	
ENVS-790	Environmental Science Thesis (Research Pathway)	
	Hours	**3**
	Total Hours	**30**

Graduate Public Policy/STS Core Electives

Code	Title	Hours
ENVS-631	Climate Change: Science Technology & Policy	3
ESHS-755	Corporate Social Responsibility	3
PUBL-610	Technological Innovation and Public Policy	3
PUBL-630	Energy Policy	3
PUBL-631	Climate Change: Science, Technology and Policy	3
PUBL-700	Readings in Public Policy	3
PUBL-701	Graduate Policy Analysis	3
PUBL-702	Graduate Decision Analysis	3
PUBL-703	Evaluation and Research Design	3
PUBL-810	Technology, Policy and Sustainability	3
STSO-621	Graduate Biodiversity and Society	3
STSO-710	Graduate Science and Technology Policy Seminar	3
STSO-750	Graduate Sustainable Communities	3

Graduate Science Core Electives

Code	Title	Hours
BIOL-636	Graduate Seminar in Life Sciences	1
BIOL-640	Environmental Genomics	4
BIOL-650	High Throughput Sequencing Analysis	3
BIOL-655	Biogeography	3
BIOL-673	Marine Biology	4
BIOL-675	Advanced Conservation Biology	3
BIOL-676	Environmental Microbiology	4
BIOL-798	Grad Biology Independent Study	1-4
ENVS-631	Climate Change: Science Technology & Policy	3
ENVS-640	Ecological Models in Geographic Information Systems	4
ENVS-650	Hydrologic Applications of Geographic Information Systems	4
ENVS-670	Advanced Concepts of Environmental Chemistry	3
ENVS-798	Advanced Environmental Science Independent Study	1-4
IMGS-632	Advanced Environmental Applications of Remote Sensing	3

Graduate GIS Electives

Code	Title	Hours
ENVS-640	Ecological Models in Geographic Information Systems	4
ENVS-650	Hydrologic Applications of Geographic Information Systems	4
IGME-771	Introduction To Geographic Information Systems	3
ISTE-742	Introduction To Geographic Information Systems	3

Graduate Statistics Electives

Code	Title	Hours
BIOL-672	Computational Statistics and Data Science Methods	3
STAT-614	Applied Statistics	3
STAT-641	Applied Linear Models - Regression	3
STAT-670	Design of Experiments	3

Graduate Professional Electives

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Students may select any of the above courses or the following:
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Code	Title	Hours
ESHS-613	Solid and Hazardous Waste Management	3
ESHS-614	Industrial Wastewater Management	3
ESHS-615	Air Emissions Management	3
ISUS-704	Industrial Ecology	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Environmental Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in environmental science, biological science, or a related discipline. A minimum cumulative GPA of 3.2 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit three letters of recommendation.
- Entrance exam requirements: GRE required for individuals with degrees from international universities. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Imaging Science MS

Plan Code: IMGS-MS | **HEGIS:** 1999.20

This program is available online.

Program Overview

RIT's master's degree in imaging science is geared toward advancing and broadening the skills of professionals who are working and conducting research in the many industries that use various imaging modalities to research and solve problems in engineering and science. This field integrates engineering, math, physics, computer science, and psychology to understand and develop imaging systems and technology. The curriculum emphasizes a systems approach to the study of imaging science. You may choose two courses from a variety of tracks, including digital image processing, computer vision, electro-optical imaging systems, remote sensing, color imaging, optics, hard copy materials and processes, and nanoimaging. You may also create a custom track to meet your personal, professional, and educational goals. You may choose to complete either a research thesis or a project and a paper in the non-thesis option. The research thesis is based on experimental evidence obtained by the student in an appropriate field, as arranged between the student and their advisor. The four required research credits may be fulfilled by performing experiments in the university's laboratories or conducting research at your place of employment. Students with demonstrated practical or research experience, approved by the graduate program coordinator, may choose the graduate project option (3 credit hours). This option takes the form of a systems project course. The degree may be completed on-campus or online, and on a full or part-time basis.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Thesis Option

First Year		
Fall		**Hours**
IMGS-606	Graduate Seminar I	1
IMGS-617	Image Processing and Discrete Fourier Methods	2
Imaging Science Elective 1		3
Select two of the following:		4
IMGS-613	Noise and System Modeling	
IMGS-619	Radiometry	
IMGS-620	The Human Visual System	
IMGS-621	Computer Vision	
IMGS-633	Optics for Imaging	
	Hours	**10**
Spring		
IMGS-607	Graduate Seminar II	1
IMGS-790	Research & Thesis	1
Imaging Science Electives 2, 3		6
Select one of the following:		2
IMGS-613	Noise and System Modeling	
IMGS-619	Radiometry	
IMGS-620	The Human Visual System	
IMGS-621	Computer Vision	

IMGS-633	Optics for Imaging	
	Hours	**10**
Second Year		
Fall		
IMGS-790	Research & Thesis	1
Imaging Science Elective 4		3
	Hours	**4**
Spring		
IMGS-790	Research & Thesis	1
Imaging Science Elective 5		3
Select one of the following:		2
IMGS-790	Research & Thesis	
IMGS Elective		
	Hours	**6**
	Total Hours	**30**

Project Option

First Year		
Fall		**Hours**
IMGS-617	Image Processing and Discrete Fourier Methods	2
Imaging Science Elective 1		3
Select two of the following:		4
IMGS-613	Noise and System Modeling	
IMGS-619	Radiometry	
IMGS-620	The Human Visual System	
IMGS-621	Computer Vision	
IMGS-633	Optics for Imaging	
	Hours	**9**
Spring		
Imaging Science Electives 2, 3, 4		8
Select one of the following:		2
IMGS-613	Noise and System Modeling	
IMGS-619	Radiometry	
IMGS-620	The Human Visual System	
IMGS-621	Computer Vision	
IMGS-633	Optics for Imaging	
	Hours	**10**
Second Year		
Fall		
Imaging Science Elective 5		5
	Hours	**5**
Spring		
IMGS-740	Imaging Science MS Systems Project Paper	3
Imaging Science Elective 6		3
	Hours	**6**
	Total Hours	**30**

Imaging Science Course Electives

Code	Title	Hours
IMGS-606	Graduate Seminar I	1
IMGS-607	Graduate Seminar II	1
IMGS-609	Graduate Laboratory	2
IMGS-613	Noise and System Modeling	2
IMGS-617	Image Processing and Discrete Fourier Methods	2
IMGS-619	Radiometry	2
IMGS-620	The Human Visual System	2
IMGS-621	Computer Vision	2
IMGS-622	Vision Sciences Seminar	1
IMGS-624	Interactive Virtual Env	3
IMGS-628	Design and Fabrication of Solid State Cameras	3
IMGS-632	Advanced Environmental Applications of Remote Sensing	3
IMGS-633	Optics for Imaging	2
IMGS-635	Optical System Design and Analysis	3
IMGS-639	Principles of Solid State Imaging Arrays	3
IMGS-640	Remote Sensing Systems and Image Analysis	3
IMGS-642	Testing of Focal Plane Arrays	3
IMGS-643	Mathematical Methods of Imaging Science 1	1
IMGS-644	Mathematical Methods of Imaging Science 2	1
IMGS-684	Deep Learning for Vision	3
IMGS-689	Graduate Special Topics	1-4
IMGS-699	Imaging Science Graduate Co-op	0
IMGS-719	Radiative Transfer I	3
IMGS-720	Radiative Transfer II	3
IMGS-723	Remote Sensing: Spectral Image Analysis	3
IMGS-724	Introduction to Electron Microscopy	3
IMGS-730	Magnetic Resonance Imaging	3
IMGS-732	Synthetic Aperture Radar Image Formation Processing	3
IMGS-740	Imaging Science MS Systems Project Paper	3
IMGS-765	Performance Modeling and Characterization of Remote Sensing Systems	3
IMGS-789	Graduate Special Topics	1-3
IMGS-790	Research & Thesis	1-6
IMGS-799	Imaging Science Independent Study	1-4
IMGS-830	Advanced Topics in Remote Sensing	3
IMGS-890	Research & Thesis	1-6

Suggested Graduate Courses Offered Outside of Imaging Science:

Code	Title	Hours
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
CLRS-601	Principles of Color Science	3
CLRS-602	Color Physics and Applications	3
CLRS-720	Computational Vision Science	3
CLRS-820	Modeling Visual Perception	3
CSCI-603	Computational Problem Solving	3
CSCI-630	Foundations of Artificial Intelligence	3
CSCI-631	Foundations of Computer Vision	3
ENVS-650	Hydrologic Applications of Geographic Information Systems	4
MATH-605	Stochastic Processes	3
MATH-645	Graph Theory	3
MCSE-713	Lasers	3
STAT-641	Applied Linear Models - Regression	3
STAT-758	Multivariate Statistics for Imaging Science	3

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring

Full-time Application Deadline: Fall - January 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Imaging Science program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants must have completed courses in mathematics (through calculus and including differential equations), and a full year of calculus-based physics (including modern physics). It is assumed that students can write a common computer program.

Online Degree Information

The online Imaging Science MS program is designed for part-time study and can be completed fully online. It is flexible for working professionals. Students typically say they spend between 10-12 hours per week on their classes and take one class per term. Most students finish in about 2.5 years but can be expedited if you study year-round and take more than one class each semester. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Imaging Science MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Imaging Science Ph.D.

Plan Code: IMGS-PHD | **HEGIS:** 1999.20

Program Overview

A doctoral degree in imaging science signifies high achievement in scholarship and independent investigation in the diverse aspects of imaging science, and with a Ph.D. from RIT, you will contribute to the fundamental body of knowledge in science and engineering that is associated with this field of study. The core curriculum consists of coursework and research and integrates a common body of knowledge essential to an understanding of imaging processes and applications. Courses are defined by your study plan and must include core course sequences plus a sequence in a topical area such as remote sensing, digital image processing, color imaging, digital graphics, electro-optical imaging systems, or microlithographic imaging technologies. You may take a limited number of credit hours in other departments and must complete research credits, including two credits of research associated with the Graduate Seminar. Elective courses allow you to concentrate your studies in a range of imaging science research and imaging application areas, including electro-optical imaging, digital image processing, color science, perception and vision, electrophotography, lithography, remote sensing, medical imaging, electronic printing, and machine vision.

You must spend at least two consecutive semesters (summer excluded) as resident full-time students to be eligible to receive the doctoral degree and maintain continuous enrollment during the research phase of the program. Typically, full-time students complete the course of study for the doctorate in approximately three to five years. A total of seven years is allowed to complete the degree after passing the qualifying exam.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
IMGS-606	Graduate Seminar I	1
IMGS-609	Graduate Laboratory	2
IMGS-617	Image Processing and Discrete Fourier Methods	2
IMGS-619	Radiometry	2
IMGS-620	The Human Visual System	2
IMGS-890	Research & Thesis	2
	Hours	**11**
Spring		
IMGS-607	Graduate Seminar II	1
IMGS-613	Noise and System Modeling	2
IMGS-621	Computer Vision	2
IMGS-633	Optics for Imaging	2
IMGS-890	Research & Thesis	2
	Hours	**9**
Second Year		
Fall		
IMGS-890	Research & Thesis	3
IMGS Electives		6
	Hours	**9**
Spring		
IMGS-890	Research & Thesis	3
IMGS Electives		6
	Hours	**9**
Third Year		
Fall		
IMGS-890	Research & Thesis	3
IMGS Electives		6
	Hours	**9**
Spring		
IMGS-890	Research & Thesis	3
	Hours	**3**
Fourth Year		
Fall		
Select one of the following:		3
IMGS-890	Research & Thesis	
IMGS Elective		
	Hours	**3**
Spring		
Select one of the following:		3
IMGS-890	Research & Thesis	
IMGS Elective		
	Hours	**3**
Fifth Year		
Fall		
Select one of the following:		4
IMGS-890	Research & Thesis	
IMGS Elective		
	Hours	**4**
	Total Hours	**60**

Notes:

A total of 60 credits are required with a minimum of 32 course credits and a minimum of 18 research credits. The balance of course and research credits will be determined in consultation with research advisor and documented in the student's plan of study. Two milestones must be completed along the way; passage of the qualifying exam and candidacy exam.

Imaging Science Course Electives

Code	Title	Hours
IMGS-622	Vision Sciences Seminar	1
IMGS-624	Interactive Virtual Env	3
IMGS-628	Design and Fabrication of Solid State Cameras	3
IMGS-632	Advanced Environmental Applications of Remote Sensing	3
IMGS-635	Optical System Design and Analysis	3
IMGS-639	Principles of Solid State Imaging Arrays	3
IMGS-640	Remote Sensing Systems and Image Analysis	3
IMGS-642	Testing of Focal Plane Arrays	3
IMGS-643	Mathematical Methods of Imaging Science 1	1
IMGS-644	Mathematical Methods of Imaging Science 2	1
IMGS-684	Deep Learning for Vision	3
IMGS-689	Graduate Special Topics	1-4
IMGS-699	Imaging Science Graduate Co-op	0
IMGS-719	Radiative Transfer I	3
IMGS-720	Radiative Transfer II	3
IMGS-723	Remote Sensing: Spectral Image Analysis	3
IMGS-730	Magnetic Resonance Imaging	3
IMGS-732	Synthetic Aperture Radar Image Formation Processing	3

IMGS-740	Imaging Science MS Systems Project Paper	3
IMGS-765	Performance Modeling and Characterization of Remote Sensing Systems	3
IMGS-789	Graduate Special Topics	1-3
IMGS-790	Research & Thesis	1-6
IMGS-799	Imaging Science Independent Study	1-4
IMGS-830	Advanced Topics in Remote Sensing	3
IMGS-890	Research & Thesis	1-6

Suggested Graduate Courses Offered Outside of Imaging Science:

Code	Title	Hours
ASTP-613	Astronomical Observational Techniques and Instrumentation	3
CLRS-601	Principles of Color Science	3
CLRS-602	Color Physics and Applications	3
CLRS-720	Computational Vision Science	3
CLRS-820	Modeling Visual Perception	3
CSCI-603	Computational Problem Solving	3
CSCI-630	Foundations of Artificial Intelligence	3
CSCI-631	Foundations of Computer Vision	3
ENVS-650	Hydrologic Applications of Geographic Information Systems	4
MATH-605	Stochastic Processes	3
MATH-645	Graph Theory	3
MCSE-713	Lasers	3
STAT-641	Applied Linear Models - Regression	3
STAT-758	Multivariate Statistics for Imaging Science	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Imaging Science program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in the physical sciences, mathematics, computer science, or engineering. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#imaging-science-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Materials Science and Engineering MS

Plan Code: MSENG-MS | **HEGIS:** 0915.00

Program Overview

The materials science and engineering MS combines science, engineering, and sustainability to solve challenges from diverse industries ranging from medicine to energy. The program includes required core courses, graduate electives, and either a thesis or project. The core courses are specially designed to establish a common base of materials-oriented knowledge for students with baccalaureate degrees in chemistry, chemical engineering, electrical engineering, mechanical engineering, physics, and related disciplines. Elective courses may be selected from advanced courses offered by RIT's School of Chemistry and Materials Science or, upon approval, from courses offered by other RIT graduate programs. You may choose to complete a required thesis or capstone project at the conclusion of the program. The program offers courses in the late afternoon and evenings to encourage practicing scientists and engineers to pursue the program without interrupting their employment.

Co-ops and internships are encouraged for graduate students in the materials science degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Thesis Option

First Year		
Fall		**Hours**
MTSE-601	Materials Science	3
MTSE-704	Theoretical Methods in Materials Science and Engineering	3
Graduate Elective		3
	Hours	**9**
Spring		
MTSE-705	Experimental Techniques	3
Graduate Elective		3
Graduate Elective		3
	Hours	**9**
Second Year		
Fall		
MTSE-790	Research & Thesis	3
Graduate Elective		3
	Hours	**6**
Spring		
MTSE-790	Research & Thesis	6
	Hours	**6**
	Total Hours	**30**

Project Option

First Year		
Fall		**Hours**
MTSE-601	Materials Science	3
MTSE-704	Theoretical Methods in Materials Science and Engineering	3
Graduate Elective		3
	Hours	**9**
Spring		
MTSE-705	Experimental Techniques	3
Graduate Elective		3
Graduate Elective		3
	Hours	**9**
Second Year		
Fall		
Graduate Elective		3
Graduate Elective		3
	Hours	**6**
Spring		
MTSE-777	Graduate Project	3
Graduate Elective		3
	Hours	**6**
	Total Hours	**30**

Approved Graduate Electives

Approved Electives comprise graduate courses offered by programs in the College of Science, Kate Gleason College of Engineering, Golisano Institute for Sustainability, School of Individualized Studies and the Saunders College of Business. Prerequisites for all Approved Electives include Graduate Standing and may require permission of instructor.

Code	Title	Hours
MTSE-602	Polymer Science	3
MTSE-617	Material Degradation	3
MTSE-632	Solid State Science	3
MTSE-704	Theoretical Methods in Materials Science and Engineering	3
MTSE-780	Theory of Microsensors and Actuators	3
MTSE-799	Independent Study	1-4

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Materials Science and Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in chemistry, physics, chemical engineering,

electrical engineering, mechanical engineering, or a related field. A minimum cumulative GPA of 3.2 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Materials Science and Engineering Advanced Certificate

Plan Code: MTSE-ACT | **HEGIS:** 0915.00

Program Overview

The advanced certificate in materials science and engineering is specially designed to establish a common base of advanced materials-oriented knowledge that goes beyond baccalaureate degrees in chemistry, chemical engineering, electrical engineering, mechanical engineering, physics, and related disciplines. The advanced certificate may be completed on a full- or part-time basis.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
MTSE-601	Materials Science	3
MTSE-704	Theoretical Methods in Materials Science and Engineering	3
MTSE-705	Experimental Techniques	3
	Hours	**9**
Spring		
Open Graduate Elective		3
Open Graduate Elective		3
Open Graduate Elective		3
	Hours	**9**
	Total Hours	**18**

Approved Electives

Approved Electives comprise graduate courses offered by programs in the College of Science, Kate Gleason College of Engineering, Golisano Institute for Sustainability, School of Individualized Studies and the Saunders College of Business. Prerequisites for all Approved Electives include Graduate Standing and may require permission of instructor.

Code	Title	Hours
MTSE-602	Polymer Science	3
MTSE-617	Material Degradation	3
MTSE-632	Solid State Science	3
MTSE-799	Independent Study	1-4

Admission Requirements

This program is available on-campus only.

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Materials Science and Engineering program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in chemistry, physics, chemical engineering, electrical engineering, mechanical engineering, or a related field. A minimum cumulative GPA of 3.2 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Mathematical Modeling Ph.D.

Plan Code: MATHML-PHD | **HEGIS:** 1799.00

Program Overview

RIT's mathematical modeling Ph.D. enables you to develop mathematical models to investigate, analyze, predict, and solve the behaviors of a range of fields from medicine, engineering, and business to physics and science. The program requires coursework and research. The curriculum consists of required core courses, required concentration foundation courses, a course in scientific computing and high-performance computing (HPC), elective courses focused on your chosen research concentration, and a doctoral dissertation. Elective courses are available from within the School of Mathematics and Statistics as well as from other graduate programs at RIT, which can provide application-specific courses of interest for particular research projects. You will develop a plan of study in consultation with an application domain advisory committee. The committee ensures that you have a roadmap for completing your degree based on your background and research interests. You must spend at least two consecutive semesters (summer excluded) as resident full-time students to be eligible to receive the doctoral degree.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
MATH-602	Numerical Analysis I	3
MATH-606	Graduate Seminar I	1
MATH-622	Mathematical Modeling I	3
MATH Concentration Course One		3
	Hours	**10**
Spring		
MATH-607	Graduate Seminar II	1
MATH-722	Mathematical Modeling II	3
MATH Concentration Course Two		3
MATH Elective One		3
	Hours	**10**
Second Year		
Fall		
MATH-790	Research & Thesis	3
MATH Concentration Course Three		3
MATH Elective Two		3
	Hours	**9**
Spring		
MATH-751	High-performance Computing for Mathematical Modeling	3
MATH-790	Research & Thesis	4
MATH Elective Three		3
	Hours	**10**
Third Year		
Fall		
MATH-790	Research & Thesis	4
	Hours	**4**
Spring		
MATH-790	Research & Thesis	5
	Hours	**5**

Fourth Year		
Fall		
MATH-790	Research & Thesis	3
	Hours	**3**
Spring		
MATH-790	Research & Thesis	3
	Hours	**3**
Fifth Year		
Fall		
MATH-790	Research & Thesis	3
	Hours	**3**
Spring		
MATH-790	Research & Thesis	3
	Hours	**3**
	Total Hours	**60**

Concentrations

Applied Inverse Problems

Code	Title	Hours
MATH-625	Applied Inverse Problems	3
MATH-633	Measure Theory of Elements and Functional Analysis	3
MATH-741	Partial Differential Equations I	3

Biomedical Mathematics

Code	Title	Hours
MATH-631	Dynamical Systems	3
MATH-702	Numerical Analysis II	3
MATH-761	Mathematical Biology	3

Discrete Mathematics

Code	Title	Hours
CSCI-665	Foundations of Algorithms	3
MATH-645	Graph Theory	3
MATH-646	Combinatorics	3

Dynamical Systems and Fluid Dynamics

Code	Title	Hours
MATH-631	Dynamical Systems	3
MATH-741	Partial Differential Equations I	3
MATH-831	Mathematical Fluid Dynamics	3

Geometry, Relativity and Gravitation

Code	Title	Hours
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-861	Advanced Relativity and Gravitation	3
MATH-702	Numerical Analysis II	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Mathematical Modeling program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete foundation courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#mathematical-modeling-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Additional Information

Foundation Courses

Mathematical modeling encompasses a wide variety of scientific disciplines, and candidates from diverse backgrounds are encouraged to apply. If applicants have not taken the expected foundational course work, the program director may require the student to successfully complete foundational courses prior to matriculating into the Ph.D. program. Typical foundation course work includes calculus through multivariable and vector calculus, differential equations, linear algebra, probability and statistics, one course in computer programming, and at least one course in real analysis, numerical analysis, or upper-level discrete mathematics.

Physics MS

Plan Code: PHYS-MS | **HEGIS:** 1902.00

Program Overview

From quantum mechanics to studying the entire universe with general relativity, RIT's master of science in physics prepares you to gain the research and technical skills you will need to advance your career. The program provides robust training in core areas of physics and allows students to select additional sub-areas that align with their interests and career aspirations. Sub-areas may include atomic, molecular, and optical physics; computational physics; lasers; modern and quantum optics; nanoscale physics; physics education research; radiation, scattering, and spectroscopy; relativity and gravitation; solid-state, materials, and device physics; and soft matter and biological physics. You will work directly with faculty to conduct research, including participating in the School of Physics and Astronomy's research in experimental, theoretical, applied, and computational physics. With access to labs and equipment, you will gain hands-on experience and put your knowledge into practice. You will also develop professional skills in organization and leadership, managing research teams, promoting innovation or sustainable technologies, entrepreneurship and intellectual property, finance and accounting, data science, scientific visualization, electronics, STEM pedagogy and education research, public policy, and communication.

Co-ops in the College of Science include cooperative education and internship experiences in industry and health care settings, as well as research in an academic, industry, or national lab.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

Research Option

First Year		
Fall		**Hours**
PHYS-601	Graduate Physics Seminar I	1
Physics Elective [1]		3
Select two of the following:		6
PHYS-610	Mathematical Methods for Physics	
PHYS-611	Classical Electrodynamics I	
PHYS-614	Quantum Theory	
	Hours	**10**
Spring		
PHYS-602	Graduate Physics Seminar II	1
Physics Elective [1]		3
Select one of the following:		3
PHYS-630	Classical Mechanics	
PHYS-640	Statistical Physics	
Select one of the following:		3
PHYS-790	Graduate Research & Thesis	
Physics Elective [1]		
	Hours	**10**
Second Year		
Fall		
PHYS-790	Graduate Research & Thesis	3
Select one of the following:		3
PHYS-610	Mathematical Methods for Physics	
PHYS-611	Classical Electrodynamics I	
PHYS-614	Quantum Theory	
	Hours	**6**

Spring		
PHYS-790	Graduate Research & Thesis	4
	Hours	**4**
	Total Hours	**30**

[1] Students may select a Physics (or closely related) elective from the list below (p. 195).

Professional Option

First Year		
Fall		**Hours**
PHYS-601	Graduate Physics Seminar I	1
Physics Elective or Professional Elective [1]		3
Select two of the following:		6
PHYS-610	Mathematical Methods for Physics	
PHYS-611	Classical Electrodynamics I	
PHYS-614	Quantum Theory	
	Hours	**10**
Spring		
PHYS-602	Graduate Physics Seminar II	1
Physics Elective [1]		3
Physics Elective or Professional Elective [1]		3
Select one of the following:		3
PHYS-630	Classical Mechanics	
PHYS-640	Statistical Physics	
	Hours	**10**
Second Year		
Fall		
PHYS-780	Graduate Physics Project	4
Physics Elective or Professional Elective [1]		3
Physics Elective [1]		3
	Hours	**10**
	Total Hours	**30**

[1] Students may select a Physics (or closely related) elective from the list below (p. 195). Professional Electives may be selected from the list below (p. 195).

Physics (or closely-related) Electives

List is representative and not exhaustive; other courses as approved by the Program may also be considered.

Code	Title	Hours
Sample Electives in Science		
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-861	Advanced Relativity and Gravitation	3
CLRS-601	Principles of Color Science	3
CLRS-602	Color Physics and Applications	3
IMGS-617	Image Processing and Discrete Fourier Methods	2
IMGS-619	Radiometry	2
IMGS-628	Design and Fabrication of Solid State Cameras	3
IMGS-633	Optics for Imaging	2
IMGS-635	Optical System Design and Analysis	3
IMGS-639	Principles of Solid State Imaging Arrays	3
IMGS-642	Testing of Focal Plane Arrays	3
IMGS-719	Radiative Transfer I	3
IMGS-720	Radiative Transfer II	3
MATH-602	Numerical Analysis I	3
MATH-702	Numerical Analysis II	3
MATH-712	Numerical Methods for Partial Differential Equations	3
MATH-831	Mathematical Fluid Dynamics	3
MTSE-601	Materials Science	3
MTSE-632	Solid State Science	3
PHYS-612	Classical Electrodynamics II	3
PHYS-616	Data Analysis for the Physical Sciences	3
PHYS-667	Quantum Optics	3
PHYS-670	Teaching and Learning Physics	3
PHYS-689	Graduate Special Topics	1-3
PHYS-715	Advanced Quantum Theory	3
PHYS-720	Computational Methods for Physics	3
PHYS-732	Advanced Solid State Physics	3
PHYS-751	Soft Matter Physics	3
PHYS-752	Biological Physics	3
PHYS-760	Radiation Interactions & Scattering Probes of Matter	3
PHYS-767	Optical Coherence and Light-Matter Interactions	3
PHYS-770	Advanced Methods in Physics Education Research	3
PHYS-799	Physics Independent Study	1-4
Sample Electives in Engineering		
EEEE-605	Modern Optics For Engineers	3
EEEE-689	Fundamentals of MEMS	3
MCEE-620	Photovoltaic Science and Engineering	3
MCEE-713	Quantum and Solid-State Physics for Nanostructures	3
MCSE-702	Introduction to Nanotechnology and Microsystems	3
MCSE-712	Nonlinear Optics	3
MCSE-713	Lasers	3
MCSE-731	Integrated Optical Devices & Systems	3
MCSE-771	Optoelectronics	3
MCSE-889	Special Topics (variable)	3

Professional Electives

List is representative and not exhaustive; other courses as approved by the Program may also be considered.

Code	Title	Hours
Sample Electives in Business		
ACCT-603	Accounting for Decision Makers	3
ACCT-794	Cost Management in Technical Organizations	3
BLEG-612	Legal and Accounting Issues for New Ventures	3
DECS-744	Project Management	3
ESCB-705	Economics and Decision Modeling	3
FINC-605	Financing New Ventures	3
FINC-721	Financial Analysis for Managers	3
MGIS-650	Introduction to Data Analytics and Business Intelligence	3
MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
MGMT-755	Negotiations	3
Sample Electives in Science		
ITDS-611	STEM Education: Concepts and Practice	3

ITDS-613	STEM Education: Research Methods and Theory	3
Sample Electives in Engineering		
EEEE-610	Analog IC Design	3
EEEE-620	Design of Digital Systems	3
Sample Electives in Liberal Arts		
PSYC-716	Graduate Social Psychology	3
PUBL-630	Energy Policy	3
PUBL-701	Graduate Policy Analysis	3
Sample Electives in Sustainability		
ISUS-704	Industrial Ecology	3
ISUS-705	Technology, Policy, and Sustainability	3
Sample Electives in Computing & Information Sciences		
CSCI-603	Computational Problem Solving	3
CSCI-605	Advanced Object-Oriented Programming Concepts	3
CSCI-610	Foundations of Computer Graphics	3
CSCI-620	Introduction to Big Data	3
CSCI-714	Scientific Visualization	3
CSCI-720	Big Data Analytics	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall; Spring may be considered
Full-time Application Deadline: Fall - February 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall; Spring may be considered
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Physics program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in physics, applied physics, or a closely-related discipline within the physical/mathematical sciences or engineering fields. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: GRE optional but recommended
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Physics Ph.D.

Plan Code: PHYS-PHD | **HEGIS:** 1902.00

Program Overview

RIT's physics Ph.D. fosters a creative and innovative approach to physics education and knowledge expertise. Graduates of the physics Ph.D. program become leaders in their field, shaping and improving the world with the knowledge gained at RIT. The program offers various research areas, allowing you to pursue your passion and delve into cutting-edge scientific investigations. You will have the opportunity to work with distinguished faculty who are dedicated to mentorship and to ensuring each student receives personalized guidance and support throughout their academic journey. The curriculum provides a deep understanding of fundamental physics principles, advanced research skills, and specialized knowledge in your chosen areas of focus. The program combines core courses, electives, research, and professional development activities.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program.

First Year		
Fall		**Hours**
PHYS-601	Graduate Physics Seminar I	1
Select two of the following:		6
PHYS-610	Mathematical Methods for Physics	
PHYS-611	Classical Electrodynamics I	
PHYS-614	Quantum Theory	
Select one of the following:		3
PHYS-790	Graduate Research & Thesis	
Physics Elective [1]		
	Hours	**10**
Spring		
PHYS-602	Graduate Physics Seminar II	1
Physics Elective [1]		3
Select one of the following:		3
PHYS-630	Classical Mechanics	
PHYS-640	Statistical Physics	
Select one of the following:		3
PHYS-790	Graduate Research & Thesis	
Physics Elective [1]		
	Hours	**10**
Second Year		
Fall		
PHYS-790	Graduate Research & Thesis	3
Physics Elective [1]		3
Select one of the following:		3
PHYS-610	Mathematical Methods for Physics	
PHYS-611	Classical Electrodynamics I	
PHYS-614	Quantum Theory	
	Hours	**9**
Spring		
PHYS-790	Graduate Research & Thesis	3
Select one of the following:		3
PHYS-790	Graduate Research & Thesis	
Physics Elective [1]		
Select one of the following:		3
PHYS-790	Graduate Research & Thesis	
Physics Elective [1]		
	Hours	**9**
Third Year		
Fall		
PHYS-890	Research & Thesis	3
	Hours	**3**
Spring		
PHYS-890	Research & Thesis	3
	Hours	**3**
Fourth Year		
Fall		
PHYS-890	Research & Thesis	4
	Hours	**4**
Spring		
PHYS-890	Research & Thesis	4
	Hours	**4**
Fifth Year		
Fall		
PHYS-890	Research & Thesis	4
	Hours	**4**
Spring		
PHYS-890	Research & Thesis	4
	Hours	**4**
	Total Hours	**60**

1 Students may select Physics (or closely related) Electives from the list below (p. 197).

Physics (or closely-related) Electives

List is representative and not exhaustive; other courses as approved by the Program may also be considered.

Code	Title	Hours
Sample Electives in Science		
ASTP-660	Introduction to Relativity and Gravitation	3
ASTP-861	Advanced Relativity and Gravitation	3
IMGS-617	Image Processing and Discrete Fourier Methods	2
IMGS-635	Optical System Design and Analysis	3
IMGS-719	Radiative Transfer I	3
IMGS-720	Radiative Transfer II	3
MTSE-705	Experimental Techniques	3
MATH-602	Numerical Analysis I	3
MATH-831	Mathematical Fluid Dynamics	3
PHYS-612	Classical Electrodynamics II	3
PHYS-616	Data Analysis for the Physical Sciences	3
PHYS-667	Quantum Optics	3
PHYS-670	Teaching and Learning Physics	3
PHYS-689	Graduate Special Topics	1-3
PHYS-715	Advanced Quantum Theory	3
PHYS-720	Computational Methods for Physics	3
PHYS-732	Advanced Solid State Physics	3
PHYS-751	Soft Matter Physics	3
PHYS-752	Biological Physics	3
PHYS-760	Radiation Interactions & Scattering Probes of Matter	3
PHYS-767	Optical Coherence and Light-Matter Interactions	3
PHYS-770	Advanced Methods in Physics Education Research	3
PHYS-789	Graduate Special Topics	1-4

PHYS-799	Physics Independent Study	1-4
PHYS-889	PHYS Advanced Special Topics	1-3
PHYS-899	Independent Study	1-3
Sample Electives in Engineering		
EEEE-610	Analog IC Design	3
EEEE-620	Design of Digital Systems	3
EEEE-689	Fundamentals of MEMS	3
EEEE-711	Advanced Carrier Injection Devices	3
MCEE-620	Photovoltaic Science and Engineering	3
MCSE-705	Epitaxial Crystal Growth and Thin Film Science	3
MCSE-712	Nonlinear Optics	3
MCSE-713	Lasers	3
MCSE-771	Optoelectronics	3
MCSE-889	Special Topics (variable)	3

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline, rolling thereafter
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Physics program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college in physical sciences or engineering. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete foundation courses (p.) prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#physics-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: GRE, both General and Physics, are optional. No minimum score requirement.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 94
IELTS: 7.0
PTE Academic: 66

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant’s need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

The School is committed to a diverse applications pool and alleviating any financial burden of application. For information, please contact the Program Director.

Additional Information

Foundation Courses

Physics forms the backbone of many scientific and engineering disciplines, thus candidates from diverse backgrounds are encouraged to apply. However, applicants to the doctoral program are typically expected to have some undergraduate preparation in physics, including courses in electromagnetism, classical and quantum mechanics, statistical physics, and mathematical methods of physics. If applicants have not taken the expected background coursework, the program director may require the student to successfully complete foundational courses prior to matriculating into the Ph.D. program. A written agreement between the candidate and the program director will identify the required foundation courses, which must be completed with an overall B average before a student can matriculate into the graduate program. Note that this can lead to a delay in degree completion by as much as a year.

College of Science Faculty

Dean's Office

André O. Hudson, BS, Virginia Union University; Ph.D., Rutgers University—Dean; College of Science; Professor, Biochemistry: amino acid metabolism, bacterial cell wall metabolism, plant-bacterial interactions

Larry Buckley, BA, University of Missouri at St. Louis; MS, Southern Illinois University at Edwardsville; Ph.D., Southern Illinois University at Carbondale—Senior Associate Dean for Academic Affairs; Associate Professor

Casey Miller, BA, Wittenberg University; Ph.D., University of Texas at Austin—Senior Associate Dean for Research and Faculty Affairs; Professor

Catherine Mahrt-Washington, BS, Niagara University; MS, Rochester Institute of Technology; Ph.D., Andrews University—Senior Assistant Dean; Director of Student Advising; College of Science Honors Advocate

Bioinformatics

Gregory Babbitt, BA, Ohio Wesleyan University; MS, Ph.D., University of Florida—Associate Professor: evolution of the biophysical properties of whole genomes and their interactions with DNA binding proteins

Elle M. Barnes, BA, New York University; Ph.D., Fordham University—Assistant Professor: Creation and maintenance of host- associated microbiomes, Integration of ecological theory with molecular and computational methods

Eli Borrego, BS, Ph.D., Texas A&M University—Assistant Professor: plant biochemistry and pathology

Larry Buckley, BA, University of Missouri; MS, Southern Illinois University at Edwardsville; Ph.D., Southern Illinois University at Carbondale—Senior Associate Dean for Academic Affairs; Associate Professor, Biology: herpetology, anatomy, evolution, biogeography, systematics

Feng Cui, MS, Truman State University; Ph.D., Iowa State University; MD, Hunan Medical University (China)—Graduate Program Director, Bioinformatics; Professor, Bioinformatics: next- generation sequencing data analysis, chromatin organization, epigenomics, cancer genomics and p53-DNA interactions

André O. Hudson, BS, Virginia Union University; Ph.D., Rutgers University—Dean, College of Science; Professor, Biochemistry: amino acid metabolism, bacterial cell wall metabolism, plant- bacterial interactions

Michael V. Osier, BS, University of Vermont; Ph.D., Yale University—Associate Professor, Bioinformatics: high-throughput sequencing analysis, human genetics

Elena Lopez Peredo, BS, Ph.D., University of Oviedo (Spain)—Assistant Professor, Adaptations between terrestrial and aquatic lifestyles during plant evolution, microbial communities, ecosystems

Gary R. Skuse, BA, University of Rochester; Ph.D., Syracuse University—Professor Emeritus, Bioinformatics: cancer genetics, RNA processing, natural language processing to mine the scientific and medical literature, computer networking, wired and wireless communications

Julie A. Thomas, B.App.Sc., Ph.D., LaTrobe University, Bendingo (Australia)—Associate Professor, virology, phage genetics and genome structure, phage gene expression

Crista Wadsworth, BA, Smith College; Ph.D., Tuffs University—Associate Professor, microbial evolution, populations dynamics and genomics.

Environmental Science

Elle M. Barnes, BA, New York University; Ph.D., Fordham University—Assistant Professor: Creation and maintenance of host- associated microbiomes, Integration of ecological theory with molecular and computational methods

Eli Borrego, BS, Texas A&M University, Ph.D., Texas A&M University—Assistant Professor, Biology: plant biochemistry and pathology

Evelyn Brister, BA, Austin College; Ph.D., Northwestern University—Professor, Philosophy: Philosophy of science and environmental philosophy, land management and ecological applications.

Larry Buckley, BA, University of Missouri; MS, Southern Illinois University at Edwardsville; Ph.D., Southern Illinois University at Carbondale—Senior Associate Dean for Academic Affairs; Associate Professor, Biology: herpetology, anatomy, evolution, biogeography, and systematics

Sandra Connelly, BS, Juniata College; MS, University at Buffalo; Ph.D., Miami University of Ohio—Principal Lecturer, Biology: ecotoxicology, freshwater ecosystems, anthropogenic stresses, UV-radiation, evolution

Nathan Eddingsaas, BS, University of Wisconsin, Stevens Point; Ph.D., University of Illinois at Urbana- Champaign—Associate Professor, Analytical Chemistry: atmospheric chemistry

Elizabeth N. Hane, BA, Rice University; MA, University of Kansas; Ph.D., Brown University—Professor, Biology: plant community ecology, ecosystem biology, conservation biology

Matthew J. Hoffman, BA, Williams College; MS, Ph.D., University of Maryland—Professor, data assimilation, applied mathematics, ocean and atmospheric forecasting, remote sensing; hyperspectral vehicle tracking

M. Ann Howard, BS, Cornell University; J.D., Rutgers University School of Law—Professor, College of Liberal Arts, Science, Technology and Society/Public Policy: relationship between environmental decision-making and the role of citizen involvement, sustainable community development

André O. Hudson, BS, Virginia Union University; Ph.D., Rutgers University—Dean, College of Science; Professor, Biochemistry: amino acid metabolism, bacterial cell wall metabolism, plant-bacterial interactions

Christine Keiner, BA, McDaniel College; Ph.D., Johns Hopkins University—Associate Professor, College of Liberal Arts, Science, Technology and Society/Public Policy: history of ecology and biology, U.S. environmental politics, and relations between science and politics

Karl F. Korfmacher, BA, Carleton College; MS, Ph.D., Duke University—Professor, Environmental Science: GIS-based habitat suitability, transportation, hydrologic, and pollution modelling, green infrastructure land cover analysis, soil science

Carmody K. McCalley, BA, Middlebury College; Ph.D., Cornell University—Graduate Program Director, Environmental Science; Associate Professor, Environmental Science: biogeochemistry, global change biology, terrestrial and wetland ecosystem ecology

Susan Smith Pagano, BS, State University College at Oswego; MS, State University College at Brockport; Ph.D., University of Rhode Island—

Associate Head; Associate Professor, Biology: avian nutritional ecology and migration physiology

Todd Pagano, BA, State University College at Oswego; MS, Ph.D., Tufts University—Professor, Chemistry/Laboratory Science Technology: aquatic chemistry, environmental chemistry, sensor/instrument design, environmental monitoring

Elena Lopez Peredo, BS, Ph.D., University of Oviedo (Spain)—Assistant Professor: Adaptations between terrestrial and aquatic lifestyles during plant evolution, microbial communities, ecosystems

Paul Shipman, BSE, MS, Emporia State University; Ph.D., Oklahoma State University—Associate Professor, Biology: ecological informatics, conservation of amphibians and reptiles, behavioral and evolutionary ecology

Kaitlin Stack-Whitney, BS, Cornell University; Ph.D., University of Wisconsin-Madison—Assistant Professor, Biology: insects, ecology, novel ecosystems, environmental policy, critical open studies, animal studies, and pollinators

Anna Christina Tyler, BS, Cornell University; MS, Ph.D., University of Virginia—Professor, Environmental Science and Biology: aquatic ecology, biogeochemistry, invasive species, ecosystem restoration

Jan van Aardt, BSc, University of Stellenbosch (South Africa); MS, Ph.D., Virginia Polytechnic Institute and State University—Director, Chester F. Carlson Center for Imaging Science; Professor, Imaging Science: remote sensing of natural resources, application of hyperspectral, light detection and ranging for spectral- structural characterization of natural systems, integrated modeling approaches, scaling of natural resources remote sensing solutions through sensor interoperability

Jeffrey Wagner, AB, University of Missouri at Columbia; MS, Ph.D., University of Illinois-Urbana—Professor, College of Liberal Arts, Economics: sustainable waste management, green consumption, economics of active transportation, economics of endangered species recovery

Applied and Computational Mathematics, Applied Statistics

Anurag Agarwal, MS, Indian Institute of Technology (India); Ph.D., State University of New York at Buffalo—Associate Professor, number theory, cryptography, algebra, graph theory

Ephraim Agyingi, BS, MS, University of Ilorin (Nigeria); Ph.D., University of Manchester (United Kingdom)—Professor, numerical analysis

Olalekan Babaniyi, BS, MS, Ph.D., Boston University—Assistant Professor, inverse problems, computational mechanics, biomechanical imaging, uncertainty quantification

Mihail Barbosu, BS, Ph.D., Babes- Bolyai University (Romania); MS, Ph.D., Paris VI University (France)—Associate Head, Applied Statistics; Professor, mathematical modeling, dynamical systems, celestial mechanics and space dynamics, symbolic computation systems, data analytics, management science

Nathaniel Barlow, BS, Ph.D., Clarkson University—Undergraduate Program Coordinator, Applied and Computational Mathematics; Associate Professor, stability and propagation of waves in fluids, asymptotic methods

Maurino P. Bautista, BS, Ateneo de Manila University (Philippines); MS, Ph.D., Purdue University—Professor, numerical analysis, applied mathematics

Bernard Brooks, BS, University of Toronto (Canada); MBA, Rochester Institute of Technology; MS, Ph.D., University of Guelph (Canada)—Associate Head, School of Mathematics and Statistics; Professor, mathematical modeling, dynamical systems, financial mathematics

Nathan Cahill, BS, MS, Rochester Institute of Technology; D.Phil., University of Oxford (United Kingdom)—Professor, Mathematics: scientific computing, biomedical image analysis, computer vision, advanced mathematical approaches to image processing

Manuela Campanelli, Laureate in Mathematics, University of Perugia (Italy); Ph.D., University of Bern (Switzerland)—Director, Center for Computational Relativity and Gravitation; John Vouros Endowed Professor; Distinguished Professor, Mathematics: numerical relativity, gravitational physics, computational astrophysics, black holes, gravitational waves

Lucia Carichino, BS, MS, Politecnico di Milano (Italy); Ph.D., Purdue University—Assistant Professor, mathematical modeling, scientific computing

Linlin Chen, BS, Beijing University (China); MCS, Rice University; MA, Ph.D., University of Rochester—Associate Professor, statistics, biostatistics, statistical consulting, genetics, bioinformatics and computational biology

Matthew Coppenbarger, BS, University of Arizona; MA, Ph.D., University of Rochester—Associate Professor, mathematical physics, spectral theory

Michael Cromer, BS, York College of Pennsylvania; MS, Ph.D., University of Delaware—Associate Professor, mathematical modeling of complex fluids, asymptotics and perturbation methods, simulation

Blessing Emerenini, BTech, Federal University of Technology (Nigeria); M.Sc.,Technical University Eindhoven (Netherlands); M.Eng., Johannes Kepler University (Austria); Ph.D., University of Guelph (Canada)—Assistant Professor, mathematical modeling, mathematical biology

Joshua Faber, BS, State University of New York at Stony Brook; Ph.D., Massachusetts Institute of Technology—Head, School of Mathematics and Statistics; Professor, numerical relativity, computational astrophysics, dynamics

Raluca Felea, BS, University of Iasi (Romania); Ph.D., University of Rochester—Professor, microlocal analysis

Ernest Fokoue, Maitrise B.Sc., University of Yaounde (Cameroon); M.Sc., Aston University (United Kingdom); Ph.D., University of Glasgow (United Kingdom)—Professor, statistical machine learning and data mining

Teresa Gibson, BS, Carnegie Mellon University; MS, MA, Ph.D., University of Michigan—Graduate Program Director, Applied Statistics; Professor of Practice, advanced analytic methods, machine learning

Anthony A. Harkin, BS, State University College at Brockport; MS, Massachusetts Institute of Technology; Ph.D., Boston University—Associate Professor, applied and computational mathematics, partial differential equations

Matthew J. Hoffman, BA, Williams College; MS, Ph.D., University of Maryland—Professor, data assimilation, applied mathematics, ocean and atmospheric forecasting, remote sensing; hyperspectral vehicle tracking

Jobby Jacob, BS, Bharata Mata College (India); MS, Indian Institute of Technology (India); MS, Ph.D., Clemson University—Professor, graph theory

Baasansuren Jadamba, BS, National University of Mongolia (Mongolia); MS, University of Kaiserslautern (Germany); Ph.D., University of Erlangen-Nuremberg (Germany)—Associate Head; Professor, partial differential equations, inverse problems, numerical optimization

Akhtar Khan, MS, Technical University Kaiserslautern (Germany); Ph.D., Michigan Technological University—Professor, applied math, optimization, inverse problems, variational inequalities, elasticity imaging

Manuel Lopez, AB, Princeton University; Ph.D., Wesleyan University—Associate Professor, homological algebra

Carlos Lousto, MS, Universidad Nacional De La Plata (Argentina); Ph.D., Universidad De Buenos Aires (Argentina)—Professor, numerical relativity

Carl V. Lutzer, BS, Michigan State University; MA, Ph.D., University of Kentucky—Director, Honors Program; Professor, mathematical physics

Kara L. Maki, BS, University of New Hampshire; MS, Ph.D., University of Delaware—Graduate Program Director, Applied and Computational Mathematics; Professor, mathematical modeling, scientific computing

Nishant Malik, BS, MS, University of Delhi (India), Ph.D., University of Potsdam (Germany)—Associate Professor, network science, nonlinear dynamics, stochastic processes

James E. Marengo, BA, MS, California State University; Ph.D., Colorado State University—Professor, statistics, probability

Nonhle Channon Mdziniso, B.Sc., University of Swaziland (Eswatini); MA, Marshall University; Ph.D., Central Michigan University—Assistant Professor, probability distributions theory and applications, statistical modeling; parametric and nonparametric regression, data mining, machine learning

Laura M. Munoz, BS, California Institute of Technology; Ph.D., University of California at Berkeley—Associate Professor, mathematical biology, dynamical systems, applied control theory

Darren A. Narayan, BS, State University of New York at Binghamton; MS, Ph.D., Lehigh University—Professor, graph theory, discrete math

Shahla Nasserasr, Honours B.Sc., Tabriz University (Iran); M.Sc., Shahid Beheshti University (Iran); M.Sc., University of Victoria (Canada); Ph.D., College of William and Mary—Assistant Professor, discrete mathematics, graph theory

Richard O'Shaughnessy, BA, Cornell University; Ph.D., California Institute of Technology—Associate Professor, gravitational wave astrophysics

Niels F. Otani, BA, University of Chicago; Ph.D., University of California at Berkeley—Associate Professor, mathematical biology

Robert J. Parody, BS, Clarkson University; MS, Rochester Institute of Technology; Ph.D., University of South Carolina—Associate Professor, experimental design, response surface methods, quality control and improvement

Michael Radin, BA, Rowan University; MS, Ph.D., University of Rhode Island—Associate Professor, differential equations

Mary Lynn Reed, BS, Georgia Institute of Technology; MFA, University of Maryland; Ph.D., University of Illinois—Professor, abstract algebra, network science, cybersecurity, statistical modeling

Brendan Rooney, BSc, Simon Fraser University (Canada); MS, Ph.D., University of Waterloo (Canada)—Assistant Professor, graph theory, combinatorics

Anastassiya Semenova, BS, MS, Ph.D., University of New Mexico—Assistant Professor, fluid mechanics, instabilities, spectral theory, perturbation methods

Hossein Shahmohamad, BS, MA, California State University at Long Beach; Ph.D., University of Pittsburgh—Professor, graph theory

Nourridine Siewe, Honours BS, MS, University of Buea (Cameroon); Howard University—Assistant Professor, mathematical modeling, mathematical epidemiology

Wanda Szpunar-Lojasiewicz, BS, Jagiellonian University (Poland); MS, Ph.D., University of Cracow (Poland)—Associate Professor, analysis, multi-variable and vector calculus

John T. Whelan, BA, Cornell University; Ph.D., University of California at Santa Barbara—Professor, computational relativity and gravitation, gravitational wave data analysis

Tamas Wiandt, BS, Jozsef Attila University (Hungary); Ph.D., University of Minnesota—Professor, dynamical systems

Anthony E. Wong, BA, Ohio Wesleyan University; MS, Ph.D., University of Colorado, Boulder—Assistant Professor, data assimilation, model calibration, geophysical models

Elmer L. Young, BA, Amherst College; MS, Ph.D., The Ohio State University—Associate Professor, topology and analysis

Yosef Zlochower, BS, Ph.D., University of Pittsburgh—Professor, numerical relativity, relativistic astrophysics, black hole physics

Chemistry

Emiliano Brini, BS, MS, Bologna University (Italy); Ph.D., TU Darmstadt (Germany)—Assistant Professor, Physical Chemistry and Biochemistry: molecular dynamics simulations, protein to protein interactions, free energy calculations

Jeremy Cody, BS, Indiana University of Pennsylvania; Ph.D., University of Rochester—Associate Professor, Organic Chemistry: synthetic organic chemistry

Christina Goudreau Collison, BA, Colby College; Ph.D., University of Rochester—Professor, Organic Chemistry: synthetic organic chemistry, chemical education

Christopher Collison, BSc, Ph.D., Imperial College of London (United Kingdom)—Jane King Harris Endowed Professor, Physical Chemistry: photovoltaic chemistry

Paul A. Craig, BS, Oral Roberts University; Ph.D., University of Michigan—Professor, Biochemistry: computational biochemistry, biochemistry education

Nathan Eddingsaas, BS, University of Wisconsin, Stevens Point; Ph.D., University of Illinois at Urbana-Champaign—Chemistry; Associate Professor, Analytical Chemistry: atmospheric chemistry

Michael D. Heagy, AB, Franklin and Marshall College; Ph.D., University of Southern California, Los Angeles—Head, School of Chemistry and Materials Science; Professor, Physical Organic Chemistry: fluorescent probes, solar fuels, photocatalysis

André O. Hudson, BS, Virginia Union University; Ph.D., Rutgers University—Dean; Professor, Biochemistry: amino acid metabolism, bacterial cell wall metabolism, plant-bacterial interactions

Pritam Ganguly, BS, Calcutta University (India); MS, Indian Institute of Technology (India); Ph.D., Technische Universität Darmstadt (Germany)—Assistant Professor

Ahmad Kirmani, BS, MS, Aligarh Muslim University (India); Ph.D., King Abdullah University of Science and Technology (Saudi Arabia)—Assistant Professor, perovskite photovoltaics, metal oxide electronics, colloidal quantum dot photovoltaics

Jian Liu, BS, Qingdao Agricultural University (China); MS, University of Science and Technology (China); Ph.D., Binghamton University—Assistant Professor, surface science, nanomaterials, photocatalysis, heterogeneous catalysis, metal- organic frameworks

Lea V. Michel, BA, Colgate University; Ph.D., University of Rochester—Professor, Biochemistry: structural biology, biophysics, vaccine development

Massoud J. Miri, BS, MS, Ph.D., University of Hamburg (Germany)—Graduate Program Director, Chemistry; Associate Professor, Polymer Chemistry: polymerization mechanisms, polymer properties, catalysis

Suzanne O'Handley, BS, Rutgers University; MS, Ph.D., University of Rochester—Associate Professor, Biochemistry: cloning characteristics of nudix hydrolases, novel phosphatase families, novel antibiotic targets, enzyme-substrate specificity

Hans Schmitthenner, BS, Massachusetts Institute of Technology; Ph.D., Pennsylvania State University—Research Professor, Analytical and Organic Chemistry: imaging agent synthesis and analysis.

Gerald A. Takacs, BSc, University of Alberta (Canada); Ph.D., University of Wisconsin—Professor, Physical Chemistry: chemical kinetics, atmospheric chemistry, plasma chemistry, and photochemistry

Scott Williams, BS, Purdue University; Ph.D., Montana State University—Graduate Program Director, Materials Science and Engineering; Professor, Inorganic Chemistry: nanomaterials, metal oxides, electronic materials, functional printing

Materials Science and Engineering

Jairo Diaz Amya, B.Sc., National University of Colombia, Bogota; Ph.D., Purdue University—Assistant Professor, Chemical Engineering: soft matter, biological systems, structural biology, controlling self-assembly of chiral cellulose nanocrystals

Mishkat Bhattacharya, B.Tech., Indian Institute of Technology (India); MA, Ph.D., University of Rochester—Professor, Physics: quantum optics, nanoscience, superconductivity

David A. Borkholder, BS, Rochester Institute of Technology; MS, Ph.D., Stanford University—Bausch and Lomb Professor of Microsystems Engineering

Christopher Collison, BS, Ph.D., Imperial College of London (United Kingdom)—Jane King Harris Endowed Professor, Physical Chemistry: polymer chemistry, organic photovoltaics

Denis Cormier, BS, University of Pennsylvania; MS, State University of New York at Buffalo; Ph.D., North Carolina State University—Earl W. Brinkman Professor: additive manufacturing, rapid prototyping

Michael Cromer, BS, York College of Pennsylvania; MS, Ph.D., University of Delaware—Associate Professor, mathematical modeling of complex fluids, asymptotics and perturbation methods, simulation

Pratik P. Dholabhai, BS, MS, Maharaja Sayajirao University of Baroda (India); MS, Ph.D., University of Texas at Arlington—Associate Professor, Physics: computational condensed matter physics and materials science, materials by design, nanostructured materials, materials for energy technologies

Moumita Das, BS, MS, Jadavpur University (India); Ph.D., Indian Institute of Science—Professor, Physics: theoretical soft condensed matter, mechanical response of biological materials and living systems

Scott Franklin, BA, University of Chicago; Ph.D., University of Texas—Professor, Physics: granular materials.

Thomas R. Gaborski, BS, Cornell University; MS, Ph.D., University of Rochester—Associate Professor, nanomaterials, separations, cellular mechanics

Gabrielle Gaustad, BS, Alfred University; MS, Ph.D., Massachusetts Institute of Technology—Associate Professor: sustainability, materials recovery

Surendra K. Gupta, B.Tech., India Institute of Technology (India); MS, University of Notre Dame; Ph.D., University of Rochester—Professor, Mechanical Engineering: x-ray diffraction, atomic force microscopy, micromechanics modeling, digital image analysis

Richard K. Hailstone, BS, Northern Illinois University; MS, Indiana University—Associate Professor, Imaging Science: silver halide materials and processing, imaging materials

Seth M. Hubbard, BS, Drexel University; MS, Case Western Reserve University; Ph.D., University of Michigan—Head, School of Physics and Astronomy; Professor, Physics: epitaxial crystal growth, growth and characterization of nanomaterials, high-efficiency photovoltaic devices, semiconductor device design and fabrication, thin films

Patricia Iglesias Victoria, BS, Ph.D., Polytechnic University of Cartagena (Spain)—Assiociate Professor: ionic liquids, tribology

Michael A. Jackson, BS, MS, Ph.D., State University of New York at Buffalo—Associate Professor, Microelectronic Engineering: microelectronic device design, fabrication, and test; material characterization techniques, surface analytical instrumentation; vacuum processing, including CVD, plasma, and ion beam techniques, micromachining, ferroelectric thin films, amorphous silicon and polysilicon film deposition and characterization

Ahmad Kirmani, BS, MS, Aligarh Muslim University (India); Ph.D., King Abdullah University of Science and Technology (Saudi Arabia)—Assistant

Professor, perovskite photovoltaics, metal oxide electronics, colloidal quantum dot photovoltaics

Karuna Koppula, B.Tech., Andhra University (India); MS, University of New Hampshire; Ph.D., Michigan State University—Senior Lecturer, Chemical Engineering: turbulent flow modeling, multiphase flow in Pulse jet mixers

Michael Kotlarchyk, BS, MS, Ph.D., Massachusetts Institute of Technology—Professor, Physics: characterization of structure and phase transitions in surfactant systems (micelles, microemulsions, and liquid crystals) using scattering techniques; mass and surface fractals in condensed matter systems, theories of liquids; chaos in simple non-linear physical systems

Santosh Kurinec, BS, MS, Ph.D., University of Delhi (India)—Professor, Microelectronic Engineering; electronic materials and devices, IC processing, quantum and nanoscale devices

Kathleen Lamkin-Kennard, BS, Worcester Polytechnic Institute; MS, Ph.D., Drexel University—Associate Professor, Mechanical Engineering: biomedical engineering and biomaterials

Brian Landi, BS, MS, Ph.D., Rochester Institute of Technology—Professor, Chemical Engineering: batteries, nanomaterials, carbon nanotubes

Christopher Lewis, BS, Pennsylvania College of Technology; MS, University of Texas; Ph.D., University of Rochester—Assistant Professor, College of Engineering Technology: thermoplastics, polymers, shape memory, biodegradation

Jian Liu, BS, Qingdao Agricultural University (China); MS, University of Science and Technology (China); Ph.D., Binghamton University—Assistant Professor, surface science, nanomaterials, photocatalysis, heterogeneous catalysis, metal-organic frameworks

Casey Miller, BA, Wittenberg University; Ph.D., University of Texas at Austin—Associate Dean for Research and Faculty Affairs; Professor, Chemistry and Materials Science: thin film magnetism, spintronics, magnetocaloric effect

Massoud Miri, BS, MS, Ph.D., University of Hamburg (Germany)—Graduate Program Director, Chemistry; Associate Professor, Chemistry: polymerization mechanisms, polymer properties, catalysis

Parsian Mohseni, BS, Ph.D., McMaster University (Canada)—Assistant Professor, Microsystems Engineering: solid state physics, optoelectronics, materials characterization, nanoscale engineering and physical chemistry, synthesis paradigms for precise manipulation of material properties at the nanometer scale for next generation device technologies

Ali Ogut, B.Ch.E., Hacettepe University (Turkey); MS, Ph.D., University of Maryland—Professor, Mechanical Engineering: polymer processing, heat and mass transfer, rheology, transport phenomena

Michael S. Pierce, BS, Rensselaer Polytechnic Institute; MS, Ph.D., University of Washington—Associate Professor, Physics: experimental physics, condensed matter physics, surface science, magnetism, x-ray science, and phase transitions

Poornima Padmanabhan, B.Tech., Indian Institute of Technology, Madras (India); Ph.D., Cornell University—Assistant Professor, Chemical Engineering: self-assembly, thermodynamics, materials design, soft matter

Sean L. Rommel, BS, Ph.D., University of Delaware—Professor, Microelectronic Engineering; emerging semiconductor devices, photonic devices, integration

Michael Schertzer, B. Eng. Mgt., M.A.Sc., McMaster University (Canada); Ph.D., University of Toronto (Canada)—Associate Professor, Bioengineering and Microsystems

Michael Schrlau, BS, University of Pittsburgh; Ph.D., University of Pennsylvania—Assistant Professor, Bioengineering and Microsystems

Bruce Smith, BS, MS, Ph.D., Rochester Institute of Technology—Professor, Microelectronic Engineering: 193 nm lithography, multilayer resist processing, attenuated phase shift mask materials

Patricia Taboada-Serrano, BS, Mayor de San Andres University (Bolivia); MS, Simon Bolivar University (Venezuela); Ph.D., Georgia Institute of Technology—Associate Professor, Chemical Engineering: titanium dioxide nanotubes, electrosorption, sustainable energy for underserved populations

Gerald A. Takacs, BS, University of Alberta (Canada); Ph.D., University of Wisconsin—Professor, Chemistry: physical chemistry, chemical kinetics, photochemistry, atmospheric chemistry, plasma etching and modification of materials

George Thurston, AB, Oberlin College; Ph.D., Massachusetts Institute of Technology—MS Graduate Program Director, Physics; Professor, Physics: biological and chemical physics, experimental and theoretical studies of phase transitions, physical and chemical basis of protein condensation diseases, nuclear magnetic resonance, light, x-ray, and neutron scattering

Obioma Uche, B.Sc., University of California, Berkeley; Ph.D., Princeton University—Visiting Assistant Professor, Chemical Engineering: surface dynamics, computational catalysis

Jayanti Venkataraman, BS, MS, Bangalore University (India); Ph.D., Indian Institute of Science (India)—Professor, Electrical Engineering: electromagnetic fields

Steven J. Weinstein, BS, University of Rochester; MS, Ph.D., University of Pennsylvania—Department Head; Professor, interfacial transport processes, hydrodynamic wave phenomena, applied mathematics

Scott Williams, BS, Purdue University; Ph.D., Montana University—Graduate Program Director, Materials Science and Engineering; Professor, Inorganic Chemistry: nanomaterials, metal oxides, electronic materials, functional printing

Physics

Raphael A. Abrahao, BS, MS, University of Campinas (Brazil); Ph.D., University of Queensland (Australia)—Assistant Professor, Physics: experimental quantum optics, quantum information, and photonics

Ashish Agrawal, B. Tech., Indian Institute of Technology (India); MS, Ph.D., Virginia Polytechnic Institute—Assistant Professor, Engineering Technology: STEM education

Mishkat Bhattacharya, B.Tech., Indian Institute of Technology (India); MA, Ph.D., University of Rochester—Professor, Physics: quantum optics, quantum information, optomechanics, precision measurement, non-classical state engineering, cold atoms and molecules, superconducting quantum computing

Manuela Campanelli, Laureate in Mathematics, University of Perugia (Italy); Ph.D., University of Bern (Switzerland)—Director, Center for Computational Relativity and Gravitation; John Vouros Endowed Professor; Distinguished Professor, Mathematics: numerical relativity, computational astrophysics, black holes, gravitational waves

Moumita Das, BS, MS, Jadavpur University (India); Ph.D., Indian Institute of Science—Professor, Physics: theoretical soft condensed matter, mechanical response of biological materials and living systems

Pratik P. Dholabhai, BS, MS, Maharaja Sayajirao University of Baroda (India); MS, Ph.D., University of Texas at Arlington—Associate Professor, Physics: computational condensed matter physics and materials science, materials by design, nanostructured materials, materials for energy technologies

Mbaye Diouf, MS, Ph.D., University Cheikh Anta Diop (Senegal)—Assistant Professor, Physics: optical physics, optical biosensing

Joshua Faber, BS, State University of New York at Stony Brook; Ph.D., Massachusetts Institute of Technology—Head, School of Mathematics and Statistics; Professor, Mathematics: numerical relativity, computational astrophysics, dynamics

Scott Franklin, BA, University of Chicago; Ph.D., University of Texas—Professor, Physics: granular materials, physics education research

Edwin Hach III, BS, MS, St. Bonaventure University; Ph.D., University of Arkansas—Associate Professor, Physics: quantum theory, quantum optics, quantum information and computing

Seth Hubbard, BS, Drexel University; MS, Case Western Reserve University; Ph.D., University of Michigan—Ph.D. Program Director, Physics; Director, Nanopower Research Laboratory; Professor, Physics: next generation photovoltaic devices, nanomaterials, novel and wide bandgap semiconductors, semiconducting polymers and devices

Ahmad R. Kirmani, BS, MS, AM University (India); Ph.D., King Abdullah University of Science and Technology (Saudi Arabia)—Assistant Professor, Chemistry and Materials Science; solution-processed semiconductor electronics, printed electronics

Michael Kotlarchyk, BS, MS, Ph.D., Massachusetts Institute of Technology—Head, School of Physics and Astronomy; Professor, Physics: radiation scattering techniques, laser light scattering, small-angle neutron and x-ray scattering, photon correlation spectroscopy, structure and interactions in complex fluids, nuclear magnetic resonance

Santosh Kurinec, BS, MS, Ph.D., University of Delhi (India)—Professor, Microelectronic Engineering: electronic materials and devices, integrated circuit processing, quantum and nanoscale devices

Nicola Lanatà, B.Sc., Università degli studi di Pisa (Italy); M.Sc., Università di Pisa (Italy); Ph.D., International School for Advanced Studies (Italy) —Assistant Professor, Physics: theoretical condensed- matter physics, strongly-correlated quantum matter, machine learning approaches to quantum-embedding simulations, development of new theoretical and computational methods

Carlos Lousto, MS, Universidad Nacional De La Plata (Argentina); Ph.D., Universidad De Buenos Aires (Argentina)—Professor, Mathematics: numerical relativity, relativistic astrophysics, black hole physics, perturbation theory

Casey Miller, BA, Wittenberg University; Ph.D., University of Texas at Austin—Senior Associate Dean for Research and Faculty Affairs; Professor, Chemistry and Materials Science: thin film magnetism, spintronics, magnetocaloric effect

Lishibanya Mohapatra, BS, St. Stephen's College (India); MS, Indian Institute of Technology (India); Ph.D., Brandeis University—Assistant Professor, Physics: theoretical biological physics, size control in cellular structures

Parsian K. Mohseni, BS, Ph.D., McMaster University (Canada)—Associate Professor, Microsystems Engineering: solid state physics, optoelectronics, materials characterization, nanoscale engineering and physical chemistry, synthesis paradigms for precise manipulation of material properties at the nanometer scale for next generation device technologies

Shima Parsa Moghaddam, B.Sc., Iran University of Science and Technology (Iran); M.Sc., Tabriz University (Iran); Ph.D., Wesleyan University—Assistant Professor, Physics: soft matter, complex fluids, porous media, turbulence, transport, non-linear and chaotic dynamics

Vivek Narayanan, M.Sc., Indian Institute of Technology (India); MA, Ph.D., University of Texas—Senior Lecturer, Physics; mathematical and theoretical physics

Richard O'Shaughnessy, BA, Cornell University; Ph.D., California Institute of Technology—Associate Professor, Mathematics: gravitational wave astronomy, numerical and general relativity

Michael S. Pierce, BS, Rensselaer Polytechnic Institute; MS, Ph.D., University of Washington—Associate Professor, Physics: experimental condensed matter physics, surface and interface science, x-ray diffraction, coherent scattering, surface microscopy, applications for basic energy science

Stefan Preble, BS, Rochester Institute of Technology; Ph.D., Cornell University—Professor, Microsystems Engineering: integrated photonic circuits and devices, quantum silicon photonics

Diana Sachmpazidi, BS, University of Ioannina (Greece); MS, Central Michigan University; Ph.D. Western Michigan University—Assistant Professor, Physics: physics education research

George Thurston, AB, Oberlin College; Ph.D., Massachusetts Institute of Technology—MS Program Director, Physics; Professor, Physics: biological and chemical physics, experimental and theoretical studies of phase transitions, physical and chemical basis of protein condensation diseases, nuclear magnetic resonance, light, x-ray, and neutron scattering

John T. Whelan, BA, Cornell University; Ph.D., University of California at Santa Barbara—Professor, Mathematics: quantum physics, gravitational wave data analysis, astrophysical relativity

Ke Xu, BE, Zhejiang University (China); MS, Ph.D., University of Illinois at Chicago—Assisant Professor, Physics: low-dimensional materials-based electronic, iontronic, optoelectronic, and quantum devices

Michael D. Zemcov, BSc, University of British Columbia (Canada); Ph.D., Cardiff University (United Kingdom)—Associate Professor, Physics and Astronomy: experimental and observational cosmology, including cosmological structure formation, extragalactic background radiation, cosmic microwave background, near infra-red to submillimeter instrumentation

Yosef Zlochower, BS, Ph.D., University of Pittsburgh—Professor, Mathematics: numerical relativity, relativistic astrophysics, black hole physics

Benjamin M. Zwickl, BS, Purdue University; MS, Ph.D., Yale University—Professor, Physics: physics education research, STEM education and workforce connections, optics and optomechanics

Astrophysical Sciences and Technology

Manuela Campanelli, Laureate in Mathematics, University of Perugia (Italy); Ph.D., University of Bern (Switzerland)—Distinguished Professor; Director, Center for Computational Relativity and Gravitation; John Vouros Endowed Professor, Mathematics: numerical relativity, computational astrophysics, black holes, gravitational waves

Joshua Faber, BS, State University of New York at Stony Brook; Ph.D., Massachusetts Institute of Technology--Head, School of Mathematics and Statistics; Professor, Mathematics: numerical relativity, general relativistic magnetohydrodynamics, relativistic astrophysics

Donald F. Figer, BA, Northwestern University; MS, University of Chicago; Ph.D., University of California—Professor, Center for Detectors: massive stars, massive star clusters, galactic center, imaging detectors

Jeyhan S. Kartaltepe, BA, Colgate University; MS, Ph.D., University of Hawaii—Director, Laboratory for Multiwavelength Astrophysics; Associate Professor, Physics and Astronomy: galaxy formation and evolution, galaxy mergers and interactions, galaxy morphology, infrared and submillimeter galaxies, active galactic nuclei

Joel H. Kastner, BS, University of Maryland; MS, Ph.D., University of California—Professor, Imaging Science: astronomical imaging, including x-ray, infrared and radio spectroscopy; young stars and planet formation; evolved stars and planetary nebulae

Carlos Lousto, MS, Universidad Nacional De La Plata (Argentina); Ph.D., Universidad De Buenos Aires (Argentina)—Professor, Mathematics: numerical relativity, relativistic astrophysics, black hole physics, perturbation theory

Nicole Melso, BS, Pennsylvania State University; MA, Ph.D., Columbia University—Assistant Professor, Physics and Astronomy: optical and UV instrumentation development, ultra-low surface brightness spectral imaging, mapping properties of the circumgalactic medium

Zoran Ninkov, BSc, University of Western Australia (Australia); MS, Monash University (Australia); Ph.D., University of British Columbia (Canada)—Professor, Imaging Science: detector array development and characterization, development of novel astronomical instrumentation, studies of young stellar clusters, planetary detection

Jason Nordhaus, BA, BS, MS, Ph.D., University of Rochester—Associate Professor, Science and Mathematics, National Technical Institute for the Deaf: computational astrophysics, core-collapse supernovae, binary interactions, strongly magnetized compact objects, physics of common envelopes

Richard O'Shaughnessy, BA, Cornell University; Ph.D., California Institute of Technology—Associate Professor, Mathematics: gravitational wave astronomy, numerical and general relativity

Michael W. Richmond, BA, Princeton University; MA, Ph.D., University of California at Berkeley—Professor, Physics and Astronomy: observational astronomy, supernovae, variable stars, reduction of optical data, automatic telescopes

Andrew Robinson, BSc, Ph.D., University of Manchester (United Kingdom)—Graduate Program Director, Astrophysical Sciences and Technology; Professor, Physics and Astronomy: astronomy, active galactic nuclei, supermassive black holes, radio galaxies, high redshift quasars

John T. Whelan, BA, Cornell University; Ph.D., University of California at Santa Barbara— Professor, Mathematics: quantum physics, gravitational wave data analysis, astrophysical relativity

Michael D. Zemcov, BSc, University of British Columbia (Canada); Ph.D., Cardiff University (United Kingdom)—Associate Professor, Physics and Astronomy: Experimental and observational cosmology, including cosmological structure formation, extragalactic background radiation, cosmic microwave background, near infra-red to submillimeter instrumentation

Yosef Zlochower, BS, Ph.D., University of Pittsburgh—Professor, Mathematics: numerical relativity, relativistic astrophysics, black hole physics

Cognitive Science

Elena A. Fedorovskaya, MS, Ph.D., Lomonosov Moscow State University (Russia)—Director, Program of Neuroscience; Research Professor, Program of Color Science

Christopher Thorstenson, BS, Florida State University; MA, Appalachian State University; MS, Rochester Institute of Technology, Ph.D., University of Rochester—Assistant Professor, Program of Color Science

Agnes K. Villwock, MA, University of Hamburg (Germany); Dr. rer. nat. (Ph.D. equivalent), University of Hamburg (Germany)—Assistant Professor of Cognitive Science and Neuroscience

Color Science

Mekides Assefa Abebe, BS, Mekelle University (Ethiopia); MS, Jean Monnet University (France); Ph.D., University of Poitiers (France)—Richard S. Hunter Professor; Visiting Assistant Professor, Program of Color Science

Mark D. Fairchild, BS, MS, Rochester Institute of Technology; MA, Ph.D., University of Rochester—Distinguished Professor, Program of Color Science

Susan Farnand, BS, Cornell University; MS, Ph.D., Rochester Institute of Technology—Graduate Program Director, Program of Color Science; Associate Professor, Program of Color Science

Elena Fedorovskaya, MS, Ph.D., Lomonosov Moscow State University (Russia)—Director, Program of Neuroscience; Research Professor, Program of Color Science

Michael Murdoch, BS, Cornell University; MS, Rochester Institute of Technology, Ph.D., Eindhoven University of Technology (The Netherlands)—Head, Integrated Sciences Academy; Director, Munsell Color Science Laboratory; Associate Professor, Program of Color Science

Christopher Thorstenson, BS, Florida State University; MA, Appalachian State University; MS, Rochester Institute of Technology, Ph.D., University of Rochester—Assistant Professor, Program of Color Science

Extended Faculty of Program of Color Science

James Ferwerda, BA, MS, Ph.D., Cornell University—Associate Professor, Imaging Science

Joseph Geigel, BS, Manhattan College; MS, Stevens Institute of Technology; D.Sc., George Washington University—Associate Professor, Computer Science

David Long, BS, University of Texas at Austin; MS, University of Rochester, Ph.D., Rochester Institute of Technology—Director, RIT Center for Media, Arts, Games, Interaction & Creativity (MAGIC) and MAGIC Spell Studios; Associate Professor, Motion Picture Science

Imaging Science

Jan van Aardt, BSc, University of Stellenbosch (South Africa); MS, Ph.D., Virginia Polytechnic Institute and State University—Professor and Director, Chester F. Carlson Center for Imaging ScienceImaging Science: remote sensing of natural resources, application of hyperspectral, light detection and ranging for spectral-structural characterization of natural systems, integrated modeling approaches, scaling of natural resources remote sensing solutions through sensor interoperability

Iris Asllani, B.Sc., University of Tirana (Albania); M.Sc., Ph.D., University of Washington, Seattle—Research Associate Professor, Neuroimaging, Functional MRI, NMR Physics

Charles Bachmann, A.B., Princeton University; Sc.M., Ph.D., Brown University—Professor, Imaging Science; Frederick and Anna B. Wiedman Chair: coastal characterization from remote sensing; advanced retrieval algorithms for hyperspectral and multi-sensor imagery; spectroscopy, BRDF, and advanced instrumentation for calibration and validation; pattern recognition; graph and manifold descriptions of high-dimensional data

Nathan Cahill, BS, MS, Rochester Institute of Technology; D.Phil., University of Oxford (United Kingdom)—Graduate Program Director, Mathematical Modeling; Professor, Mathematics: scientific computing, biomedical image analysis, computer vision, advanced mathematical approaches to image processing

Manuela Campanelli, Laureate in Mathematics, University of Perugia(Italy); Ph.D., University of Bern(Switzerland)—Director, Center for Computational Relativity and Gravitation; John Vouros Endowed Professor; Distinguished Professor, Mathematics: numerical relativity, computational astrophysics, blackholes, gravitational waves

Benjamin Chin, BA, Vassar College; Ph.D., University of Pennsylvania—Assistant Professor, Imaging Science: physiological optics; visual accommodation (focusing the eye); human visual perception of object motion, depth, and color; visuomotor coordination in humans

Dimah Dera, BS, Damascus University (Syria); MA, MS, Ph.D., Rowan University—Assistant Professor, Imaging Science; robust deep learning, continual learning, statistical signal and image processing and optimization

Gabriel J. Diaz, BFA, Skidmore College; MS, Ph.D., Rensselaer Polytechnic Institute—Associate Professor, Imaging Science: visually guided action; human motor control; eye movements; visual prediction; virtual/augmented reality systems

Roger L. Easton Jr., BS, Haverford College; MS, University of Maryland; MS, Ph.D., University of Arizona—Professor, Imaging Science: application of imaging technologies to manuscripts of cultural importance; optical holography; digital and optical signal/image processing

Rehman Eon, BS, Viterbo University; Ph.D., Rochester Institute of Technology—Assistant Research Professor, Imaging Science: modeling and simulation of remote sensing phenomenology, calibration and validation of EO/IR sensor, algorithm development

Susan Farnand, BS, Cornell University; MS, Ph.D., Rochester Institute of Technology—Graduate Program Director, Program of Color Science; Associate Professor, Program of Color Science

James Ferwerda, BA, MS, Ph.D., Cornell University—Associate Professor, Imaging Science: high dynamic range imaging, perceptually-based rendering, material appearance, display systems, low vision and assistive technologies

Ernest Fokoue, Maitrise B.Sc., University of Yaounde (Cameroon); M.Sc., Aston University (United Kingdom); Ph.D., University of Glasgow (United Kingdom)—Professor, statistical machine learning and data mining

Michael Gartley, BS, Binghamton University; MS, Ph.D., Rochester Institute of Technology—Assistant Research Professor, Imaging Science: modeling and simulation of remote sensing signature phenomenology

Aaron Gerace, BS, MS, State University College at Brockport; Ph.D., Rochester Institute of Technology—Research Assistant Faculty, Imaging Science: Simulation and modeling to inform the impact of sensor requirements on future Landsat and other spaceborne missions, algorithm development to support improved Landsat Science

Richard Hailstone, BS, Northern Illinois University; MS, Indiana University—Associate Professor, Imaging Science: characterization of materials using electron microscopy, synthesis of nanoparticles, imaging system modeling

Matthew J. Hoffman, BA, Williams College; MS, Ph.D., University of Maryland—Professor, data assimilation, applied mathematics, ocean and atmospheric forecasting, remote sensing; hyperspectral vehicle tracking

Emmett Ientilucci, BS, MS, Ph.D., Rochester Institute of Technology—Gerald W. Harris Endowed Professor; Associate Professor, Imaging Science: remote sensing, hyperspectral image processing, multivariate statistics, target detection, radiometry

Joel H. Kastner, BS, University of Maryland; MS, Ph.D., University of California, Los Angeles—Professor, Imaging Science: astronomical imaging, including x-ray, infrared and radio spectroscopy; young stars and planet formation; evolved stars and planetary nebulae

Jeyhan S. Kartaltepe, BA, Colgate University; MS, Ph.D., University of Hawaii—Director, Laboratory for Multiwavelength Astrophysics; Associate Professor, Physics and Astronomy: galaxy formation and evolution, galaxy mergers and interactions, galaxy morphology, infrared and submillimeter galaxies, active galactic nuclei

John P. Kerekes, BS, MS, Ph.D., Purdue University—Research Professor, Imaging Science: multispectral remote sensing systems, multidimensional imaging system, pattern recognition

Bartosz Krawczyk, B.Eng., MS.c., Ph.D., Wroclaw University of Science and Technology (Poland)—Assistant Professor, Imaging Science: machine learning; imbalanced data; continual and lifelong learning; data streams; concept drift; explainable artificial intelligence; adversarial learning; representation learning

Robert L. Kremens, BS, The Cooper Union; MS, University of Rochester; MS, Ph.D., New York University—Research Professor, Imaging Science: wildland fire behavior and effects, remote sensing instrumentation, autonomous remote instruments for environmental monitoring, electronics measurement systems

Cristian Linte, BSc, University of Windsor (Canada); MESc, Ph.D., University of Western Ontario (Canada)—Professor, Biomedical Engineering: image-guided visualization and navigation for minimally invasive therapy

Dongfang Liu, Ph.D., Purdue University—Assistant Professor, Artificial Intelligence, Machine Learning, Deep Learning, Computer Vision, Human-Computer Interaction, and Medical Imaging

Nishant Malik, BS, MS, University of Delhi (India), Ph.D., University of Potsdam (Germany)—Assistant Professor, network science, nonlinear dynamics, stochastic processes

David W. Messinger, BS, Clarkson University; Ph.D., Rensselaer Polytechnic Institute—Graduate Program Director; Professor

Zoran Ninkov, B.Sc., University of Western Australia (Australia); MS, Monash University (Australia); Ph.D., University of British Columbia (Canada)—Xerox Chair; Professor, Imaging Science: detector array development and characterization, development of novel astronomical instrumentation, studies of young stellar clusters, planetary detection

Richard O'Shaughnessy, BA, Cornell University; Ph.D., California Institute of Technology—Associate Professor, gravitational wave astrophysics

Shima Parsa Moghaddam, B.Sc., Iran University of Science and Technology (Iran); M.Sc., Tabriz University (Iran); Ph.D., Wesleyan University—Assistant Professor

Flip Phillips, BFA, MA, Ph.D., The Ohio State University—Professor, Motion Picture Science, MAGIC Center

Jie Qiao, BS, University of Science and Technology Liaoning (China); MS, Tsinghua University (China); MBA, University of Rochester; Ph.D., University of Texas at Austin—Associate Professor, Imaging Science: optical metrology, optical instrumentations, adaptive optics and active optics, ultrafast laser systems and applications (remote sensing, material processing), optical system design and performance evaluation

Eli Saber, BS, State University of New York at Buffalo; MS, Ph.D., University of Rochester—Professor, Electrical and Microelectronic Engineering: signal, image and video processing; computer vision

Carl Salvaggio, BS, MS, Rochester Institute of Technology; Ph.D., Syracuse University and the State University of New York College of Environmental Science and Forestry—Professor: novel techniques for the measurement of spectral optical properties, quantitative reflective and emissive remote sensing, digital image processing, three-dimensional geometry extraction from imagery, and scene simulation and modeling

Andreas Savakis, BS, MS, Old Dominion University; Ph.D., North Carolina State University—Professor, Computer Engineering: digital image processing, computer vision

Grover Swartzlander, BS, Drexel University; MSEE, Purdue University; Ph.D., Johns Hopkins University—Professor, Imaging Science: optical vortices, optical coronagraphs and high contrast imaging, pattern formation in linear and nonlinear optics, optical tweezers, optical coherence, solar sailing, metamaterials

Brian Tomaszewski, BA, University of Albany; MA, University of Buffalo; Ph.D., Pennsylvania State University—Professor, Interactive Games and Media: geographic information science and technology, visual analytics, context modeling and representation, disaster management

Anthony Vodacek, BS, University of Wisconsin; MS, Ph.D., Cornell University—Graduate Program Director; Professor, Imaging Science: imaging spectrometry applications environmental characterization and monitoring; remote sensing data assimilation in environmental models; thermal and non-thermal techniques for wildland fire detection; coastal remote sensing and aquatic optics

Mathematical Modeling

Ephraim Agyingi, BS, MS, University of Ilorin (Nigeria); Ph.D., University of Manchester (United Kingdom)—Professor, numerical analysis

Olekan Babaniyi, BS, MS, Ph.D., Boston University—Assistant Professor, inverse problems, computational mechanics, biomechanical imaging, uncertainty quantification

Mihail Barbosu, BS, Ph.D., Babes- Bolyai University (Romania); MS, Ph.D., Paris VI University (France)—Associate Head, Applied Statistics; Professor, mathematical modeling, dynamical systems, celestial mechanics and space dynamics, symbolic computation systems, data analytics, management science

Nathaniel Barlow, BS, Ph.D., Clarkson University—Undergraduate Program Coordinator, Applied and Computational Mathematics; Associate Professor, stability and propagation of waves in fluids, asymptotic methods

Maurino P. Bautista, BS, Ateneo de Manila University (Philippines); MS, Ph.D., Purdue University—Professor, numerical analysis, applied mathematics

Bernard Brooks, BS, University of Toronto (Canada); MBA, Rochester Institute of Technology; MS, Ph.D., University of Guelph (Canada)—Associate Head, Applied and Computational Mathematics; Professor: mathematical modeling, dynamical systems, financial mathematics

Nathan Cahill, BS, MS, Rochester Institute of Technology; D.Phil., University of Oxford (United Kingdom)—Professor, Mathematics: scientific computing, biomedical image analysis, computer vision, advanced mathematical approaches to image processing

Lucia Carichino, BS, MS, Politecnico di Milano (Italy); Ph.D., Purdue University—Assistant Professor, mathematical modeling, scientific computing

Matthew Coppenbarger, BS, University of Arizona; MA, Ph.D., University of Rochester—Associate Professor, mathematical physics, spectral theory

Michael Cromer, BS, York College of Pennsylvania; MS, Ph.D., University of Delaware—Associate Professor, mathematical modeling of complex fluids, asymptotics and perturbation methods, simulation

Moumita Das, BS, MS, Jadavpur University (India); Ph.D., Indian Institute of Science—Professor, Physics: theoretical soft condensed matter, mechanical response of biological materials and living systems

Blessing Emerenini, BTech, Federal University of Technology (Nigeria); M.Sc.,Technical University Eindhoven (Netherlands); M.Eng., Johannes Kepler University (Austria); Ph.D., University of Guelph (Canada)—Assistant Professor, mathematical modeling, mathematical biology

Joshua Faber, BS, State University of New York at Stony Brook; Ph.D., Massachusetts Institute of Technology—Head, School of Mathematics and Statistics; Professor, Mathematics: numerical relativity, computational astrophysics, dynamics

Raluca Felea, BS, University of Iasi (Romania); Ph.D., University of Rochester—Professor, microlocal analysis

Ernest Fokoue, Maitrise B.Sc., University of Yaounde (Cameroon); M.Sc., Aston University (United Kingdom); Ph.D., University of Glasgow (United Kingdom)—Professor, statistical machine learning and data mining

Anthony A. Harkin, BS, State University College at Brockport; MS, Massachusetts Institute of Technology; Ph.D., Boston University—Associate Professor, applied and computational mathematics, partial differential equations

Matthew J. Hoffman, BA, Williams College; MS, Ph.D., University of Maryland—Professor, data assimilation, applied mathematics, ocean and atmospheric forecasting, remote sensing; hyperspectral vehicle tracking

Bonnie C. Jacob, BA, Smith College; MS, Ph.D., Clemson University—Associate Professor, Science and Mathematics, National Technical Institute for the Deaf, graph theory, combinatorial matrix theory

Jobby Jacob, BS, Bharata Mata College (India); MS, Indian Institute of Technology (India); MS, Ph.D., Clemson University—Professor, graph theory

Baasansuren Jadamba, BS, National University of Mongolia (Mongolia); MS, University of Kaiserslautern (Germany); Ph.D., University of Erlangen-Nuremberg (Germany)—Associate Head, Applied and Computational Math; Professor, partial differential equations, inverse problems, numerical optimization

Akhtar Khan, MS, Technical University Kaiserslautern (Germany); Ph.D., Michigan Technological University—Professor, applied math, optimization, inverse problems, variational inequalities, elasticity imaging

Carlos Lousto, MS, Universidad Nacional De La Plata (Argentina); Ph.D., Universidad De Buenos Aires (Argentina)—Professor, numerical relativity

Carl V. Lutzer, BS, Michigan State University; MA, Ph.D., University of Kentucky—Director, Honors Program; Professor, mathematical physics

Kara L. Maki, BS, University of New Hampshire; MS, Ph.D., University of Delaware—Graduate Program Director, Applied and Computational Mathematics; Professor, mathematical modeling, scientific computing

Nishant Malik, BS, MS, University of Delhi (India); Ph.D., University of Potsdam (Germany)—Associate Professor, network science,nonlinear dynamics, stochastic processes

Nonhle Channon Mdziniso, BSc, University of Swaziland (Eswatini); MA, Marshall University; Ph.D., Central Michigan University—Assistant Professor, probability distributions theory and applications, statistical modeling; parametric and nonparametric regression, data mining, machine learning

Laura M. Munoz, BS, California Institute of Technology; Ph.D., University of California at Berkeley—Associate Professor, mathematical biology, dynamical systems, applied control theory

Darren A. Narayan, BS, State University of New York at Binghamton; MS, Ph.D., Lehigh University—Professor, graph theory, discrete math

Shahla Nasserasr, Honours B.Sc., Tabriz University (Iran); M.Sc., Shahid Beheshti University (Iran); M.Sc., University of Victoria (Canada); Ph.D., College of William and Mary—Assistant Professor, discrete mathematics, graph theory

Richard O'Shaughnessy, BA, Cornell University; Ph.D., California Institute of Technology—Associate Professor, gravitational wave astrophysics

Niels F. Otani, BA, University of Chicago; Ph.D., University of California at Berkeley—Associate Professor, mathematical biology

Mary Lynn Reed, BS, Georgia Institute of Technology; MFA, University of Maryland; Ph.D., University of Illinois—Professor, abstract algebra, network science, cybersecurity, statistical modeling

Brendan Rooney, BSc, Simon Fraser University (Canada); MS, Ph.D., University of Waterloo (Canada)—Assistant Professor, graph theory, combinatorics

Anastassiya Semenova, BS, MS, Ph.D., University of New Mexico—Assistant Professor, fluid mechanics, instabilities, spectral theory, perturbation methods

Nourridine Siewe, Honours BS, MS, University of Buea (Cameroon); Howard University—Assistant Professor, mathematical modeling, mathematical epidemiology

Steven J. Weinstein, BS, University of Rochester; MS, Ph.D., University of Pennsylvania—Professor, interfacial transport processes, hydrodynamic wave phenomena, applied mathematics

Tamas Wiandt, BS, Jozsef Attila University (Hungary); Ph.D., University of Minnesota—Professor, dynamical systems

Anthony E. Wong, BA, Ohio Wesleyan University; MS, Ph.D., University of Colorado, Boulder—Assistant Professor, data assimilation, model calibration, geophysical models

Yosef Zlochower, BS, Ph.D., University of Pittsburgh—Professor, numerical relativity, relativistic astrophysics, black hole physics

Emeritus Faculty

Jerry Adduci, Professor Emeritus
John Andersen, Professor Emeritus
Peter Bajorski, Professor Emeritus
David Barth-Hart, Associate Professor Emeritus
Linda Barton, Associate Professor Emeritus
William Basener, Professor Emeritus
Roy Berns, Professor Emeritus
Raymond Biehler, Professor Emeritus
Marcia Birken, Professor Emeritus
William Burns, Professor Emeritus
Edward Cain, Professor Emeritus
Patricia Clark, Professor Emeritus
Robert Clark, Dean Emeritus and Professor Emeritus
David Crystal, Professor Emeritus
Rebecca Daggar, Senior Lecturer Emeritus
Margaret D'Ambruso, Professor Emeritus
Tracy Davis, Associate Professor Emeritus
Joseph DeLorenzo, Lecturer Emeritus
Richard Doolittle, Professor Emeritus
Jean Douthwright, Professor Emeritus
Roger Dube, Research Professor Emeritus
F. Kingsley Elder, Professor Emeritus

Alejandro Engel, Professor Emeritus
Alan Entenberg, Professor Emeritus
Albert Erskine, Professor Emeritus
David Farnsworth, Professor Emeritus
G. Thomas Frederick, Professor Emeritus
Lester Fuller, Professor Emeritus
Thomas Gennett, Professor Emeritus
Robert Gilman, Professor Emeritus
Dennis Glanton, Lecturer Emeritus
James Glasenapp, Professor Emeritus
Marvin Gruber, Professor Emeritus
Laxmi Gupta, Professor Emeritus
Mykola Hadsinskyj, Professor Emeritus
Paul A. Haefner, Professor Emeritus
Charles W. Haines, Professor Emeritus
Jim Halavin, Professor Emeritus
William J. Hayles, Professor Emeritus
Charles Hewett, Professor Emeritus
Rebecca Hill, Professor Emeritus
Edwin Hoefer, Professor Emeritus
Richard J. Hoerner, Professor Emeritus
Jack Hollingsworth, Professor Emeritus
Ronald Jodoin, Professor Emeritus
James Kern, Professor Emeritus
M. Joseph Klingensmith, Professor Emeritus
Art Kovacs, Professor Emeritus
Earl Krakower, Professor Emeritus
Seshavadhani Kumar, Professor Emeritus
Vern Lindberg, Professor Emeritus
Sophia Maggelakis, Dean Emeritus and Professor Emeritus
Carol Marchetti, Professor Emeritus
David Mathiason, Professor Emeritus
Lane McCord, Associate Professor Emeritus
Douglas Meadow, Professor Emeritus
Douglas Merrill, Professor Emeritus
Terence Morrill, Professor Emeritus
John Neenan, Professor Emeritus
Carol Oehlbeck, Lecturer Emeritus
Richard Orr, Professor Emeritus
Niels Otani, Associate Professor Emeritus
John Paliouras, Dean Emeritus and Professor Emeritus
Jeff Pelz, Professor Emeritus
Van Peursem, Dean Emeritus
F. Harvey Pough, Professor Emeritus
Dr. VV Raman, Professor Emeritus
Varadaraja Raman, Professor Emeritus
Navalgund Rao, Professor Emeritus
Harvey Rhody, Professor Emeritus
Paul Rosenberg, Professor Emeritus
David Ross, Professor Emeritus
Robert Rothman, Professor Emeritus
James Runyon, Professor Emeritus
Pasquale Saeva, Professor Emeritus
Nina M. Sandberg, Associate Profesor Emeritus
Kalathur Santhanam, Professor Emeritus
Harry Schey, Professor Emeritus
John Schott, Professor Emeritus
Franz Seischab, Professor Emeritus
Earl Sexton, Professor Emeritus
John Shaw, Professor Emeritus
Joel Shore, Professor Emeritus
Gary Skuse, Professor Emeritus
Thomas Smith, Professor Emeritus
Egon Stark, Professor Emeritus
Robert Teese, Professor Emeritus
Jack Tishkoff, Professor Emeritus
Laura Tubbs, Professor Emeritus
Kay Turner, Professor Emeritus
Thomas Upson, Professor Emeritus
Joseph Voelkel, Professor Emeritus
Vladimir Vukanovic, Distinguished Professor Emeritus
Jerome Wagner, Professor Emeritus
Nancy Wanek, Professor Emeritus
Kristen Waterstram-Rich, Professor Emeritus
John Waud, Professor Emeritus
Theodore Wilcox, Professor Emeritus
James, Wilson, Jr., Professor Emeritus
Paul Wilson, Professor Emeritus
James J. Worman, Professor Emeritus
Anne Young, Professor Emeritus

GOLISANO INSTITUTE FOR SUSTAINABILITY

Overview

Golisano Institute for Sustainability is a comprehensive academic, training, and technology-transfer center focusing on multidisciplinary studies in sustainable production systems and the built environment. The institute's research areas include sustainable products, sustainable mobility, alternative energy systems, Eco-IT, and pollution prevention.

Please visit the college's website for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarships

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Doctoral Degrees

- Sustainability Ph.D. (p. 212)

Master's Degrees

- Architecture M.Arch (p. 211)
- Sustainable Systems MS (p. 214)

Architecture M.Arch

Plan Code: ARCH-MARCH | **HEGIS:** 0202.00

This program is available online.

Program Overview

RIT's NAAB-accredited master of architecture program provides a well-balanced education that integrates design, technology, and research with sustainability to prepare graduates to enter the modern field of architecture. This program offers an immersive approach to investigating the complexity of designing buildings with people, space, and the environment in mind. You will learn how to design with context and substance in areas such as positive energy, performance building, climate-responsive designs, passive resiliency, and more. You will engage in a comprehensive curriculum that covers a diverse range of courses like sustainability, technology, and urbanism along with in-depth classes that explore integrated building systems, urban planning, industrial ecology, and more. You also have the flexibility to choose electives from other subject areas. This program is available in a traditional on-campus setting or through a fully online format and it provides advanced standing or standard admission tracks for both settings. For students with previous experience and an undergraduate degree in architecture, the advanced standing track is the preferred pathway to completion. For those with no prior experience or background in architecture, the standard admissions pathway provides the additional background courses you need for success in the program.

Accreditation

The master of architecture program is accredited by the National Architectural Accrediting Board (NAAB), www.rit.edu/sustainabilityinstitute/study/architecture-march/accreditation-support#accreditation (https://www.rit.edu/sustainabilityinstitute/study/architecture-march/accreditation-support/#accreditation).

In addition, the program is now designated as a STEM program in Architectural and Building Sciences/Technology (CIP code 04.0902) making international graduates eligible to extend their F-1 visas for up to three years in order to work in the United States.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
ARCH-611	Architectural Representation I	3
ARCH-621	Architectural History I	3
ARCH-631	Architectural Design I	6
ARCH-662	Sustainable Built Environment	3
	Hours	**15**
Spring		
ARCH-612	Architectural Representation II	3
ARCH-622	Architectural History II	3
ARCH-632	Architectural Design II	6
ARCH-641	Fundamentals of Building Systems	3
	Hours	**15**
Second Year		
Fall		
ARCH-731	Architectural Studio I: Site	6
ARCH-741	Integrated Bldg Systems I	3
ARCH-771	Professional Practice	3
ARCH Professional Elective		3
	Hours	**15**
Spring		
ARCH-734	Architecture Studio II: Urban	6
ARCH-742	Integrated Building Systems II	3
ARCH-754	Architectural Research Methods	3
ARCH-763	Sustainable Building Metrics	3
	Hours	**15**
Summer		
ARCH-699	Coop Architecture	0
	Hours	**0**
Third Year		
Fall		
ARCH-733	Architectural Studio III: Adaptive	6
ARCH-743	Integrated Building Systems III	3
ARCH-753	Thesis Preparation	3
Open Graduate Elective		3
	Hours	**15**
Spring		
ARCH-735	Architecture Studio IV: Integrative	6
ARCH-744	Integrated Building Systems IV	3
ARCH-790	Thesis	3
ARCH Professional Elective		3
	Hours	**15**
Summer		
ARCH-698	Global Experience	0
	Hours	**0**
	Total Hours	**90**

Professional Electives

Code	Title	Hours
ARCH-651	Architectural Theory	3
ARCH-652	Urban and Regional Planning	3
ARCH-689	ST: Passive House Design	3
ARCH-764	Race to Net Zero	3
ARCH-781	Graduate Scholarship	1-6
ARCH-789	Architecture Special Topics	1-6

Admission Requirements

This program is available on-campus or online.

Offered Full-time
Full-time Admit Term(s): Fall; Spring considered with advanced standing
Full-time Application Deadline: Fall - February 15 priority deadline, rolling thereafter; Spring - rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Architecture program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit a portfolio. Requirements are listed on the Graduate Admissions website.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

Applicants are expected to have successfully completed one semester of a college-level math course.

Advanced Standing Track for Spring Admit Term

The Advanced Standing track provides an option for students to start in the spring term; however, due to course sequencing, spring start students must take courses over 5 semesters (3 Spring & 2 Fall). The Spring admit term is only available for applicants pursuing the Advanced Standing Track. To qualify for advanced standing, applicants must have previous experience and an undergraduate degree in architecture.

Sustainability Ph.D.

Plan Code: SUST-PHD | **HEGIS:** 4904.00

Program Overview

RIT's doctoral degree in sustainability fosters innovation and creativity in solving real-world challenges within social, economic, technological, and business realms. Our approach to sustainability means working in the broader context of environmental assessment, economics, and policy. In this inherently interdisciplinary program, you'll be part of a network of academics from across RIT who are working to optimize sustainable systems and practices in engineering, manufacturing, energy, education, and more. You'll learn from areas across the entire university to develop your own innovative approach to the field by building off methodologies such as life cycle assessment, environmental risk and impact assessment, design for the environment, pollution prevention, closed-loop supply chain management, and product life assessment. Moreover, you'll work side-by-side with world-renowned faculty who are avid researchers in diverse areas including biofuels, transportation, energy policy, resource recovery, and smart products and systems.

The curriculum allows you to develop a deep foundation in sustainability science, sustainable systems, and risk analysis. You also can choose several electives from across RIT's colleges. From classes in computational modeling and simulation to principles of statistical data mining, you can tailor your degree and create interdisciplinary relationships throughout the university. Through your sponsored research project, you'll have the opportunity to make novel and impactful contributions to the development and understanding of sustainable technologies.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
ISUS-702	Fundamentals of Sustainability Science	3
ISUS-706	Economics of Sustainable Systems	3
ISUS-806	Risk Analysis	3
	Hours	**9**
Spring		
ISUS-704	Industrial Ecology	3
ISUS-808	Multicriteria Sustainable Systems	3
Elective		3
	Hours	**9**
Second Year		
Fall		
ISUS-807 or ISUS-890	Research or Dissertation Research	4
PUBL-810	Technology, Policy and Sustainability (or approved substitute)	3
Elective		3
	Hours	**10**
Spring		
ISUS-807 or ISUS-890	Research or Dissertation Research	4
Elective		3
Elective		3
	Hours	**10**

Third Year		
Fall		
ISUS-890	Dissertation Research	4
Elective		3
	Hours	**7**
Spring		
ISUS-890	Dissertation Research	4
Elective		3
	Hours	**7**
Fourth Year		
Fall		
ISUS-890	Dissertation Research	4
	Hours	**4**
Spring		
ISUS-890	Dissertation Research	4
	Hours	**4**
	Total Hours	**60**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: January 15 priority deadline
Full-time STEM Designated: Yes

Full-time study is 9+ semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Sustainability program, candidates must fulfill the following requirements:

- Learn tips to apply (https://www.rit.edu/admissions/graduate/applying-doctoral-program/) for a doctoral program and then complete a graduate application (https://join.rit.edu/apply/).
- Submit (https://join.rit.edu/apply/) copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a statement of purpose for research (https://www.rit.edu/admissions/graduate/statement-purpose-research/#sustainability-phd) which will allow the Admissions Committee to learn the most about you as a prospective researcher.
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit one writing sample (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials), of your own work, in which you are the only author. This can be a report or paper from previous academic or professional work that reflects your critical thinking and writing abilities.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 100
IELTS: 7.0
PTE Academic: 70

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Ph.D. students typically receive full tuition and an RIT Graduate Assistantship that will consist of a research assistantship (stipend) or a teaching assistantship (salary).

Additional Information

Prerequisites

The Sustainability Ph.D. program requires that students gain mastery of key sustainability concepts and methods, several of which are quantitative in nature. Due to this, we require incoming students to have taken university-level calculus, statistics, and two courses in physical sciences (such as chemistry or physics).

Sustainable Systems MS

Plan Code: SUSTSY-MS | **HEGIS:** 4904.00

Program Overview

The MS degree in sustainable systems teaches you to apply sustainability science principles to any field so you can help to solve the world's most pressing challenges, including pollution, food scarcity, public health crises, and more. The program accepts students from any academic background and encompasses a wide range of interdisciplinary studies in sustainability science. You will comprehensively learn and experience the methods that lead to environmental, social, technological, and business success, working one-on-one with a faculty advisor to tailor the degree to your sustainability interests. Through a flexible and interdisciplinary curriculum, you'll begin your degree in sustainable systems with core courses in industrial ecology, risk assessment, and the economics of sustainability. From a broad foundation of knowledge in environmental life cycle assessment, sustainable decision making, and economic and policy strategies, you will move toward customizing your degree with electives from across the university that aptly match your talents and suit your career goals. By focusing on areas like renewable energy or mobility, you will get the hands-on experience that employers are seeking. Your degree will culminate with a research thesis or a capstone project.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

Capstone Option

First Year		
Fall		**Hours**
ISUS-702	Fundamentals of Sustainability Science	3
ISUS-706	Economics of Sustainable Systems	3
ISUS-806	Risk Analysis	3
PUBL-810	Technology, Policy and Sustainability (or approved substitute)	3
	Hours	**12**
Spring		
ISUS-704	Industrial Ecology	3
ISUS-808	Multicriteria Sustainable Systems	3
Elective		3
Elective		3
	Hours	**12**
Second Year		
Summer		
ISUS-780	Capstone	6
	Hours	**6**
	Total Hours	**30**

Thesis Option

First Year		
Fall		**Hours**
ISUS-702	Fundamentals of Sustainability Science	3
ISUS-706	Economics of Sustainable Systems	3
ISUS-806	Risk Analysis	3
	Hours	**9**
Spring		
ISUS-704	Industrial Ecology	3
ISUS-808	Multicriteria Sustainable Systems	3
Elective		3
	Hours	**9**
Second Year		
Fall		
ISUS-790	Thesis	3
PUBL-810	Technology, Policy and Sustainability (or Approved substitute)	3
	Hours	**6**
Spring		
ISUS-790	Thesis	3
Electives		3
	Hours	**6**
	Total Hours	**30**

Admission Requirements

This program is available on-campus only.

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: Yes

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Sustainable Systems program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.d university or college.
- Satisfy prerequisite requirements and/or complete bridge courses prior to starting program coursework.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit one writing sample (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials), of your own work, in which you are the only author. This can be a report or paper from previous academic or professional work that reflects your critical thinking and writing abilities.
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Prerequisites

The Sustainable Systems MS program requires that students gain mastery of key sustainability concepts and methods, several of which are quantitative in nature. Due to this, we require incoming students to have taken university-level calculus, statistics, and two courses in physical sciences (such as chemistry or physics).

MS/MBA Option

Students are eligible to earn an MBA in just one year after completing the Sustainable Systems MS. This combination of graduate degrees allows students to learn business, policy, engineering, and science behind our world's systems to gain knowledge to solve any sustainability problem. Admission to the MBA is automatic upon successful completion of the MS, with scholarship guaranteed. Students admitted to the program graduate as dual-degree holders—with both a Master of Science and an MBA—in just two years. For more details on this accelerated pathway, visit: Sustainable Systems MS & MBA (https://www.rit.edu/sustainabilityinstitute/driven/dual-masters/).

Golisano Institute for Sustainability Faculty

Nabil Nasr, BS, Helwan University (Egypt); M.Eng., Pennsylvania State University; MS, Ph.D., Rutgers University—Associate Provost and Director, Golisano Institute for Sustainability

Dennis A. Andrejko, RA, FAIA: B.Arch., Arizona State University; M.Arch., Massachusetts Institute of Technology—Associate Professor

Callie W. Babbitt, BS, Georgia Institute of Technology; ME, Ph.D., University of Florida—Professor

Amitrajeet A. Batabyal, BS, Cornell University; MS, University of Minnesota; Ph.D., University of California at Berkeley—Head, Department of Sustainability; Distinguished Professor, Arthur J. Gosnell Professor of Economics

Julius J. Chiavaroli, RA, AIA, NCARB, LEED-AP. B.Arch., University of Notre Dame; MBA, Rochester Institute of Technology—Professor

Alissa D. de Wit-Paul, RA, NCIDQ, LEED-AP. BS, Cornell University; M.Arch., State University of New York at Buffalo; Ph.D., Binghamton University—Assistant Professor

Seth H. Holmes, RA, AIA, LEED-AP BD+C, CPHC: B.Arch., Roger Williams University; MDes, Harvard University—Associate Professor and Interim Head, Department of Architecture

Amanda Reis, RA, MAA, MRAIC: B.Env.D., M.Arch., University of Manitoba (Canada)—Assistant Professor

Eric Williams, BA, Macalester College; Ph.D., State University of New York at Stony Brook—Professor

Nathaniel J. Williams, BS, Whitworth University; MSc, Nelson Mandela University (South Africa); Ph.D., Carnegie Mellon University—Assistant Professor

Emeritus Faculty

Thomas Trabold, Research Professor Emeritus

SCHOOL OF INDIVIDUALIZED STUDY

Overview

The School of Individualized Study is about the individual students' ideas, interests and goals. Through the school, students can combine multiple disciplines to create a singular master's degree program, the MS in professional studies. The school also offers an advanced certificate in project management.

Please visit the college's website–**www.rit.edu/sois (https://www.rit.edu/individualizedstudy/)**–for in depth information on academics, faculty, facilities, research initiatives, advising, and more.

Admission Requirements

Each college or degree-granting entity makes all decisions regarding graduate admission. Please refer to the individual program descriptions for information regarding specific admission criteria. For general graduate admission information, please refer to the Admission section of this catalog.

Financial Aid and Scholarship

Please refer to the Financial Aid and Scholarship section of this catalog for information regarding financial aid, scholarships, grants, loans, and graduate assistantships.

Graduate Programs

Master's Degrees

Advanced Certificates

Project Management Advanced Certificate

Plan Code: PROMGT-ACT | **HEGIS:** 0506.00

This program is available online.

Program Overview

The advanced certificate in project management will prepare you to effectively plan, organize, and execute a range of projects. The certificate consists of three core courses and one elective. Courses cover the fundamentals of project management as well as agile leadership and design thinking. The certificate can be completed entirely online, on campus, or through a combination of both options. RIT's School of Individualized Study is a Project Management Institute (PMI) Authorized Training Partner.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
PROF-710	Project Management	3
PROF-714	Agile Project Management	3
	Hours	**6**
Spring		
Select one of the following:		3
PROF-711	Advanced Project Management	
PROF-712	International Project Management	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	
	Hours	**3**
Summer		
Program Elective		3
	Hours	**3**
	Total Hours	**12**

Program Electives

Code	Title	Hours
HRDE-720	Theories of Organizational Development	3
HRDE-722	Talent Development	3
HRDE-742	Leading Change	3
ISEE-682	Lean Six Sigma Fundamentals	3
MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
MGMT-755	Negotiations	3
PROF-720	Individual Leadership Development	3
PROF-721	Building High Performance Teams	3
SERQ-710	Service Design Fundamentals	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
SERQ-737	Leadership Development	3
Any of the following not taken as part of the core curriculum:		
PROF-711	Advanced Project Management	
PROF-712	International Project Management	
PROF-713	Program Management for Product and Service Development	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	

Online + edX Option

First Year		
Fall		**Hours**
edX Project Management MicroMasters [1]		9
	Hours	**9**
Spring		
PROF-714	Agile Project Management	3
	Hours	**3**
	Total Hours	**12**

1 All three courses in the edX Project Management MicroMasters program must be successfully passed as verified in order to be eligible for 9 credits toward the Masters in Project Management. edX Project Management MicroMasters courses cannot be repeated (i.e. taken a second time). Individual course credits will not be granted for the edX Project Management MicroMasters.

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Part#time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for advanced certificates.

Application Details

To be considered for admission to the Project Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Using edX MicroMasters Credit

Applicants interested in leveraging their edX MicroMasters for credit (https://www.rit.edu/online/pathways/ritx-project-management/), should send their edX MicroMasters program record to RIT using these instructions (https://help.edx.org/edxlearner/s/article/Viewing-and-sharing-your-program-record/) and we will add the credential to their application for review.

Online Degree Information

The online Project Management Advanced Certificate can only be completed part-time, taking one or two courses per term. The average time to completion is one year. Delivery is a blend of asynchronous and synchronous study, and your academic advisor will work with you to select courses that meet your degree requirements and your schedule. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. A successfully completed Project Management Advanced Certificate can be "stacked" and will award 12 credits toward our Professional Studies MS, Project Management MS, and Construction Management MS. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Project Management Adv. Cert. is a designated online degree program that is billed at a 43% discount from our on campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Project Management MS

Plan Code: PROMGT-MS | **HEGIS:** 0506.00

This program is available online.

Program Overview

The project management master's degree focuses on the practical application of project management in a variety of organizations and industries. You will learn how project management is adapted to each unique project, organization, and client to deliver the greatest value and results. The program focuses on effective leadership skills including the ability to create an environment of confidence among and between teams and clients. Project managers are critical resources to achieve innovation, strategic goals, and deliver products and services to clients. The complexity, scale, and diversity of organizations globally requires leaders that can translate vision into practice while adapting to the changing needs of markets and clients. The program's core courses cover project management methods and frameworks including predictive, agile, and hybrid. The program can be customized to focus on specific industries, technologies, businesses, or science disciplines. During your required capstone experience, you will analyze an organizational scenario, challenge, or problem and prepare a solution based on your course work and experience in project management.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

On Campus Option

First Year		
Fall		**Hours**
PROF-710	Project Management	3
PROF-714	Agile Project Management	3
Elective		3
Elective		3
	Hours	**12**
Spring		
Select three of the following:		9
PROF-711	Advanced Project Management	
PROF-712	International Project Management	
PROF-713	Program Management for Product and Service Development	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	
	Hours	**9**
Second Year		
Fall		
PROF-719	MSPM Capstone Experience	3
Elective		3
Elective		3
	Hours	**9**
	Total Hours	**30**

Program Electives

Code	Title	Hours
HRDE-720	Theories of Organizational Development	3
HRDE-722	Talent Development	3
HRDE-742	Leading Change	3
ISEE-682	Lean Six Sigma Fundamentals	3

MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
MGMT-755	Negotiations	3
PROF-720	Individual Leadership Development	3
PROF-721	Building High Performance Teams	3
RIT Advanced Certificate [1]		12
SERQ-710	Service Design Fundamentals	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
SERQ-737	Leadership Development	3
Any of the following not taken as part of the core curriculum:		
PROF-711	Advanced Project Management	
PROF-712	International Project Management	
PROF-713	Program Management for Product and Service Development	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	

1 Technology Entrepreneurship, Applied Statistics, Cybersecurity, Lean Six Sigma or Web Development

Online Option

First Year		
Fall		**Hours**
PROF-710	Project Management	3
PROF-714	Agile Project Management	3
	Hours	**6**
Spring		
Select two of the following:		6
PROF-712	International Project Management	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	
	Hours	**6**
Summer		
PROF-711	Advanced Project Management	3
Elective		3
	Hours	**6**
Second Year		
Fall		
Electives		6
	Hours	**6**
Spring		
PROF-719	MSPM Capstone Experience	3
Elective		3
	Hours	**6**
	Total Hours	**30**

Program Electives

Code	Title	Hours
HRDE-720	Theories of Organizational Development	3
HRDE-722	Talent Development	3
HRDE-742	Leading Change	3
ISEE-682	Lean Six Sigma Fundamentals	3
MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
MGMT-755	Negotiations	3
PROF-720	Individual Leadership Development	3
PROF-721	Building High Performance Teams	3
SERQ-710	Service Design Fundamentals	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
SERQ-737	Leadership Development	3
RIT Advanced Certificate [1]		12
Any of the following not taken as part of the core curriculum:		
PROF-711	Advanced Project Management	
PROF-712	International Project Management	
PROF-713	Program Management for Product and Service Development	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	

1 Technology Entrepreneurship, Applied Statistics, Cybersecurity, Lean Six Sigma or Web Development

Online+ edX Option

First Year		
Fall		**Hours**
edX Project Management MicroMasters [1]		3
PROF-714	Agile Project Management	3
	Hours	**6**
Spring		
Select one of the following:		3
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	
edX Project Management MicroMasters [1]		6
	Hours	**9**
Summer		
Electives		6
	Hours	**6**
Second Year		
Fall		
Electives		6
	Hours	**6**
Spring		
PROF-719	MSPM Capstone Experience	3
	Hours	**3**
	Total Hours	**30**

1 All three courses in the edX Project Management MicroMasters program must be successfully passed as verified in order to be eligible for 9 credits toward the Masters in Project Management. edX Project Management MicroMasters courses cannot be repeated (i.e. taken a second time). Individual course credits will not be granted for the edX Project Management MicroMasters.

Program Electives

Code	Title	Hours
HRDE-720	Theories of Organizational Development	3
HRDE-722	Talent Development	3
HRDE-742	Leading Change	3
ISEE-682	Lean Six Sigma Fundamentals	3
MGMT-735	Management of Innovation	3
MGMT-740	Leading Teams in Organizations	3
MGMT-755	Negotiations	3
Any of the following not taken as part of the core curriculum:		

PROF-713	Program Management for Product and Service Development	
PROF-715	Agile Leadership and Self Organizing Teams	
PROF-716	Agile and Design Thinking	
PROF-720	Individual Leadership Development	3
PROF-721	Building High Performance Teams	3
RIT Advanced Certificate [1]		12
SERQ-710	Service Design Fundamentals	3
SERQ-712	Breakthrough Thinking, Creativity, and Innovation	3
Second edX MicroMasters [2]		9

1 Technology Entrepreneurship, Applied Statistics, Cybersecurity, Lean Six Sigma or Web Development

2 RITx Cybersecurity MicroMasters, MITx Statistics & Data Science MicroMasters, MITx Finance MicroMasters, GTx Analytics: Essential Tools and Methods MicroMasters, Curtinx Internet of Things MicroMasters, HEC Montrealxl UX Design and Evaluation MicroMasters, RWTHx Managing Technology and Innovation: How to Deal with Disruptive Change MicroMasters, Adelaidex Big Data MicroMasters

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall
Full-time Application Deadline: February 1 priority deadline
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall
Part-time Application Deadline: February 1 priority deadline
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall, Spring, or Summer
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall, Spring, or Summer
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Project Management program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Using edX MicroMasters Credit

Applicants interested in leveraging their edX MicroMasters for credit (https://www.rit.edu/online/pathways/ritx-project-management/), should send their edX MicroMasters program record to RIT using these instructions (https://help.edx.org/edxlearner/s/article/Viewing-and-sharing-your-program-record/) and we will add the credential to their application for review.

Online Degree Information

The online Project Management MS can be completed full or part-time. Delivery is a blend of asynchronous and synchronous study, and your academic advisor will work with you to select courses that meet your degree requirements and your schedule. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. A successfully completed Project Management Advanced Certificate can be "stacked" toward this Project Management MS degree, awarding 12 credits. For specific details about the delivery format and learning experience, contact the Program Contact listed on this page. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Project Management MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Professional Studies MS

Plan Code: PROFST-MS | **HEGIS:** 4999.00

This program is available online.

Program Overview

The master's degree in professional studies enables you to create an individualized plan of study tailored around your personal and professional goals. Drawing upon graduate courses from more than 80 of RIT's master's degrees, you'll select courses to gain the advanced knowledge and skills necessary to respond successfully to new and emerging career opportunities. You will pursue two to three concentrations in specialized fields of study. You will begin the degree with Contexts and Trends, the program's foundation course. In this course, you will explore your professional career objectives and research RIT's portfolio of graduate programs to identify courses that best match your professional and personal goals. You'll then create two or three concentrations that make up the required course work for the degree program. Credit hours not required to fulfill a concentration area may be used as electives. All electives and transferred graduate courses need to be integrated into the proposed plan of study. This master's degree includes a required capstone project which is an applied, hands-on project directly related to your customized plan of study.

Co-op is optional but strongly encouraged for graduate students in the MS in professional studies.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
PROF-705	Context and Trends	3
Concentration A course		3
Concentration B course		3
	Hours	**9**
Spring		
Concentration A courses		6
Concentration B course		3
	Hours	**9**
Second Year		
Fall		
PROF-770	Proposal Seminar	0
Concentration A or elective course		3
Concentration B course		3
Concentration B or elective course		3
	Hours	**9**
Spring		
PROF-775	Capstone Project	3
Concentration A or elective course		3
	Hours	**6**
	Total Hours	**33**

Admission Requirements

This program is available on-campus or online.

On Campus

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Online

Offered Full-time
Full-time Admit Term(s): Fall or Spring
Full-time Application Deadline: Rolling
Full-time STEM Designated: No

Offered Part-time
Part-time Admit Term(s): Fall or Spring
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Full-time study is 9+ semester credit hours. Part-time study is 1-8 semester credit hours. International students requiring a visa to study at the RIT Rochester campus must study full-time.

Application Details

To be considered for admission to the Professional Studies program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit 1 letter of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 79
IELTS: 6.5
PTE Academic: 56

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Using edX MicroMasters Credit

Applicants interested in leveraging their edx MicroMasters for credit (https://www.rit.edu/online/edx-pathways/), should send their edX MicroMasters program record to RIT using these instructions (https://help.edx.org/edxlearner/s/article/Viewing-and-sharing-your-program-record/) and we will add the credential to their application for review.

Online Degree Information

The online Professional Studies MS includes courses that are a blend of synchronous and asynchronous classes. Full-time students can take 3 to 4 courses each semester, allowing them to graduate in 1.5 years. Part-time students usually take one or two courses each semester and can graduate in 2.5 years. Students typically spend 10-12 hours per week per class, depending on the content and their background knowledge. For specific details about available concentration areas, delivery format and learning experience, or edX MicroMasters credit, contact the Program Contact listed on this page. The program culminates with a capstone project. RIT does not offer student visas for online study.

Online Tuition Eligibility

The online Professional Studies MS is a designated online degree program that is billed at a 43% discount from our on-campus rate. View the current online tuition rate (https://www.rit.edu/admissions/tuition-and-fees/).

Workplace Learning and Instruction Advanced Certificate

Plan Code: TRNDAS-ACT | **HEGIS:** 0515.00

This program is available exclusively online.

Program Overview

The advanced certificate in workplace learning and instruction is a four-course graduate-level certificate that provides professionals with the competencies required to develop highly effective learning materials that drive strategic employee development, boost performance, and manage the employee development efforts of an organization. Senior leaders in the most successful businesses agree that leveraging the human capital of an organization is vital to survival in today's competitive business climate, and this advanced certificate will prepare you to create employee development plans and design targeted learning experiences to ensure employees are equipped to perform at their peak.

Curriculum

The curriculum below outlines the typical course sequence(s) for this program

First Year		
Fall		**Hours**
EDLI-730	Theories of Learning	3
EDLI-755	Learning Assessment and Evaluation	3
EDLI-756	Learning Design and Technology	3
Select one of the following:		3
EDLI-733	Instructional Design	
Approved Graduate elective [1]		
	Hours	**12**
	Total Hours	**12**

[1] Approved graduate electives may be chosen from the following areas:
- EDLI (Education, Learning and Instruction)
- Other RIT graduate courses: approval to apply the course to the certificate is required from the Graduate Director of the certificate. In addition, course registration must be approved by the department offering the course and all pre-requisites must be met

Admission Requirements

This program is available exclusively online.

Offered Part#time
Part-time Admit Term(s): Fall
Part-time Application Deadline: Rolling
Part-time STEM Designated: No

Part-time study is 1#8 semester credit hours. RIT will not issue a student visa for programs offered exclusively online.

Application Details

To be considered for admission to the Workplace Learning and Instruction program, candidates must fulfill the following requirements:

- Complete an online graduate application (https://join.rit.edu/apply/).
- Submit copies of official transcript(s) (https://www.rit.edu/admissions/graduate/application-instructions/#application-

materials) (in English) of all previously completed undergraduate and graduate course work, including any transfer credit earned.
- Hold a baccalaureate degree (or US equivalent) from an accredited university or college. A minimum cumulative GPA of 3.0 (or equivalent) is recommended.
- Submit a current resume or curriculum vitae.
- Submit a personal statement of educational objectives (https://www.rit.edu/admissions/graduate/application-instructions/#application-materials).
- Submit two letters of recommendation.
- Entrance exam requirements: None
- Submit English language test scores (TOEFL, IELTS, PTE Academic), if required. Details are below.

English Language Test Scores

International applicants whose native language is not English must submit one of the following official English language test scores. Some international applicants may be considered for an English test requirement waiver.

TOEFL: 88
IELTS: 6.5
PTE Academic: 60

International students below the minimum requirement may be considered for conditional admission. Each program requires balanced sub-scores when determining an applicant's need for additional English language courses.

Cost and Financial Aid

An RIT graduate degree is an investment with lifelong returns. Graduate tuition varies by degree, the number of credits taken per semester, and delivery method. A combination of sources can help fund your graduate degree. Visit the RIT Financial Aid website to view funding sources and to learn how to fund your degree.

Additional Information

Online Study Restrictions for Some International Students

Certain countries are subject to comprehensive embargoes under US Export Controls, which prohibit virtually ALL exports, imports, and other transactions without a license or other US Government authorization. Learners from the Crimea region of the Ukraine, Cuba, Iran, North Korea, and Syria may not register for RIT online courses. Nor may individuals on the United States Treasury Department's list of Specially Designated Nationals or the United States Commerce Department's table of Deny Orders. By registering for RIT online courses, you represent and warrant that you are not located in, under the control of, or a national or resident of any such country or on any such list.

School of Individualized Study (SOIS) Faculty

James Hall, BA, Wilfrid Laurier University (Canada); MTS, Waterloo Lutheran Seminary (Canada); MA, Ph.D., University of Iowa— Executive Director; Professor

Peter Boyd, BA, Nazareth College; MA, Columbia University— Graduate Program Coordinator; Senior Lecturer

Stephen Aldersley, BS, University of Surrey (United Kingdom); MS, University of Lancaster (United Kingdom); Graduate Education Certificate, St. Martin's College (United Kingdom); MS, College of St. Rose; Ed.D., University of Rochester—Professor

Leonie Fernandes, BS, University of Michigan; MS, Rochester Institute of Technology; PMI—Project Management Coordinator; Senior Lecturer

Clarence Sheffield, BS, University of Utah; MA, University of Colorado at Boulder; Ph.D., Bryn Mawr College—Professor

David P. Wick, BS, MS, Ph.D., Clarkson University—Associate Professor

Emeritus Faculty

Robert C. Baker, Professor Emeritus
Thomas Moran, Professor Emeritus

COURSE DESCRIPTIONS

A

B

C

D

E

F

G

H

I

M

Accounting (ACCT)

ACCT-603 Accounting for Decision Makers (3 Credits)
A graduate-level introduction to the use of accounting information by decision makers. The focus of the course is on two subject areas: (1) financial reporting concepts/issues and the use of general-purpose financial statements by internal and external decision makers and (2) the development and use of special-purpose financial information intended to assist managers in planning and controlling an organization's activities. Generally accepted accounting principles and issues related to International Financial Reporting Standards are considered while studying the first subject area and ethical issues impacting accounting are considered throughout.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ACCT-641 Cases in Forensic Accounting and Fraud Examination (3 Credits)
Overview of the nature of occupational fraud and how it is committed including an introduction to the actions that can be taken to determine the presence of occupational fraud and procedures that can be implemented to deter fraud. Also covered is the proper manner in which allegations of fraud should be investigated and documented to meet the requirements of civil/criminal court procedure. Course is principally taught through case study.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ACCT-650 Financial Reporting for Government and Not-for-Profit Entities (3 Credits)
This course provides a detailed examination and discussion of the accounting principles used by governmental and not-for-profit entities. The course focuses on the use of special funds for such entities as state and local governments, hospitals and other health care entities, voluntary health and welfare organizations, and other organizations. Students will learn what characterizes an entity as one for which the GASB is the authoritative standard-setting body versus one for which the FASB is the authoritative standard-setting body and develop an understanding of why two unique sets of accounting principles were developed to serve these entities.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-704 Corporate Financial Reporting I (3 Credits)
A comprehensive exposure at an intermediate level to financial accounting theory and practice under U.S. Generally Accepted Accounting Principles. Emphasis is placed on applying underlying accounting theory to complex accounting and reporting problems. The effects of alternative accounting methods are considered. International Financial Reporting Standards are introduced as they relate to course subject matter.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-705 Corporate Financial Reporting II (3 Credits)
Continuation of Corporate Continuation of Corporate Financial Reporting I with emphasis on equity and special measurement and reporting problems. Topics include liabilities and contingencies, stockholders' equity, earnings per share, pensions, leases, revenue recognition, income tax accounting, and the statement of cash flows. International Financial Reporting Standards are introduced as they relate to course subject matter.
Prerequisites: ACCT-704 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ACCT-706 Cost Management (3 Credits)
The development and use of cost data for external reporting and internal cost management (planning and control). Topics include job costing, process costing, joint product costing, cost reassignments, standard costs, activity-based costing, decentralization and transfer pricing, and cost variances. Consideration is given to manufacturing, service and retail organizations.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-707 Advanced Accounting (3 Credits)
Study of the application of generally accepted accounting principles and international financial reporting standards to business enterprises, including corporations with investments in subsidiaries, domestic and international, and partnerships. Issues involving consolidated financial statements, including international topics, are considered. Also examined are objectives for not-for-profit and governmental entities, and how these objectives affect their financial accounting and reporting.
Prerequisites: ACCT-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-708 Advanced Topics in Auditing and Assurance (3 Credits)
A study of the legal, ethical, and technical environment in which the auditor works. Current auditing theory, standards, procedures, and techniques are studied. The audit process is studied to ascertain how it leads to the development of an audit opinion.
Prerequisites: ACCT-490 or ACCT-704 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-709 Basic Taxation (3 Credits)
A basic introductory course in federal income taxation. Emphasis is on taxation of individuals and sole proprietorships. Topics include income measurement and deductibility of personal and business expenses.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-710 Tax Analysis and Strategy (3 Credits)
A continuation of Basic Taxation. Emphasis is on taxation of business entities, as well as estate and gift taxation and planning. Students use technology to prepare complex returns and to research tax issues. Tax analysis and planning are integrated throughout.
Contact Hours: Lecture 3
Typically Offered: Fall

ACCT-711 Internal Auditing (3 Credits)
Course explores the role of the internal audit function in the management of companies. Topics include internal vs. external auditing, internal control issues, reliability and integrity of information; compliance with policies, procedures, laws and regulations; efficiency of operations. Ethical considerations affecting the internal audit function are introduced.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ACCT-738 Information Systems Auditing and Assurance Services (3 Credits)
An examination of the unique risks, controls, and assurance services resulting from and related to auditing financial information systems with an emphasis on enterprise resource systems.
Prerequisites: ACCT-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-740 Comparative Financial Statement Analysis (3 Credits)
This course is designed to prepare students to interpret and analyze financial statements effectively. Explores in greater depth some of the financial reporting topics introduced in the core accounting course and includes a discussion of International Financial Reporting Standards. The course uses financial mathematics and applied statistics in the context of financial statement analysis.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ACCT-745 Accounting Information and Analytics (3 Credits)
This course covers data management and data analysis in accounting. As such, it covers technical aspects of accounting data exploration, accounting data acquisition, and data warehouse structure. Additionally, students learn accounting data analysis and reporting by using techniques such as slicing, dicing and queries. The course also covers data visualization techniques in Big Data to conduct descriptive and predictive analysis. The overall goal is to provide data analytic skills in the accounting context. A specific goal is to acquire techniques of accounting data exploration, data management and data analysis. A final goal is to use these techniques to turn accounting data into actionable insights and recommendations for the organization's key decision-makers.
Prerequisites: ACCT-110 or ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

ACCT-758 Seminar in Accounting (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to accounting. Specific topics will vary depending upon student and faculty interest and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics normally vary from semester to semester. (Depends on topic)
Contact Hours: Lecture 3

ACCT-790 Field Exam Prep (0 Credits)
All MS-Accounting students will take a field exam at the end of their program. This course provides basic help to students taking this exam. Note: all required courses in the MS-Accounting program.
Prerequisites: This course is restricted to students in ACCT-MS.
Contact Hours: Comprehensive Exam 1
Typically Offered: Fall, Spring, Summer

ACCT-794 Cost Management in Technical Organizations (3 Credits)
A first course in accounting for students in technical disciplines. Topics include the distinction between external and internal accounting, cost behavior, product costing, profitability analysis, performance evaluation, capital budgeting, and transfer pricing. Emphasis is on issues encountered in technology intensive manufacturing organizations. *Note: This course is not intended for Saunders College of Business students.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-795 Financial Accounting Theory and Research (3 Credits)
This course examines the theoretical concepts, definitions, and models espoused in the accounting literature and relevant to analyzing various contemporary issues in financial accounting and reporting. It also considers the historical development of accounting standards, contemporary issues in financial reporting including international standards, and research methods used to determine the appropriate methods to comply with accounting standards. Course requires writing and student presentations.
Prerequisites: ACCT-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-796 Accounting Capstone Experience (3 Credits)
The principal focus of this course is students completing several projects provided by members of CPA firms and industry employers. Employers provide assignments, which may include data or require students to gather relevant data, and students use defined technology, which may include a variety of applications common in technological accounting practice, to complete projects in teams. Students also write comprehensive individual reports and analyses related to the projects. Peripheral work in the course includes examination of theoretical concepts, definitions, and models espoused in the accounting literature and relevant to analyzing various contemporary issues in financial accounting and reporting. The historical development of accounting standards and contemporary issues in financial reporting are integrated. The course requires writing and student presentations. Subject to approval by the Program Director, an individual student internship/coop followed by an in-depth report may obtain equivalent credit.
Contact Hours: Lecture 3
Typically Offered: Spring

ACCT-799 Independent Study Accounting (3 Credits)
The student will work independently under the supervision of a faculty adviser.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

ACCT-801 Financial Accounting and Reporting (2 Credits)
This course provides an understanding of how financial accounting and reporting information are used by stakeholders of corporations, especially external stakeholders such as investors, lenders, and regulators. Topics include standards and practices of financial reporting, analysis of financial statements, and various methods of measurement of financial transactions.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2
Typically Offered: Fall, Spring

ACCT-802 Managerial Accounting (2 Credits)
Managerial Accounting emphasizes identifying and applying common techniques used by organizations to improve operational efficiency and effectiveness, improve profitability and control costs, among others. The course focuses on understanding how managerial accounting is used to help organizations achieve their goals.
Prerequisites: ACCT-801 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall, Spring

ACCT-810 Doctoral Seminar in Research in Financial Accounting (3 Credits)
This course introduces the landscape of financial accounting research. Three main topics will be included: 1) the use of accounting information by investors, creditors, analysts and other decision makers; 2) the preparation of accounting information by managers who may respond to economic incentives and use discretion to manage earnings; and 3) the regulation of accounting information by standard setters and other regulators who are evaluating the relevance and reliability of current and potential accounting information.
Prerequisites: ACCT-365 or ACCT-705 or equivalent course.
Contact Hours: Seminar 3
Typically Offered: Fall

ACCT-820 Auditing Research Seminar (3 Credits)
This Ph.D. level course develops basic research topics in Auditing area. Focus is on developing a general understanding of the research questions tested in Auditing. Emphasis will also be placed on regulation and institutional issues affecting audit quality, auditor behavior, and audit markets. Furthermore, time will be devoted to discuss challenging research opportunities in auditing, the process of conducting audit research, and selecting the appropriate research methodology and design, which should help students to identify an important research topic and develop a sound research proposal.
Contact Hours: Seminar 3
Typically Offered: Fall

ACCT-858 Seminar: Special Topics in Accounting (3 Credits)
This research seminar focuses on timely, special topics not covered in other seminars. Topics rotate based on faculty expertise (such as Financial Institutions and Markets, Behavioral Research in Accounting) and student needs as determined by the department.
Contact Hours: Seminar 3
Typically Offered: Biennially

Analytical Chemistry (CHMA)

CHMA-621 Advanced Instrumental Analysis Lab (3 Credits)
This is a capstone course requiring students to develop experimental protocols involving advanced techniques in instrumental analysis. This course is intended to give an opportunity to develop innovative skills and writing proficiency. Library, literature and textbook research will be required.
Prerequisites: CHMB-405 or CHMP-445 or Graduate Standing in CHEM-MS.
Contact Hours: Laboratory 6
Typically Offered: Spring

CHMA-650 Chemical Separations and Mass Spectrometry (3 Credits)
This course will teach state of the art chemical separations and methods which are coupled to mass spectroscopy for the modern analysis of pharmaceutical and biotechnology samples in industrial and academic laboratories. These include gas chromatography (GC, GC-MS), high performance liquid chromatography (HPLC, LC-MS), solid phase extraction (SPE and SPME), size exclusion/gel permeation (SEC, GPC), and ion exchange chromatography (IXC). Aspects of mass spectroscopy including ionization methods of electron impact (EI), chemical ionization (CI), positive and negative electrospray (ES+, ES-), APCI, and MALDI and techniques involving single and multiple ion/reaction methods (SIM, SRM, MRM) will be included. The separation and analysis of peptides, proteins and pharmaceuticals by LC and LC-MS will be a major focus. Isolation of drug metabolites from serum by SPE followed by HPLC analysis or using size exclusion chromatography to separate biomolecules, or labeling a peptide with a near infrared (NIR) dye are examples of important skills that are learned.
Prerequisites: (CHMG-111 or CHMG-131 or CHMG-141 or CHEM-151) and (CHMG-145 or CHEM-155) and (CHMO-231 or CHMO-331) or equivalent courses.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

CHMA-670 Advanced Concepts of Environmental Chemistry (3 Credits)
This course will build on previous chemistry courses to expand knowledge of biogeochemical cycles, environmental toxicology and applied methods of environmental analysis. The course will be conducted in a workshop format at the graduate level.
Prerequisites: CHMO-231 and CHMO-235 or CHMO-331 and CHMO-335 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CHMA-711 Advanced Instrumental Analysis (3 Credits)
The theory, applications, and limitations of selected instrumental methods in qualitative, quantitative and structural analysis will be discussed. This course is also intended to give an opportunity to develop writing and revising abilities, as well as communication skills. Library, literature, and textbook research will be required.
Prerequisite: CHMA-261 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMA-725 The Magnetic Resonance Family (3 Credits)
This course presents the magnetic resonance family of techniques. General techniques include nuclear magnetic resonance (NMR), electron spin resonance (ESR), nuclear quadrupole resonance (NQR), and muon spin resonance (mSR). Each technique will be presented in enough detail to give the student an appreciation of its capabilities and an understanding the theory of the spectroscopy.
Prerequisites: Graduate standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMA-740 Practical NMR (3 Credits)
A graduate level lecture and laboratory course designed to teach a student how to use a Bruker high-resolution NMR spectrometer to perform a variety of chemical analyses. Students are presented a series of brief descriptions of how to perform various functions and experiments on a Bruker NMR. Students then receive hands-on training and perform the experiment. Specific operations taught include: file management, magnet shimming, probe tuning, parameter optimization, pulse sequence development, one-dimensional and two-dimensional acquisitions, variable temperature studies, data processing, diffusion measurements, and measuring relaxation times. This course serves as mechanism to gain different levels of access to the Chemistry Department's NMR spectrometers.
Prerequisites: CHMO-332 or CHMA-221 or equivalent course or graduate standing in CHEM-MS.
Contact Hours: Lecture 5
Typically Offered: Spring

CHMA-750 NMR Spectrometer Maintenance (3 Credits)
This course is designed to introduce the technical aspects of keeping a magnetic resonance system operating. The theory of operation of the magnet, radio frequency, pulse programmer, computer, and supporting subsystems of a magnetic resonance instrument will be studied. Emphasis is placed on relating theory to achievable practice and the consequences of differences between the two. Techniques for troubleshooting problems will be presented and developed.
Prerequisites: CHMA-725 and CHMP-747 and CHMA-740 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

Applied Cognitive Neuroscience (CGNS)

CGNS-601 Cognitive Neuroscience (3 Credits)
Cognitive neuroscience is concerned with the study of the biological processes that underlie cognition with a specific focus on neural systems in the brain that are involved in mental processes. This course provides the foundation of cognitive neuroscience including neuroanatomy, neural signaling, motor and sensory pathways, experimental methods employed in cognitive neuroscience, and discusses the neural bases of complex cognitive functions such as attention, perception, learning, memory, emotional regulation, executive control, decision making and language. Critical analysis of primary research and research projects employed in the course foster an in-depth understanding of main areas of cognitive neuroscience and its recent advances.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

CGNS-689 Neuroscience Graduate Special Topics (1-4 Credits)
This course is a faculty-developed exploration of appropriate graduate-level neuroscience topics that are not part existing courses. The level of study is appropriate for student in their final two years of study.
Typically Offered: Fall, Spring, Summer

CGNS-710 Design Thinking and Cognition (3 Credits)
Design thinking refers to the cognitive, strategic, and practical processes involved in problem solving and creation of innovative design concepts, which can lead to the development of new products and to aid scientific exploration. Several key concepts and aspects of design thinking have been pinpointed through studies of design cognition, focusing on understanding of how designers think when they are trying to find creative and original solutions for vague, ill-defined problems. Currently, cognitive neuroscientists are becoming increasingly interested in identified brain mechanisms of design thinking. This course focuses on the principles, processes, and scientific underpinnings of design thinking and their applications to real-life innovative problem solving.
Prerequisite: CGNS-601 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CGNS-799 Neuroscience Graduate Independent Study (1-4 Credits)
This course is a faculty-directed exploration of appropriate advanced multi-disciplinary topics that are not part of the formal curriculum. The level of study is appropriate for student in their final two years of study.
Typically Offered: Fall, Spring, Summer

Architecture (ARCH)

ARCH-611 Architectural Representation I (3 Credits)
Introduction to the range of architectural representation skills necessary to effectively document basic architectural form and space. Skill development will be both manual and digital. Class 2, Studio 4, Credit 3 (F)
This class is restricted to students in the ARCH-MARCH program.
Contact Hours: Studio 2
Typically Offered: Fall

ARCH-612 Architectural Representation II (3 Credits)
Introduction to the range of architectural communication skills necessary to effectively document basic architectural form and space. The focus will be on digital skill development.
Contact Hours: Studio 4
Typically Offered: Spring

ARCH-621 Architectural History I (3 Credits)
Students study global architecture from pre-history to the 10th century, including form, technology, urban context, and how architecture reflects social, cultural, and political concerns.
This class is restricted to students in the ARCH-MARCH program.
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-622 Architectural History II (3 Credits)
Students study global architecture from the 15th to the 21st century, including form, technology, urban context, and how architecture reflects social, cultural, and political concerns.
This class is restricted to students in the ARCH-MARCH program.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-631 Architectural Design I (6 Credits)
Exploration of basic architectural space and form through studio design problems. Problems require understanding of elements such as spatial relationships, circulation, light, and orientation. (Co-requisite, ARCH-611 Architectural Representation I). Classroom 3, Studio 9, Credit 6 (F)
Co-requisites: ARCH-611 or equivalent course.
Contact Hours: Studio 12
Typically Offered: Fall

ARCH-632 Architectural Design II (6 Credits)
Students will analyze and solve building based architectural design problems with a focus on residential design and other wood based structures. (Pre-requisite, ARCH-631 Architectural Design I, Corequisite, ARCH-621 Architectural Representation II). Classroom 3, Studio 9, Credit 6 (S) ARCH-
Co-requisites: ARCH-641 or equivalent course.
Contact Hours: Studio 12
Typically Offered: Spring

ARCH-641 Fundamentals of Building Systems (3 Credits)
Students will receive an overview of the various passive and active architectural and engineering systems that comprise a building project while focusing on wood frame construction. (Co-requisite ARCH- 632 Architectural Design II) Class 3, Credit 3 (S)
Co-requisites: ARCH-632 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-651 Architectural Theory (3 Credits)
A survey of architectural theory and criticism with emphasis on contemporary architecture. Students will investigate, learn, and apply critical thinking, as well as communicate it to others.
Prerequisites: ARCH-621 and ARCH-622 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-652 Urban and Regional Planning (3 Credits)
This course immerses students in the field of urban and regional planning by studying and actively engaging in the planning process through projects with community agencies.
Prerequisites: ARCH-621, ARCH-622 and ARCH-632 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-661 Understanding Sustainability (3 Credits)
Students will study the interaction between industrial, environmental/ecological and social systems in the built environment by introduction of systems thinking and the multiple disciplines comprising sustainability.
This class is restricted to graduate students in the Golisano Institute for Sustainability (ARCH-MARCH, SUSTSY-MS, SUST-PHD).
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-662 Sustainable Built Environment (3 Credits)
Students will study the interaction between industrial, environmental/ecological and social systems in the built environment by introduction of life cycle and systems thinking and the multiple disciplines comprising sustainability in the built environment. Methods of measuring sustainability will also be studied, including life cycle analysis.
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-689 ST: Passive House Design (3 Credits)
This course introduces students to fundamental of the Passive House design philosophy as it relates to concepts affecting the energy performance of a building, including thermodynamics, building science, construction, and design. This course utilizes historic and modern passive design principles as a primary framework for these concepts. The course culminates in a final project where students design and model a residential building to meet Passive House Certification.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-698 Global Experience (0-3 Credits)
An immersive experience outside the student's home culture whereby architecture is studied as the outcome of historic, social, cultural, religious, and physical factors.
Contact Hours: Study Abroad 3, Study Abroad Grades 3
Typically Offered: Fall, Spring, Summer

ARCH-699 Coop Architecture (0 Credits)
ARCH-699 Co-op Architecture This course provides a ten-week (350 hour min.) work experience in the field. (Second year program status) Credit 0 (Su)
This class is restricted to students in the ARCH-MARCH program.
Typically Offered: Summer

ARCH-731 Architectural Studio I: Site (6 Credits)
Building on the 1st year studios that explored basic communications between form and space this introduction to the 2nd year will investigate in greater depth the complexity and integrated nature of the architectural object and design process. Students will explore the artistic, conceptual, creative, and experiential side of architecture as a way of developing a rigorous process of architectural form-making. By developing methods, parameters, and alternatives of form-making, issues such as expression, perception, and representation will be explored. Although site design will be the focus of the course, full building designs will be examined in response to site parameters. Students will be expected to work in teams to explore communally a broad spectrum of design strategies at every opportunity.
Prerequisites: ARCH-632 or equivalent course. Co-requisites: ARCH-741 or equivalent course.
Contact Hours: Studio 12
Typically Offered: Fall

ARCH-732 Architectural Studio II: Tectonic (6 Credits)
This foundation studio considers architecture both as a representation and as a built form. It will expand student horizons beyond the confines of the studio by bridging the gap between theory (representation) and practice (action). Architects are responsible for shaping the built environment and this studio will provide students with a first-hand experience of the professional responsibility to the public. Through the process of design students will be making strong connections between drawing/representation and the finished building produced.
Prerequisites: ARCH-731 or equivalent course. Co-requisites: ARCH-743 or equivalent course.
Contact Hours: Studio 3
Typically Offered: Spring

ARCH-733 Architectural Studio III: Adaptive (6 Credits)
This course examines the adaptive reuse of existing spaces, with implicit exposure to the basics of historic preservation. Students will examine and document an existing "real" space within the region, and propose coherent and rational architectural interventions for that space.
Prerequisites: ARCH-734 or equivalent course. Co-requisites: ARCH-743 or equivalent course.
Contact Hours: Studio 12
Typically Offered: Fall

ARCH-734 Architecture Studio II: Urban (6 Credits)
Investigation of architectural design as a response to the modern urban context. This includes an understanding of urban design and planning, as well as community involvement.
Prerequisites: ARCH-731 or equivalent course. Co-requisites: ARCH-742 or equivalent course.
Contact Hours: Studio 12
Typically Offered: Spring

ARCH-735 Architecture Studio IV: Integrative (6 Credits)
This studio provides the opportunity for students to execute a comprehensive and integrative project from schematic design through design development.
Prerequisites: ARCH-733 or equivalent course. Co-requisites: ARCH-744 or equivalent course.
Contact Hours: Studio 12
Typically Offered: Spring

ARCH-741 Integrated Bldg Systems I (3 Credits)
This course presents the various systems that comprise a project's site work; architectural materials/methods, civil engineering, and landscaping architecture as well as site constraints.
Prerequisites: ARCH-641 or equivalent course. Co-requisite: ARCH-731 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-742 Integrated Building Systems II (3 Credits)
The major tectonic components of a building will be studied in this course focusing on the building envelope and typical structural configurations. Structural inquiry will fully cover the field of statics.
Prerequisites: ARCH-741 or equivalent course. Co-requisites: ARCH-734 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-743 Integrated Building Systems III (3 Credits)
Typical interior building components will be studied in this course from subdivision of space down to selection of material finishes as they relate to building code regulations. Structural inquiry will continue with full coverage of strength of materials.
Prerequisites: ARCH-742 or equivalent course. Co-requisites: ARCH-733 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-744 Integrated Building Systems IV (3 Credits)
In conjunction with the co-requisite course, students will document a building design with design development drawings, including MEP with a focus on environmental systems and lighting. (Pre-requisite ARCH-743 Integrated Building Systems III, Co-requisite ARCH-733 Architectural Studio IV: Comprehensive) Class 3, Credit 3 (S)
Prerequisites: ARCH-743 or equivalent course. Co-requisites: ARCH-733 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-753 Thesis Preparation (3 Credits)
Students frame individual thesis proposals by using various research tools, accessing the literature, and creating a proposal. They then develop a thesis plan and begin to execute it.
This class is restricted to students in the ARCH-MARCH program.
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-754 Architectural Research Methods (3 Credits)
A graduate-level survey course on research design/methods and analysis for the architectural profession. The goal is to prepare students to engage and participate in architectural research to test and evaluate innovations in the field.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

ARCH-762 Industrial Ecology Fundamental (3 Credits)
Students will learn how to assess the impact and interrelations of built environments on the natural environment by utilizing life cycle assessment tools and principles of sustainability.
Prerequisites: ARCH-661 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

ARCH-763 Sustainable Building Metrics (3 Credits)
The measurement science, performance metrics, assessment tools, and fundamental data critical for the development and implementation of building systems associated with life-cycle operation of buildings while maintaining a healthy indoor environment.
This class is restricted to graduate students in the Golisano Institute for Sustainability (ARCH-MARCH, SUSTSY-MS, SUST-PHD).
Contact Hours: Lecture 3
Typically Offered: Fall

ARCH-764 Race to Net Zero (3 Credits)
Students will participate in "The Race to Zero" competition and may enter their projects in the NY State Pollution Prevention Institute Research and Development Student Competition.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-771 Professional Practice (3 Credits)
Students will study the roles of stakeholders involved in architecture within the context of project management and business practices including legal responsibilities, and professional ethics. (Second year courses) Class 3, Credit 3 (S)
This class is restricted to students in the ARCH-MARCH program.
Contact Hours: Lecture 3
Typically Offered: Spring

ARCH-781 Graduate Scholarship (1-6 Credits)
Masters-level scholarship by the candidate under the direction of the instructor. Students may enroll multiple times for a maximum of 9 credits towards their degree requirement. The subject of each offering varies depending on the nature and stage of the faculty member's work.
Contact Hours: Research 3
Typically Offered: Fall, Spring

ARCH-789 Architecture Special Topics (1-6 Credits)
A Critical examination of issues in some area of sustainability not covered in other Golisano Institute for Sustainability courses. Topic depends on specific offering.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARCH-790 Thesis (3 Credits)
Students continue work on the thesis begun previously. They execute a methods and procedures plan, analyze the data, arrive at a conclusion and successfully defend it.
Prerequisites: ARCH-753 or equivalent course.
Contact Hours: Thesis 3
Typically Offered: Fall

ARCH-791 Continuation of Thesis (0 Credits)
This course is for Master of Architecture students who require additional time to complete their thesis. Students should enroll for one credit unless otherwise instructed.
Prerequisites: ARCH-790 or equivalent course.
Typically Offered: Fall, Spring, Summer

ARCH-799 Independent Study (1-4 Credits)
Contact Hours: Independent Study 4
Typically Offered: Fall, Spring, Summer

Art Education (ARED)

ARED-701 Child Development in Art (3 Credits)
In this course students will investigate and study the topic of child development in art and education. Students will explore a range of perspectives on developmental theories; the creation, and understanding of children's art and meaning making; and approaches to teaching art to children in a Birth-12 setting. Resources from the areas of art, psychology, sociology and art education will be investigated. Projects will include the development of a case study, relevant readings, research and studio activities, and collaborative research. Students will be expected to complete weekly reading, writing assignments, conduct research and field experience, and to participate in weekly discussions. This course has a field experience component of 20 hours.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

ARED-702 Inclusive Art Education: Teaching Students with Disabilities in the K-12 Art Classroom (3 Credits)
Art Educators are expected to be able to understand the diverse learning needs of all students. Students in this course will discover how to adapt their own curricula and collaborate with special needs teachers to help students succeed in the art classroom. Through course work and field experience students will build a foundation of knowledge for working with children and youth with special needs. Students will develop new instructional strategies for making visual art more accessible for students with exceptionalities and a plan to incorporate accessibility strategies into their daily teachings. In a seminar format, the students realize the course objectives through participatory means. Students are expected to write critical essays, conduct research and field experience, and to participate in weekly small and large format discussion groups. Online technology is utilized in addition to lectures, videos, and other forms of media. This course has a field experience component of 20 hours.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

ARED-703 Multicultural Issues in Art and Education (3 Credits)
This course will explore a range of perspectives on multicultural issues in the visual arts and education fields. Course content will cover making connections with contemporary multicultural art, the implementation of lesson plans based on multicultural issues for the art education classroom, and an examination of curriculum and policy issues. Students are expected to write critical papers and essays, develop curriculum resources, and to participate in weekly discussions. This course has a field component of 20 hours. **Fee: A course fee applied via student account**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

ARED-704 Methods in Teaching and Learning (3 Credits)
This course will explore the process of teaching art in the public school classroom at the Elementary level. Theories and practices relevant to teaching and learning in visual art will be addressed. Projects will include: lesson-planning, unit planning, classroom management, investigating new technologies, urban education, and action research. In addition, students will focus on human development, teaching students with disabilities and multiple intelligences, and assessment processes. This course has a field experience component of 20 hours.
This course is restricted to VISART-MST students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARED-705 Methods II: Studio Thinking (3 Credits)
This course explores the relationship between curriculum, instruction, and the assessment of learning. Students are introduced to process and procedures for developing curriculum, and assessing student learning in the art classroom, specifically at the secondary level. An emphasis is placed on a studio-thinking approach to teaching and learning. Students will explore innovative and creative approaches to curriculum design. Pedagogical knowledge is developed and extended through artistic practice and meaning making in lesson and unit development. This course compliments the course: Methods in Teaching and Learning. This course has a field experience component of 20 hours.
This course is restricted to VISART-MST students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARED-711 Professional Practices in Art Education (3 Credits)
This course will focus on the development of professional practices for entry-level art educators who are involved in their student teaching practicum. Projects will include presentations, relevant readings, assessment practices, mock interviews, case studies, visiting speakers, and preparing materials for applications in the field of art education. Students will be expected to complete weekly assignments. Goals for excellence in teaching and State and National standards are investigated and addressed.
Prerequisite: ARED-704 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ARED-761 Survey of Methods and Materials for 6th – 12th Grade Art Education (3 Credits)
This course will examine four topics in media and methods: Drawing, Painting, Printmaking and Ceramic Hand building, in relation to a student's individual art practices and interest in teaching art education 6th -12th grades. Course content will include examining the elements of art and principles of design. Media and technique exploration will include graphite, charcoal, colored pencils, watercolor paint, tempera and acrylic paint, low fire clay and low fire glazes in relation to pedagogy. Historical and contemporary perspectives will be introduced for each of the four media topics covered. At the completion of this course, students will apply media, methods and perspectives taught in art education programs. Note: Students will need purchase materials to complete this course. The instructor will provide information on the materials required. **Fee: A course fee applied via student account**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

ARED-790 Student Teaching (9 Credits)
The student teaching practicum is designed to provide the student teacher with in depth pedagogical experiences, real world challenges, and rich learning opportunities. Two student teaching placements are arranged for each student for the duration of 6-7 weeks each. Full-time involvement at the school site is required. The Student Teacher will be under the guidance of experienced mentor teachers and college supervisors. This experience includes observation, full-responsibility planning and teaching, and involvement in the culture of the school setting. Students are assigned a cooperating teacher and a college supervisor for each setting. A Student Teaching Handbook is provided. Students are required to meet state and national standards when teaching. Unit and work sample preparation, instruction and assessment are required. Online technology is utilized in addition to lectures, video and other forms of media.
Prerequisites: ARED-702 and ARED-704 and ARED-705 or equivalent courses. Co-requisites: ARED-890 or equivalent course.
Contact Hours: Studio 28
Typically Offered: Spring

ARED-890 Graduate Seminar in Art Education (6 Credits)
This course will explore a range of perspectives on contemporary theories in art and education, making connections with theory, meeting state and national standards, and reflecting on pedagogical experiences to address the overall goals of the program. Students focus on the following areas to meet New York State Education Department requirements and Council for the Accreditation of Educator Programs standards: content/subject matter knowledge, pedagogical knowledge, teaching skills, curriculum development, assessment and professional skills. The development of a teaching portfolio occurs in conjunction with a capstone project and exhibition. This course requires the student to complete 20 field experience hours, which will complete their required 100 hours.
Co-requisite: ARED-790 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

Art History (ARTH)

ARTH-600 Postmodernism and After: Contemporary Aesthetics (3 Credits)
This course explores the history of contemporary art and visual culture from postmodernism to the present. We will focus on major artistic movements such as Pop Art, Minimalism, Conceptualism, Performance Art, and Relational Aesthetics. Along with and inseparable from aesthetics and media, we will chart the ways in which class, gender, race, and sexual inequality have figured into the major aesthetic movements of our time. By reading theory and criticism, discussing artworks across media forms, and researching artistic movements in context, students will examine art since the 1960s and its connections to cultural history. Graduate students will complete a research project and class presentation in addition to the writing assignments and discussion expected in the undergraduate section.
Contact Hours: Lecture 3
Typically Offered: Spring

ARTH-601 Forms of Inquiry (3 Credits)
Forms of Inquiry aims to expose students to a broad range of critical issues related to conception and production, to inspire and provoke critical reflection, and to facilitate the development of a preliminary thesis topic. Presentations, discussions, and written assignments will examine concerns from aesthetics, psychology, anthropology, philosophy, and critical theory as they relate to contemporary art, crafts, design and image making.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-611 Extreme Abstraction (3 Credits)
Although we can trace the roots of abstraction to non-modern times and find its beginning as a concept in the visual arts in the late 18th and through-out the 19th century, it is a predominantly 20th century phenomenon. During the beginning of the 20th century there were many artists who turned to nonfigural practices for reasons that were mostly cultural and political. The world was changing and the artists wanted art to change as well. Although these reasons were about creating new ways of seeing and representing the world the sources for these visions varied from artist to artist. Scientific discoveries dealing with concepts of evolution, bacteria, atomic theory and astronomy contributed to those artists theorizing and producing abstract works of art. And although the work took on a look that may have been associated with decoration, most artists denied this connection for fearing that their work would not be taken seriously. Merely decorative! Abstraction since then has gone through many manifestations. The artists of today are no longer just going through the process of abstracting but are now producing abstract work that has its own history, rules and grammar. Issues of science, spirituality, primitivism and the decorative still resonate in the work of late 20th and early 21st century artists. But what is different?
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

ARTH-621 The Image (3 Credits)
This course will examine recent scholarship devoted to the image – a ubiquitous controversial, ambiguous and deeply problematic issue in contemporary critical discourse -- and the ideological implications of the image in contemporary culture. Topics will include: the modern debate over word vs. image, the mythic origins of images, subversive, traumatic, monstrous, banned and destroyed images (idolatry and iconoclasm), the votive, the totem, and effigy, the mental image, the limits of visuality, the moving and projected image, the virtual image, dialectical images, image fetishism, the valence of the image, semiotics and the image, as well as criteria by which to assess their success or failure (their intelligibility) and their alleged redemptive and poetic power. Students will explore the theoretical framework of the concept of the image, and critically evaluate these theories within their broader intellectual and historical contexts.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-624 Scandinavian Modernism (3 Credits)
Students will examine the decorative arts and visual culture of modern Scandinavia from 1860 to the present, with special emphasis on the social, economic, and political impulses that have shaped them. Scandinavian Modern design plays a significant role in the postwar epoch; it is equated with such leading brands as Volvo, Saab, Ericsson, Nokia, H&M, Electrolux Orrefors, Georg Jensen, ARTEK, Iittala, and IKEA and the idea of progressive, social democracy. The myths and realities of its success will be examined, as well as its impact on contemporary design.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-638 Symbols And Symbol Making: Psychoanalytic Perspectives on Art (3 Credits)
This course explores the links between psychoanalytic theory and art history with special focus on the work of Sigmund Freud, Carl Jung, and their followers. A central aim is to examine the way in which psychoanalytic theory has been employed by art historians and theorists as a mode of interpretation, as well as to study how, why, and what several of the most notable psychoanalysts have written about art. Topics include the interpretation of dreams, transference, the Oedipal myth, melancholia, narcissism, abjection, the structure of the unconscious, the fetish, Archetypes and the Collective Unconscious, as well as outsider art and the art of the insane. Key theorists to be discussed include: Freud, Jung, D.W. Winnicott, Melanie Klein, Jacques Lacan, Otto Rank and Julia Kristeva; individual artists studied include: Albrecht Dürer, Leonardo da Vinci, Michelangelo, Edvard Munch, Max Ernst, Jackson Pollock, Louise Bourgeois, Mary Kelly and Victor Burgin; in addition to examples from film (Maya Deren, Luis Buñuel and Salvador Dali, as well as Stan Brakhage).
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-644 Illuminated Manuscripts (3 Credits)
Students in this course will examine the history of illuminated manuscripts, learning about the working methods of artists as well as the cultural significance of the illuminated book. Issues of production, style, function, and patronage will be introduced, and students will explore the relationships between images, texts, and readers.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-649 Topics in Global Art and Architecture: (3 Credits)
This course will focus on a critical examination of a select theme within art and architecture beyond the traditions of Europe or modern North America. A topic description will be posted each term the course is offered. This course can be taken multiple times but individual topics must be different.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ARTH-650 Topics in Art History (3 Credits)
This course is focused on the critical examination and analysis of a selected topic in art history varying according to faculty teaching the course. A subtopic course description will be published each term course is offered. This course can be retaken, topics may not.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-655 Topics in Medieval Art and Architecture (3 Credits)
A critical examination of a select theme within the field of medieval art and architecture. A subtopic description will be posted each term the course is offered. This course may be repeated for credit, but students may not repeat a topic.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-663 Modern Architecture (3 Credits)
In this course, we will explore the history of world architecture from the late nineteenth century to the present. Issues to be considered include the definition of modern as it applies to the built environment; new building types; historicism; stylistic movements; urban development; housing; modern materials; critical theory and its impact on design; and architectural representation.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

ARTH-666 Modernism Realism Expressionism (3 Credits)
This course is an inquiry into one of the major debates of modern art. This debate had a seemingly clear victor. The idea that the artist expresses his or her individuality and then communicates that self to the rest of humanity through a higher, transcendental, language has dominated the discourse and practice of modernist art. In retrospect, the art that dominated most of the first half of the 20th century was of an Expressive nature. On the other hand art that in any way addressed direct and specific social issues was banished by art's major institutions. Realism was dead. In this course students will look at the circumstances of how Realism became subordinated to Expressionism. Students will also address the question of what exactly constituted the practice of realist art. Students will look at the roots of both movements, taking us at times into 18th and 19th centuries, but will concentrate on how institutions like the Museum of Modern Art helped define how we see the history of 20th century art as being determined. Students will also explore how Modernism's other, Realism, survived and gained new currency in practices of late 20th and early 21h century art.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-668 Art And Technology: From The Machine Aesthetic to the Cyborg Age (3 Credits)
Students will explore the link between art and technology in the 20th century with special focus on the historical, theoretical, and ideological implications. Topics will include the body in the industrial revolution, utopian, dystopian, and fascist appropriations of the machine, engendering the mechanical body and machine-eroticism, humanism, the principles of scientific management, and the paranoiac machine, multiples, mass production, and the art factory, industrial design, and machines for living, the technological sublime, cyborgs, cyberpunk and the posthuman. Key theorists to be discussed include: Karl Marx, Norbert Weiner, Reyner Banham, Siegfried Gideon, Michel Foucault, Deleuze and Guattari, Donna Haraway, and Martin Heidegger, as well as examples from film (Modern Times, Metropolis, Man with the Movie Camera and Blade Runner) and literature (Shelley's Frankenstein, Zamyatin's We). Artists covered include: Tatlin, Rodchenko, Malevich, Moholy-Nagy, Léger, Sheeler, Picabia, Duchamp, Calder, Ernst, Le Corbusier, Klee, Tinguely, Oldenburg, Rauschenberg, Warhol, Beuys, Kiefer, Lewitt, Fischli and Weiss, Acconci, Nam June Paik, Survival Research Laboratories, Bureau of Inverse Technology, Stelarc, Orlan, Dara Birnbaum, Roxy Paine, Marina Abramovic, Eduardo Kac and Bill Viola.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-671 Art And Architecture Of Ancient Rome (3 Credits)
In this course, students will examine the visual culture of ancient Roman civilization from the foundations of Roman culture through the Late Imperial era. Roman culture was heavily reliant on images as a means of transmitting concepts of lineage, status, and power; students will learn how these images may have been perceived in the context of Roman social and political history, and how style may have been used as an ideological tool.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-672 Art of the Americas (3 Credits)
This is a survey course of native north and South American visual arts within an historical and anthropological framework. Included will be an examination of the development of principal styles of Ancient American architecture, sculpture, painting, and ceramics up to the sixteenth century when the Spanish conquistadores defeated the Aztec and Inca empires and imposed colonial rule. Consideration is also given to materials used, techniques of construction, individual and tribal styles, as well as to the meaning and function of various art forms within Native American societies.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-673 Conceptual Art (3 Credits)
This course examines the widely influential mid-1960s art movement that questioned the fundamental nature of art itself by renunciating the material art object as well as the phenomenon of art making. The definition of art as well as its institutional framework was thereby expanded, and the idea, concept, or intellectual dimension of the work was underscored. Students will be acquainted with the philosophical foundations and critical implications of this global movement across a wide spectrum of works and practices (paintings, performance, installations, books and texts, photography, film, and video) and its relevance to contemporary concerns.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-674 Dada and Surrealism (3 Credits)
This course examines the widely influential Dada and Surrealist movements in Europe and the United States from 1916 through the post-World War II period as well as their relevance to contemporary concerns. Emphasis is on identifying the major works of artists involved in these movements as well as their philosophical foundations, critical implications, as well as broader literary and ideological contexts (e.g., Freud, Breton, Lautréamont, Leiris and Bataille). A wide range of works and practices (paintings, performance, installations, literary texts, photography, film, and ephemeral objects) will be studied, and the work of certain key artists (Höch, Heartfield, Schwitters, Duchamp, Picabia, Picasso, Dalí, Ernst, Giacometti, Man Ray, Bellmer, Cahun, Cornell, Magritte, Miro, Oppenheim, Toyen and Picasso) will be analyzed in depth.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-677 Displaying Gender (3 Credits)
This course brings together two of the most significant strains of recent art historical scholarship: the study of gender in representation and the critical examination of exhibitions and museums – with particular focus given to key examples of curatorial practice from the late 19th century to the present day. Through readings, possible museum visit(s), class discussions, and guided individual research, questions of gender in exhibitions will be considered in relation to other aspects of identity including sexuality, race, and class.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

ARTH-678 Edvard Munch (3 Credits)
The Norwegian artist Edvard Munch (1863-1944) continues to generate a great deal of popular interest, critical scholarship, and reflection. The 4-volume catalogue raisonné of his paintings was published in 2009, and the graphic work appeared in 2001. A painter, printmaker, photographer, and filmmaker, Munch was also a prolific writer, well acquainted with the symbolist poets and playwrights, as well as the broad intellectual drift of the fin-de-siècle. He is the one Scandinavian artist included within the Modernist canon and his image, The Scream (1893), is an icon of the modern age. Munch traveled widely throughout Europe and his work was exhibited in North America beginning with the famous 1913 Armory Show. In this course students will examine recent scholarship devoted to Munch and the critical issues that his work addresses. It will also place him within the broader cultural context of Scandinavian and European modernism, while examining his impact on subsequent generations.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-681 Latin American Art (3 Credits)
Students will explore the historical development of the art of Latin America from colonial times to the present. Included will be a consideration of painting, sculpture, architecture, graphic, and photographic arts. Potential themes to be addressed include the dependence on the European neo-classical academic model; indigenism; nationalism and the resurgence of popular art; the role of the visual arts in the construction of history; the conflicts and tensions involved in the search for a cultural identity.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

ARTH-683 Installation Art (3 Credits)
This course will introduce students to historic, contemporary, and critical issues surrounding installation art. There will be an introduction to the development of installation art as a genre. We will examine the changes, which have developed over the past three decades, of object sculpture to non-object. There will be an emphasis on the development of the concept of an installation project and its relationship to site and/or audience. Both public and gallery spaces will be discussed.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-686 History of Things: Studies in Material Culture (3 Credits)
Students will examine techniques and materials together with a historical overview of the artistic achievements of craftsmen and women in the past, with particular emphasis on ceramics and metalsmithing. It will include the study of Renaissance and early modern earthenware and stoneware as a prelude to the consideration of the history of porcelain and explores creative thinking and designing in other traditional craft areas such as fiber, glass, and wood.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ARTH-688 The Gothic Revival (3 Credits)
This class covers the Gothic Revival of the 18th, 19th, 20th, and centuries. Issues to be examined include the question of stylistic revival vs. stylistic survival; the origin and meanings of Gothic as a stylistic category; the impact of antiquarianism on the Gothic Revival in the eighteenth century; Gothic and 18th-century modes of vision; Gothic in the private and public spheres; Gothic 's associations with science, gender, nationalism, and morality; the Gothic Revival and the Pre-Raphaelites, and major figures within the movement such as A.W.N. Pugin and John Ruskin.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ARTH-711 Theories of Representation (3 Credits)
Representation is the fundamental practice underlying the visual arts. In this graduate course, students will explore theoretical concepts, processes, meanings, and functions of visual representation across different cultures, eras, and media, analyzing how, why, and to whom representation communicates meaning. This course will be reading intensive, and group discussion will be the primary pedagogical method.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

Artificial Intelligence (Interdisciplinary) (IDAI)

IDAI-610 Fundamentals of Artificial Intelligence (3 Credits)
This course covers the underlying theories and algorithms used in the field of artificial intelligence. Topics include the history of AI, search algorithms (such as A*, game search and constraint satisfaction), logic and logic programming, planning, and an overview of machine learning. Programming assignments, including implementation of AI algorithms, and oral/written summaries of research papers are required.
This course is restricted to degree-seeking graduate students in GCCIS, KGCOE, or the School of Mathematics and Statistics ACMTH-MS, APPSTAT-MS, or MATHML-PHD program students. .
Contact Hours: Lecture 3
Typically Offered: Fall

IDAI-620 Mathematical Methods for Artificial Intelligence (3 Credits)
This course introduces the mathematical background necessary to understand, design, and effectively deploy AI systems. It focuses on four key areas of mathematics: (1) linear algebra, which enables describing, storing, analyzing and manipulating large-scale data; (2) optimization theory, which provides a framework for training AI systems; (3) probability and statistics, which underpin many machine learning algorithms and systems; and (4) numerical analysis, which illuminates the behavior of mathematical and statistical algorithms when implemented on computers.
This course is restricted to degree-seeking graduate students in GCCIS, KGCOE, or the School of Mathematics and Statistics ACMTH-MS, APPSTAT-MS, or MATHML-PHD program students. .
Contact Hours: Lecture 3
Typically Offered: Fall

IDAI-699 Graduate Co-op (0 Credits)
Students perform paid professional work related to Artificial Intelligence while they are considered enrolled full-time. When registered for co-op, students complete a work report. To receive a satisfactory grade, the student co-op work report should be largely consistent with employer evaluation. The minimum is 35 hours of co-op work per week for the semester's duration (summer, fall, or spring). Co-op is an enrichment opportunity and optional for degree completion. To be eligible, a student must have completed assigned bridge coursework and between 15 credits to two semesters of MS on-campus coursework, be a full-time student in good standing (cumulative GPA of 3.0 or better or a semester GPA of 3.0 or better in the semester immediately preceding the requested co-op term), and attend a co-op orientation at RIT.
Typically Offered: Fall, Spring, Summer

IDAI-700 Ethics of Artificial Intelligence (3 Credits)
This course will familiarize students with foundational concepts and emerging ideas in the ethics of artificial intelligence and their implications for public policy. It will be broken down into three sections: (1) the ethics of machine learning; (2) the moral status of AI; and (3) AI and the distant future. The first section will consider such topics as the ethical implications of unconscious bias in machine learning (e.g., in predictive text, facial recognition, speech dialogue systems); what constraints should govern the behavior of autonomous and semi-autonomous machines such as drones and smart cars; whether AI can undermine valuable social institutions and perhaps to democracy itself and what might be done to mitigate such risk; and how automation might transform the labor economy and whether this morally desirable. The second section turns to the question of our moral obligations toward (some) artificial intelligences. Here, we will ask what grounds moral status in general and how this might apply to artificial intelligences in particular, including how should we should balance moral obligations toward (some) AIs with competing obligations toward human beings and other creatures with morally protectable interests. The final section will look to the far distant future and consider how (if at all) we might identify and estimate future threats from AI and what might be done today to protect all those who matter morally.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

IDAI-710 Fundamentals of Machine Learning (3 Credits)
This course is an introduction to machine learning theories and algorithms. Topics include an overview of data collection, sampling and visualization techniques, supervised and unsupervised learning and graphical models. Specific techniques that may be covered include classification (e.g., support vector machines, tree-based models, neural networks), regression, model selection and some deep learning techniques. Programming assignments and oral/written summaries of research papers are required.
Prerequisites: IDAI-610 and IDAI-620 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

IDAI-720 Research Methods for Artificial Intelligence (3 Credits)
Hallmarks of AI are systems that perform human-like behaviors, and AI systems rely on continuous preparation and deployment of data resources as new tasks emerge. In this course, students develop their conceptual, applied, and critical understanding about (1) experimental principles and methods guiding the collection, validation, and deployment of human data resources for AI systems; (2) human-centered AI concepts and techniques including dataset bias, debiasing, AI fairness, humans-in-the loop methods, explainable AI, trust), and (3) best practices for technical writing and presentation about AI. As a milestone, based on research review, students will write and present an experimental design proposal for dataset elicitation followed by computational experimentation, with description and visualization of the intended experiment setup, as well as critical reflection of benefits, limitations, and implications in the context of AI system development and deployment.
Prerequisites: IDAI-610 and IDAI-700 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

IDAI-780 Capstone Project (3 Credits)
Graduate capstone project by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Prerequisites: IDAI-710 and IDAI-720 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

IDAI-790 Research & Thesis (1-6 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Prerequisites: IDAI-710 and IDAI-720 or equivalent courses.
Typically Offered: Fall, Spring, Summer

IDAI-791 Continuation of Research and Thesis (0 Credits)
This 0-credit course provides an optional additional semester to complete a thesis for students who already completed 6 SCH of IDAI 790. The student will continue to work closely with their thesis advisor and committee to complete the thesis proposal plan, culminating in a defended thesis.
Prerequisites: IDAI-790 or equivalent course.
Typically Offered: Fall, Spring, Summer

IDAI-799 Independent Study in Artificial Intelligence (1-3 Credits)
The student will work independently, under the supervision of one or more faculty members, on a topic that either expands beyond the depth of or addresses content not covered in another IDAI course. (Permission of instructor and joint program director.)
Prerequisites: IDAI-610 and IDAI-620 and IDAI-700 or equivalent courses.
Typically Offered: Fall or Spring or Summer

Astrophysical Sciences & Tech (ASTP)

ASTP-601 Graduate Seminar I (1 Credit)
This course is the first in a two-semester sequence intended to familiarize students with research activities, practices, and ethics in the university research environment and to introduce students to commonly used research tools. As part of the course, students are expected to attend research seminars sponsored by the Astrophysical Sciences and Technology Program and participate in a weekly journal club. The course also provides training in scientific writing and presentation skills. Credits earned in this course apply to research requirements.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Seminar 3
Typically Offered: Fall

ASTP-602 Graduate Seminar II (1 Credit)
This course is the second in a two-semester sequence intended to familiarize students with research activities, practices, and ethics in the university research environment and to introduce students to commonly used research tools. As part of the course, students are expected to attend research seminars sponsored by the Astrophysical Sciences and Technology Program and participate in a weekly journal club. The course also provides training in scientific writing and presentation skills. Credits earned in this course apply to research requirements.
Prerequisites: ASTP-601 or equivalent course. This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Seminar 3
Typically Offered: Spring

ASTP-608 Fundamental Astrophysics I (3 Credits)
This course will provide a basic introduction to modern astrophysics, including the topics of radiation fields and matter, star formation and evolution, and stellar structure. This course will provide the physical background needed to interpret both observations and theoretical models in stellar astrophysics and prepare students for more advanced topics and research in astrophysics.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-609 Fundamental Astrophysics II (3 Credits)
This course will provide a basic introduction to modern astrophysics, following on from Fundamental Astrophysics I. Topics will include basic celestial mechanics and galactic dynamics, the Milky Way and other galaxies, the interstellar medium, active galactic nuclei, galaxy formation and evolution, and an introduction to cosmology. This course will provide the physical background needed to interpret both observations and theoretical models in galactic and extragalactic astrophysics and cosmology and prepare students for more advanced topics and research in astrophysics.
Prerequisites: ASTP-608 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-610 Mathematical Methods for the Astrophysical Sciences (3 Credits)
This course is a stand-alone course on mathematical methods for astrophysics covering tensor algebra, group theory, complex analysis, differential equations, special functions, integral transforms, the calculus of variations, and chaos.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-611 Statistical Methods for Astrophysics (3 Credits)
This course provides an introduction to the statistical techniques used in astrophysics and other observational sciences, including parameter estimation, hypothesis testing, and statistical signal processing. An introduction is given to both Bayesian and frequentist approaches.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-612 Mathematical and Statistical Methods for Astrophysics (3 Credits)
This course provides an introduction to the applied mathematical and statistical tools used frequently in astrophysics including modeling, data reduction, analysis, and computational astrophysics. Topics will include Special Functions, Differential Equations, Probability and Statistics, and Frequency Domain Analysis.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-613 Astronomical Observational Techniques and Instrumentation (3 Credits)
This course will survey multi-wavelength astronomical observing techniques and instrumentation. The design characteristics and function of telescopes, detectors, and instrumentation in use at the major ground based and space based observatories will be discussed as will common observing techniques such as imaging, photometry and spectroscopy. The principles of cosmic ray, neutrino, and gravitational wave astronomy will also be briefly reviewed.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-615 Radiative Processes for Astrophysical Sciences (3 Credits)
This course will cover classical continuum radiation emission mechanisms that commonly occur in astrophysical environments. Topics will include properties of astrophysical radiation, radiative transfer, blackbody radiation, radiation from moving charges, bremstrahlung, synchrotron, and inverse compton radiation.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-617 Astrophysical Dynamics (3 Credits)
This course provides an introduction to advanced classical dynamics starting from an action principle, and its applications to astrophysical systems. Topics include Lagrangian and Hamiltonian mechanics, the two-body system, perturbation theory applied to Keplerian orbits, motion near black holes and the many-body problem.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-618 Fundamentals of Theoretical Astrophysics I (3 Credits)
This course will provide students with an in-depth theoretical background on those astrophysical phenomena where matter and electromagnetic fields play a major role. This includes stellar cores, relativistic plasmas, accretion physics, and jet production. Topics will include elements of electromagnetism, classical and relativistic fluids, magnetohydrodynamics, and radiation.
Prerequisites: ASTP-608 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-619 Fundamentals of Theoretical Astrophysics II (3 Credits)
This course will provide students with the in-depth background on Classical, Statistical, and Nuclear physics required for modeling many astrophysical systems. Particular attention is paid to topics related to the physics of stellar remnants (e.g., white dwarfs, neutron stars, and black holes) and the physics of compact object mergers.
Prerequisites: ASTP-608 and ASTP-618 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-660 Introduction to Relativity and Gravitation (3 Credits)
This course is the first in a two-course sequence that introduces Einstein's theory of General Relativity as a tool in modern astrophysics. The course will cover various aspects of both Special and General Relativity, with applications to situations in which strong gravitational fields play a critical role, such as black holes and gravitational radiation. Topics include differential geometry, curved spacetime, gravitational waves, and the Schwarzschild black hole. The target audience is graduate students in the astrophysics, physics, and mathematical modeling (geometry and gravitation) programs.
This course is restricted to students in the ASTP-MS, ASTP-PHD, MATHML-PHD and PHYS-MS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-699 Astrophysical Sciences and Technology Graduate Co-op (0 Credits)
This course is a cooperative education experience for graduate astrophysical sciences and technology students.
Typically Offered: Fall, Spring, Summer

ASTP-711 Advanced Statistical Methods for Astrophysics (3 Credits)
This is an advanced course in statistical inference and data analysis for the astrophysical sciences. Topics include Bayesian and frequentist methods of parameter estimation, model selection and evaluation using astrophysical data. Specific applications, such parameter estimation from gravitational wave signals, or analysis of large data sets from imaging, spectroscopic or time domain surveys will be discussed. Computational methods including Markov Chain Monte Carlo, with other topics such as machine learning, and time series analysis included at the discretion of the instructor.
Prerequisite: ASTP-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-720 Computational Methods for Astrophysics (3 Credits)
This course surveys the different ways that scientists use computers to address problems in astrophysics. The course will choose several common problems in astrophysics; for each one, it will provide an introduction to the problem, review the literature for recent examples, and illustrate the basic mathematical technique. In each of these segments, students will write their own code in an appropriate language.
Prerequisites: This course is restricted to students in the ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-730 Stellar Atmospheres & Evolution (3 Credits)
An overview of the physical principles and observational phenomenology describing stellar atmospheres and stellar evolution. Topics covered include: atmospheric temperature structure and line formation; atmosphere models and spectral type determination; observational (spectral) diagnostics of stellar masses, abundances, ages and evolutionary states; and a survey of contemporary topics in star formation and pre- and post-main sequence stellar evolution, with emphasis on the physical processes governing stellar accretion, mass loss, and the effects of binary companions on these processes.
Prerequisites: ASTP-608 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-740 Galactic Astrophysics (3 Credits)
This course surveys our current knowledge of the Milky Way galaxy, and the processes that shape its structure and evolution. Topics will include the structure and kinematics of the Milky Way; stellar populations; theory of orbits; Jean's theorem and equilibrium of stellar systems; the virial theorem; the Jean's equations; gravitational instabilities; tidal interactions; the central black hole; the Local Group and chemical evolution.
Prerequisite: ASTP-609 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-750 Extragalactic Astrophysics (3 Credits)
This course will cover objects in the universe beyond our own Milky Way galaxy, with an emphasis on the observational evidence. Topics will include properties of ordinary and active galaxies; galaxy clusters; the extragalactic distance scale; evidence for dark matter; cosmological models with and without the cosmological constant (Lambda).
Prerequisite: ASTP-609 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-789 Special Topics (1-3 Credits)
This is a masters-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This course requires permission of the Instructor to enroll.

ASTP-790 Research & Thesis (1-3 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ASTP-791 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring, Summer

ASTP-799 ASTP Independent Study (1-4 Credits)
An independent study in an area of astrophysical sciences and technology not covered in the available courses. This study may be reading study of an appropriate textbook, literature review, or other appropriate work. The course requires a formal proposal, faculty sponsor, and program approval.
Typically Offered: Fall, Spring, Summer

ASTP-831 Stellar Evolution & Environments (3 Credits)
A survey of contemporary topics in star formation and pre- and post-main sequence stellar evolution, with emphasis on the physical processes governing stellar accretion, mass loss, and the effects of binary companions on these processes.
Prerequisites: ASTP-730 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-835 High-Energy Astrophysics (3 Credits)
This course will survey violent astrophysical phenomena including supernovae, compact stellar remnants, X-ray binaries, gamma ray bursts, and supermassive black holes in active galactic nuclei. It will examine physical processes associated with the emission of high-energy radiation, production of high-energy particles, accretion discs around compact objects, and production and propagation of astrophysical jets. It will review current models for the sources of high-energy phenomena.
Prerequisite: ASTP-609 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-841 The Interstellar Medium (3 Credits)
This course provides a detailed overview of the physical processes and properties of the interstellar medium in our Galaxy and other galaxies. The course explores the fundamental physical basis of the observed properties of low-density astrophysical gases observed throughout the universe. Topics may include HII regions, planetary nebulae, HI clouds, molecular clouds, photodissociation regions, supernova remnants, and multi-phase models of the interstellar medium.
Prerequisite: ASTP-609 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ASTP-851 Cosmology (3 Credits)
This course will cover the evolution of the universe from the big bang to the present, with an emphasis on the synergy between theory and observations. Topics will fall under three general headings: classical and relativistic cosmology, the early universe, and structure formation.
Prerequisite: ASTP-609 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-861 Advanced Relativity and Gravitation (3 Credits)
This course is the second in a two-course sequence that introduces Einstein's theory of General Relativity as a tool in modern astrophysics. The course will cover various aspects of General Relativity, with applications to situations in which strong gravitational fields play a critical role, such as black holes and gravitational radiation. Topics include advanced differential geometry, generic black holes, energy production in black-hole physics, black-hole dynamics, neutron stars, and methods for solving the Einstein equations. The target audience is graduate students in the astrophysics, physics, and mathematical modeling (geometry and gravitation) programs.
Prerequisite: ASTP-660 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ASTP-889 Special Topics (1-3 Credits)
This is a PhD-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This course requires permission of the Instructor to enroll.

ASTP-890 Research & Thesis (1-6 Credits)
Dissertation research by the candidate for an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ASTP-891 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring, Summer

ASTP-899 AST Independent Study (1-3 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for a PhD-level student.
Enrollment in this course requires permission from the department offering the course.

Behavioral Health and Neuroscience (BHNS)

BHNS-800 Psychology Internship Seminar (0 Credits)
The internship seminar is designed to provide the didactic component to help interns achieve the training competencies required by the American Psychological Association, the accrediting body for training in clinical psychology. Interns will be exposed to a variety of doctoral-level clinical psychology content experts in the local community who discuss the ethical conduct of clinical psychologists within the domains of practice, education, consultation, and research with a focus on empirically supported treatment, addiction, and working with diverse populations. The seminar will provide balanced programming for trainees pursuing work with child and adult populations.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Seminar 2
Typically Offered: Fall, Spring, Summer

Better Me-Employee Wellness (BTRM)

BTRM-600 Bounce Pass (0 Credits)
Allows you to attend any Better Me fitness classes offered at any time during the semester. There are no refunds on the Better Me Bounce Pass.

BTRM-601 Wellness Class Pass (0 Credits)
Typically Offered: Fall, Spring, Summer

Bio Chemistry (CHMB)

CHMB-610 Advanced Protein Biochemistry: Structure and Function (3 Credits)
This course analyzes protein structure function relationships. Students will investigate how proteins function and how the structure relates to that function. The principles that explain enzyme rate enhancements and mechanistic enzymology will be examined. Additionally, protein superfamilies for phylogenetic relationships will be explored to enhance understanding of protein structure-function relationships. Students will read and discuss the current scientific literature and classic papers.
Prerequisites: CHMB-402 or equivalent course or degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

CHMB-702 Protein Conformation and Dynamics (3 Credits)
An advanced study of the structure and function of proteins and enzymes. Biophysical and mechanistic aspects of enzyme function will be examined. Applications of computation to protein structure will also be discussed.
Prerequisites: CHMB-402 or equivalent course or degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMB-704 Advanced Nucleic Acids Biochemistry; Structure and Function (3 Credits)
This course will cover nucleic acid structures as determined by NMR and X-ray crystallography and nucleic acid catalysis, especially that of ribozymes. Genomics, specifically whole-genome sequencing papers, will be analyzed. Current RNA topics including the RNA World, Ribozymes, RNAi, and Riboswitches will be discussed. Current DNA topics including Lateral/Horizontal DNA Transfer, Genome Duplication, Alternate Gene Expression and Synthetic Life will also be discussed.
Prerequisites: CHMB-402 or equivalent course or degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

Biology (BIOL)

BIOL-601 Genetic Diseases and Disorders (3 Credits)
The identification of genetic causes of disease has been one of the major modern scientific breakthroughs. This course examines a range of inherited diseases, how causative genetic variations were or are being identified, and what this means for the treatment of the diseases. Scientific literature will be utilized, both current and historical.
Prerequisites: BIOL-321 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Spring

BIOL-610 Life Science Applications of Machine Learning (3 Credits)
Machine learning is a fast-developing field of artificial intelligence (AI) with many applications in life sciences. The huge amount of genomic data can be analyzed and interpreted by machine learning techniques. This course introduces basic concepts of machine learning models and demonstrates how these models can solve complex problems in life sciences. The course will start with a discussion of how machine learning is different than descriptive statistics, and introduce the machine learning toolkits through a tutorial. Main topics cover three branches of machine learning: supervised learning, unsupervised learning, and reinforcement learning. Instead of applying different machine learning methods to different datasets, the course aims to apply different methods to the same datasets so that students are able to compare the performance and pros/cons of the methods. Hands-on exercises will be provided in both lectures and weekly labs. A group project will be given at the end of the semester so that students can apply machine learning methods to the datasets they are interested in. By the end of this course, students will be able to identify the difference between a supervised (classification) and unsupervised (clustering) technique, identify which technique to apply for a particular dataset and need, engineer features to meet that need, and write code to carry out an analysis.
This class is restricted to graduate students or those with permission from instructor.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

BIOL-625 Ethics in Bioinformatics (3 Credits)
This course will be focused on individual and organizational responsibilities in bioinformatics research, product development, product commercialization and clinical and consumer genetic testing.
This course is restricted to students in the BIOINFO-MS, BIOINFO-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

BIOL-630 Bioinformatics Algorithms (3 Credits)
Bioinformatics Algorithms will focus on the types of analyses, tools, and databases that are available and commonly used in Bioinformatics. The labs will apply the lecture material in the analysis of real data through computer programming.
Prerequisites: BIOL-230 and BIOL-327 or equivalent courses or graduate student standing.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

BIOL-635 Bioinformatics Seminar (3 Credits)
The course provides opportunities for students and faculty to develop and share professional interests while discussing current trends and developments in bioinformatics. Material for this course will be drawn from the current scientific literature.
This course is restricted to students in the BIOINFO-MS, BIOINFO-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

BIOL-636 Graduate Seminar in Life Sciences (1 Credit)
This course allows students to explore different research questions and methods within the life sciences through attending and reflecting on weekly departmental seminars. Students will write weekly assignments to summarize the research methods and findings. Students will evaluate different scientific presentation styles, which will influence their own presentation skills. Students will make connections between the main ideas presented in the seminars to their own graduate research project or to the broader scientific community. Students will read one of the speaker’s papers and discuss how the paper extends the information discussed in the seminar. During weeks with no seminar scheduled, students will meet with the faculty leader to discuss the seminars and the written assignments.
This course is restricted to Graduate students.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

BIOL-640 Environmental Genomics (4 Credits)
Students in this course will learn a variety of skills related to environmental genomics which is a rapidly emerging field that uses DNA sequencing technologies to address ecological questions. Through both lecture and hands-on laboratory exercises, students will gain the necessary theoretical and computational skills needed to analyze and interpret environmental sequence data. Topics explored in this course include: short and long-read sequencing technologies, inhibitor removal, eDNA-based monitoring, amplicon sequencing, shotgun metagenomics, and pipeline development. Laboratory exercises will build towards a collaborative research project that examines the environmental microbiome (e.g., bacteria, archaea, and/or fungi) of RIT’s forested wetlands as well as non-invasively tracks vertebrate animal biodiversity and emerging wildlife pathogens (e.g., bacteria, fungi and viruses) via eDNA.
Prerequisites: BIOL-321 and BIOL-327 or equivalent courses or graduate student standing.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Spring

BIOL-650 High Throughput Sequencing Analysis (3 Credits)
Students will utilize commonly used bioinformatics tools to analyze a real High Throughput Sequencing data set starting with raw data, proceeding with quality control, either aligning to a reference genome or performing de novo assembly, assessing differential gene expression determination, and finally annotating their results. Weekly lab reports will be required, and a group manuscript is expected at the end of the semester.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

BIOL-655 Biogeography (3 Credits)
This course is the study of the distribution of biodiversity on the earth. Patterns of past and present animal and plant distributions are used to help understand the mechanisms of basic biological processes including speciation, dispersal, divergence and extinction. This course will cover the character and history of the science of biogeography, as well as its basic principles and applications. We will also examine the assumptions, methods and conclusions of historically significant biogeographic studies.
Prerequisites: BIOL-240 or BIOL-265 or graduate student standing in the ENVS-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

BIOL-671 Database Management for the Sciences (3 Credits)
Students will learn to create and maintain efficient relational databases for use in modeling and analysis in the sciences. Topics will include an introduction to relational algebra, SQL, and advanced relational designs.
Graduate Science
Contact Hours: Lecture 2, Studio 2
Typically Offered: Spring

BIOL-672 Computational Statistics and Data Science Methods (3 Credits)
This course will introduce traditional multivariate statistical methods and multi-model inference, as well as iterative computational algorithms (i.e. Bayesian methods and machine learning) appropriate for graduate students conducting or planning to conduct a graduate research project. The course will focus on the proper application of methods to a sample data sets using statistical programming software and graphics and will forego the more in-depth analytical mathematical exposition that you might see in a math course, so that we can cover a larger variety of methods and spend more time implementing them in code. Practical examples will often derive from the fields of biology, environmental science, or medicine, however the statistical methods we cover will also have much broader application within modern data science. The ultimate goal will be to learn when and where to correctly apply a given method to real questions about real data. Class time will be devoted to introductory lecture, programming language demonstrations with a common dataset, and open discussions of potential applications, including in-class studio hours to help with homework. Students should be prepared to learn to write code scripts that will manipulate statistical tests and graphical output. However, no background experience with programming is assumed. All software used in the course is open-source and students will be required to set up and run weekly assignments on their own laptop computer or on a computer borrowed from the library or RIT's computer lab.
Prerequisites: STAT-145 or equivalent course or graduate student standing.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

BIOL-673 Marine Biology (4 Credits)
This course explores marine biology by focusing on the diversity of life and influence of oceanographic phenomena on the various ecosystems. Morphological and physiological adaptations along with environmental threats will also be investigated. The course will explore marine conservation issues, in depth.
Prerequisites: BIOL-240 or equivalent course or graduate student standing in the ENVS-MS program.
Contact Hours: Lecture 4
Typically Offered: Fall

BIOL-675 Advanced Conservation Biology (3 Credits)
This course focuses on the application of ecological principles to conservation issues. Human impact on species diversity will be emphasized as it relates to agricultural, forest, coastal and wetland ecosystems. Case studies of management practices used to manage and restore disturbed ecosystems will be included. Students will explore a topic in depth through writing a review paper of published literature.
Prerequisites: BIOL-240 or equivalent course or graduate student standing in the ENVS-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

BIOL-676 Environmental Microbiology (4 Credits)
This course presents the relationships between microbes and their environments, as well as techniques to study them. It will cover the diverse microbiology of different habitats, ranging from soils and aquatic environments, to anthropized and extreme environments. Topics include the roles of microbes in nutrient and biogeochemical cycles, evolutionary aspects, as well as the relationships between environmental microbes and humans with regard to health impacts and biotechnological applications. Laboratory experiments will explore the types of bacteria in different environmental samples using a range of techniques from culturing and coliform counting, to metagenomic approaches. Impacts of microbes on the environment and human health will be highlighted through biogeochemical techniques and antibiotic resistance testing.
Prerequisites: BIOL-311 or ENVS-301 or equivalent course or graduate student standing.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

BIOL-689 Graduate Special Topics (1-4 Credits)
This is a graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall, Spring, Summer

BIOL-694 Molecular Modeling and Proteomics (3 Credits)
This course will explore various facets of analyzing protein molecules: separation, identification, quantification, and structure. The separation component will address common protein separation techniques, focusing on different liquid chromatography approaches. For the identification and quantification of proteins, we will take a detailed look at mass spectrometry-based proteomics. The structure component will follow the levels of protein structures, comprising both experimental and computational methods to determine protein structures. The theoretical background on mass spectrometry-based proteomics will be taught in lectures, while the lab component will comprise bioinformatic analyses of whole proteomes and public proteomics datasets, including the modeling of protein properties, chromatographic behavior, and peptide fragmentation. Similarly, tertiary structure determination techniques such as X-ray crystallography, NMR, and cryo-electron microscopy will be covered in the lectures, while bioinformatic tools will be used to visualize and compare experimentally solved protein structures. In addition, different protein structure prediction tools (e.g. homology modeling, machine learning-based modeling) will be explored.
Prerequisite: BIOL-327 or equivalent course or graduate student standing.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

BIOL-780 Bioinformatics Project (1-6 Credits)
This course will result in a Bioinformatics project accomplished by the MS student for an appropriate topic as arranged between the candidate and the project advisor.
Typically Offered: Fall or Spring or Summer

BIOL-789 Graduate Special Topics (1-4 Credits)
This is a graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall, Spring, Summer

BIOL-790 Research and Thesis (1-6 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

BIOL-791 Continuation of Thesis (0 Credits)
Continuation of Thesis

BIOL-798 Grad Biology Independent Study (1-4 Credits)
This course is a faculty-directed, graduate level tutorial of appropriate topics that are not part of the formal curriculum.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Biomed & Chemical Engineering PhD (BCEP)

BCEP-795 Doctoral Seminar (1 Credit)
This seminar course presents topics of contemporary interest to graduate students enrolled in the program. Presentations include off campus speakers, and assistance with progressing on your research. Selected students and faculty may make presentations on current research under way in the department.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

BCEP-877 Doctoral Internship (0 Credits)
Internship is designed to enhance the educational experience of PhD students through full-time employment. Students must submit a proposal for the internship, to be approved by an employing supervisor and the department prior to enrolling. Students are required to submit an evaluation report at the conclusion of the internship.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Internship 40
Typically Offered: Fall, Spring, Summer

BCEP-889 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

BCEP-890 Dissertation and Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students must successfully pass the PhD Candidacy examination prior to enrolling in this course.
Typically Offered: Fall, Spring, Summer

BCEP-892 Graduate Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students may count a maximum of 9 credits towards degree requirements. If the student enrolls cumulatively in more than 9 credits, the additional credits above 9 will not be counted towards the degree.
Contact Hours: Research 40
Typically Offered: Fall, Spring, Summer

BCEP-899 Independent Study (3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student and instructor must prepare a plan of study and method of evaluation for approval by the program director prior to course registration.
Contact Hours: Independent Study 9
Typically Offered: Fall, Spring, Summer

Biomedical Engineering (BIME)

BIME-607 Graduate Biodesign (3 Credits)
This course is a graduate-level introduction to the biodesign process used for innovating medical technologies. Student teams will apply a needs-based assessment strategy to identify opportunities in a biomedical related field such as assistive technologies and rehabilitation engineering. Incorporating CAD will culminate in a virtual medical device prototype. Concepts of intellectual property, regulatory considerations, and reimbursement and business models will be introduced.
This course is restricted to Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

BIME-608 Graduate Biodesign Supplement (1 Credit)
This course is a graduate-level supplement on the biodesign process used for innovating medical technologies, building on prior experiences of the students in an undergraduate-level biodesign course. Student teams will build on prior work to apply a needs-based assessment strategy to identify opportunities in a biomedical related, including conducting patient/provider interviews, and write a technical document outlining steps for solution concept screening and prototyping.
Prerequisite: BIME-407 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Fall

BIME-610 Bioanalytical Microfluidics (3 Credits)
This course is focused on the analysis and separation of high value biological products employing microfluidic devices. The course will cover miniaturization, microfabrication, microfluidics and electrohydrodynamic flow; as well as the most common separation techniques employed in bio-analytical microdevices: chromatography, electrophoresis, dielectrophoresis, cytometry and electrochemistry. Students will be able to apply the fundamentals of these techniques for the solution of a variety of microfluidics problems. Students will also become familiar with the recent literature on bioanalytical applications in microfluidics devices. Students will review journal articles on novel microfluidics methods and they will present their finding to the rest of the group. The course also includes three “hands on” laboratory modules. Students will fabricate microfluidic devices and then use these devices to perform experiments with electroosmotic flow and dielectrophoresis.
Prerequisite: CHME-321 or BIME-320 or MECE-210 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

BIME-617 Principals of Biomedical Device Regulations (3 Credits)
This course will present the principles and fundamentals of medical device and in vitro diagnostic regulation. The course will cover the history of the FDA and the regulations around food, drug and cosmetic products. An overview of regulatory pathways, clinical trials, good manufacturing practices and quality system design will be covered. Comparisons between US, EU and other international regulatory bodies will also be discussed. The course will culminate with students developing a clinical trial and regulatory strategy for a new hypothetical medical device.
This course is restricted to Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

BIME-620 Hemodynamics (3 Credits)
This course will focus on the application of fluid mechanics principles to vascular blood flow and flow dynamics. It will cover concepts such as the vascular system and flow patterns in different segments (i.e., blood, heart, arteries and veins), parameters and measures of flow dynamics, including pressure, flow rate, and vascular resistance; fully developed laminar flow (Poiseuille’s Law), applications of electrical analogous and optimality for modeling vascular flow using Poiseuille’s Law; equations of fluid flow (Continuity, Bernoulli, Navier-Stokes). In addition, the course will also cover the principles of microcirculation briefly, as well as the principles of pulsatile flow and wave propagation in both rigid and elastic vessels. Lastly, we will briefly cover the concepts of large artery hemodynamics and its effect on the vascular disease and medical imaging and blood flow (i.e., Doppler flow imaging, phase-contrast MRI and arterial spin labeling) techniques.
Prerequisite: BIME-320 or MECE-210 or CHME-321 or equivalent course and graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

BIME-650 Modeling and Simulation of Biomedical Systems (3 Credits)
Modeling and simulation is an important tool in the medical field and is commonly used to facilitate equipment design, control of devices, research, and training. This course will focus on analytical techniques needed for creating complex simulation models. Models will be developed which use mathematics, physics and engineering principles to describe human physiologic behavior in order to demonstrate the practical application of the theory.
Prerequisite: BIME-191 and BIME-411 and BIME-450 or equivalent courses or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

BIME-660 Introduction to Medical Imaging: Acquisition and Biomedical Applications (3 Credits)
The course is designed for graduate students and those who are interested in learning about how various medical imaging modalities ––X-Ray, CT, PET, SPECT, Ultrasound, MRI and fMRI–– are applied in basic and clinical research. The course is cross-listed with BIME 560, which covers the mathematical and physics foundations of medical imaging and principles of image formation and analyses. The graduate-level component of the course focuses on the research applications. Selected papers from literature will be used to learn and discuss aspects of medical imaging research such as experimental design, safety and cost considerations, difference between clinical and basic applications of medical imaging, and advantages and shortcomings of each modality in various contexts.
This course is restricted to Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

BIME-670 Advanced Topics in Tissue Engineering (3 Credits)
This is a course with lecture and seminar components. The lecture component will provide a state-of-the-art overview of how replacement organs and tissues can be engineered using both natural and synthetic biomaterials as well as chemical and physical cues that direct cellular differentiation and integration. Furthermore, techniques commonly employed in tissue engineering research are discussed. In the seminar component, students will review and present current journal articles and will listen to research talks given by experts in the field of tissue engineering. Scientific interaction with the presenting researchers in the form of Q&A sessions is expected. Additionally, the course will train students in grant proposal writing.
Prerequisites: BIME-411 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Biennially

BIME-675 Practical Methods in Tissue Engineering (3 Credits)
This hands-on course gives engineering students experience with advanced, state of the art production and application of biomaterials, cell culture methods and analysis techniques used in the area of tissue engineering. In this project-based course, students will work on experiments relating to current literature and will learn how to critically analyze and scientifically summarize the obtained results. Students will use their knowledge and experience to finally design and conduct their independent experiment related to broadly defined topics in the area of tissue engineering.
Prerequisites: BIME-470 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

BIME-689 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor. The level of complexity is commensurate with a graduate technical course.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

BIME-697 Graduate Research Practicum (2-6 Credits)
This course will give students supervised practical training within academic research laboratories prior to conducting their own dissertation research. Students will identify a laboratory or laboratories to conduct the research with the permission of the graduate director and principal investigator. For each practicum, students will complete a brief critical literature review in the sub-field of the particular laboratory with the principal investigator. Students will then be trained on experimental or computational methods and learn relevant applied data analysis techniques. The practicum will conclude with a written summary and oral presentation. A typical 2 credit practicum is 120 hours of research training in a laboratory. Students will typically enroll in either 2 or 4 credits per semester (1 or 2 practicums) with a maximum of 6 credits earned during the degree program.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Project 10
Typically Offered: Fall, Spring, Summer

BIME-699 Graduate Co-op (0 Credits)
One term of experiential learning or work experience in biomedical engineering.
Typically Offered: Fall, Spring, Summer

BIME-743 Personalized 3D Printing (3 Credits)
This course covers the use of 3D printing technologies to produce products that have been personalized for the individual who will use them. Examples include customized invisible braces, hearing aids, footwear, helmets, swimming goggles, and bone implants. The course will cover digital scanning technologies, such as structured light and medical CT scanning, as well as the software workflow to convert point cloud scan data into editable CAD surfaces and solids. Design tools will be used to create customized digital material properties in which color, stiffness and/or other properties are manipulated. 3D printing technologies, including multi-material 3D printing, will be used to fabricate designs. Students are expected to have previous introductory experience with 3D printing and computer-aided design.
This course is restricted to KGCOE graduate students and KGCOE UG students with 5th year status.
Contact Hours: Lecture 3
Typically Offered: Spring

BIME-749 Graduate Literature Review (3 Credits)
This course will introduce students to the methods involved in conducting a review of existing research. Students will also review current journal articles within a specific research domain identified by the course instructor that will vary between offerings. The course will allow flexibility for students to select and critically review articles that align with their research interests within this domain. It will culminate with a synthesis of a detailed outline connecting the ideas across the reviews that could be used for a topical review or research proposal.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

BIME-750 Statistical Analysis and Modeling of Biomedical Data (3 Credits)
This course will expose student to the basic properties of data collected from biological systems and issues involved in the statistical analysis of such data. Specifically, this course will review the motivations and rationale behind conventional regression models, issues that arise in applying these methods to biological data, and specific extensions of these methods required to obtain meaningful results. Specific examples of these approaches and their application will be given at different levels of biology. The analysis of such problems will require the use of advanced regression techniques directed at resolving the partial confounding that is typical of living (closed loop regulated) systems, applied under statistical software packages (e.g., spreadsheets, graphing, Matlab, SPSS, Simca).
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Laboratory 3
Typically Offered: Biennially

BIME-770 Engineering Cell-Substrate Interactions (3 Credits)
Students will be introduced to both the material and cellular aspects that control and regulate cell-substrate interactions and the resulting cellular behavior including spreading, adhesion, migration and differentiation. Key material physical and surface chemistry properties will be explored as well as cellular adhesion molecules and cytoskeletal structures. In addition, cellular signaling pathways related to mechanobiology including YAP/TAZ will be discussed using current peer-review journal articles. Students will also design and propose a cell-substrate interaction study and execute feasibility experiments.
Prerequisite: BIME 470 or BIME 570 or BIME 670 or MECE 557 or MECE 657 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

BIME-791 Graduate Biomedical Laboratory (4 Credits)
This course provides students with a variety of lab experiences across many specialties of biomedical engineering. Experiments emphasize proper data collection and analysis as well as critical reading and scientific writing.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Laboratory 6, Lecture 2
Typically Offered: Fall

BIME-792 Project with Paper (6 Credits)
This course is used by students in the Biomedical Engineering MS degree program as a capstone experience following completion of BIME 607 Graduate Biodesign. Students will learn and apply advanced Biodesign strategies related to intellectual property, regulatory approval, and potential commercialization, completing a series of modules with specific learning goals. The course will include the design and fabrication of product concepts using rapid prototyping tools. Students completing an internship may use that experience as motivation for their project in this course. Students must work with a faculty advisor who will approve their topic and review their progress throughout the completion of this capstone experience. A written paper and presentation of the work as well as a prototype are required.
Prerequisites: BIME-607 or BIME-608 or equivalent course.
Contact Hours: Independent Study 6
Typically Offered: Fall, Spring, Summer

BIME-799 Graduate Independent Study (1-3 Credits)
Allows graduate students an opportunity to independently investigate, under faculty supervision, aspects of the field of biomedical engineering that are not sufficiently covered in existing courses. Proposals for independent study activities must be approved by both the faculty member supervising and the graduate program director.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

Business Analytics (BANA)

BANA-680 Data Management for Business Analytics (3 Credits)
This course introduces students to data management and analytics in a business setting. Students learn how to formulate hypotheses, collect and manage relevant data, and use standard tools such as Python and R in their analyses. The course exposes students to structured data as well as semi-structured and unstructured data. There are no pre or co-requisites; however, instructor permission is required for students not belonging to the MS-Business Analytics or other quantitative programs such as the MS-Computational Finance which have program-level pre-requisites in the areas of calculus, linear algebra, and programming.
Contact Hours: Lecture 3
Typically Offered: Fall

BANA-780 Advanced Business Analytics (3 Credits)
This course provides foundational, advanced knowledge in the realm of business analytics. Advanced topics such as machine learning, analysis of structured data, text mining, and network analysis are covered. Industry standard tools such as R and Python are extensively used in completing student projects.
Prerequisite: BANA-680 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

BANA-785 Business Analytics Experience (3 Credits)
Students apply their mathematical, data analytic, and integrative business analytics skills in a complex project involving real or simulated data. Under the supervision of an advisor, students work in teams to perform a stipulated task/project and write a comprehensive report at the end of the experience. Subject to approval by the program director, an individual student internship/coop followed by an in-depth report may obtain equivalent credit.
Prerequisite: BANA-780 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Summer

Business Interdisciplinary (SCBI)

SCBI-801 Business Administration PhD Second Year Paper (0 Credits)
Students will complete a graduate paper in their second year after all courses have been completed.
Typically Offered: Fall, Spring

SCBI-858 PhD Seminar (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to students in the PhD program. Specific topics will vary depending upon student and faculty interest and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics normally vary from semester to semester. (Depends on topic)
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

SCBI-890 Business Administration PhD Dissertation Research (5 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students must successfully pass the PhD comprehensive examination prior to enrolling in this course.
Contact Hours: Research 5
Typically Offered: Fall, Spring, Summer

SCBI-895 Business Administration PhD Comprehensive Exam (0 Credits)
Students will demonstrate synthesis and integration of the theories and foundation principles of their discipline to respond to questions found in the comprehensive examination. This demonstration will apply core knowledge to problem situations to be successful students must receive a passing grade of at least 80 percent. Students will have one additional opportunity to pass this examination if their initial attempt is unsuccessful.
Typically Offered: Fall, Spring

SCBI-899 PhD Independent Study (3 Credits)
This course provides for independent study or research activity in subject matter areas not included in any existing course in the degree program, but having specialized value to students. Proposals approved by a supervising faculty member and the program chairperson are required prior to registration.
Contact Hours: Independent Study 3
Typically Offered: Fall or Spring or Summer

Business Legal Studies (BLEG)

BLEG-612 Legal and Accounting Issues for New Ventures (3 Credits)
An introduction to basic legal and accounting issues that managers and developers of new business ventures must understand at the outset. Topics include financial statements prepared using both the cash basis and GAAP, differences among basic legal forms of business organization and related income tax issues, budgeting and cash flow management, and product costing. The focus is on understanding the legal and accounting components of the business plan.
Contact Hours: Lecture 3
Typically Offered: Spring

BLEG-730 Business Legal Concepts (3 Credits)
An introduction to legal principles and their relationship to business organizations. Explores the U.S. legal system, the U.S. court system, civil and criminal procedure, the role of government agencies, legal research, and the substantive areas of law most relevant to business, including constitutional law, tort law, criminal law, contract law, intellectual property, debtor-creditor relations, bankruptcy, business entities, securities regulation and antitrust law. Extensive legal research projects are an essential part of the course.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

BLEG-731 Commercial Law and Professional Skills (3 Credits)
Explores the impact of the Uniform Commercial Code and other substantive areas of law on business operations. Emphasis is on topics included on the certified public accounting exam, including provisions of the Uniform Commercial Code dealing with the sale and lease of goods, product warranties, commercial paper, negotiable instruments and secured transactions. Other topics include business entities, creditors' rights, bankruptcy, and insurance law. A research project on legal issues is an important aspect of this course.
Prerequisites: BLEG-730 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

BLEG-745 Legal and Ethical Issues in Technology-intensive Environments (3 Credits)
The course confronts graduate students with a wide variety of legal and ethical issues in organizational environments that are technologically intensive, such as information technology and the life sciences. Impacts of intellectual property legislation and legal cases in national and international venues are investigated. Legal and social issues involving individual privacy are argued. This exposure to legal and ethical dilemmas is an important tool as the graduates encounters such situations throughout their careers. Coupled with technical proficiency, the ability to deal with legal and ethical issues shapes professional successes and failures.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

BLEG-758 Seminar in Business Legal Studies (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to Business Legal Studies. Specific topics will vary depending upon student and faculty interests and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics will normally vary from semester to semester.
Contact Hours: Lecture 3

Ceramics (CCER)

CCER-601 Ceramic Practice (3 Credits)
This course will explore advanced aesthetics and techniques of ceramics. Course content is structured on the basis of the individual student's needs, interests, and background preparation. There will be a strengthening of ceramics techniques, design fundamentals, and encouragement of personal expression. The student will be encouraged to evaluate new techniques, materials, and concepts. **Fee: A materials fee is required for this course, and an additional course fee applied via student account**
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

CCER-607 Mold Mechanisms (3 Credits)
This course will concentrate on the fundamentals of plasterwork, mold-making, and slip-casting. Students will first engage in a series of directed exercises to build proficiency, and then apply what they've learned to the production of complex mold systems. By way of experimentation, students will broaden conceptualization of positive and negative spatial relationships while developing problem solving capacity. Supporting information relating to historical, cultural, and scientific concerns will be provided to broaden the students' perspectives of ceramic art, design, and industry, as well as is relationship to the larger world of art. **Fee: A materials fee is required for this course, and an additional course fee applied via student account**
This course is restricted to Graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

CCER-611 Ceramic Processes (3 Credits)
Students will build upon their experience to further advance the technical, aesthetic and conceptual understanding of ceramic form and surface. This course will work from a set of prompts which will provide parameters for building individual bodies of work in a variety of different forming processes. Students will work from conceptual and contextual prompts to gain insight and build skills with advanced forming processes, surface investigation, idea development, and documentation. **Fee: A materials fee is required for this course, and an additional course fee applied via student account**
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

CCER-613 Thrown Sculptural Forms (3 Credits)
This course will introduce students to intermediate forming techniques used in the ideation and creation of utilitarian and sculptural vessels. There will be a focus on form, surface development, and aesthetics. Students will gain experience with firing methodologies as well as work with material science to better understand clay and glaze chemistry. The historical, cultural, and technical concerns of ceramics will be explored to broaden students' perspective of ceramic art and its relationship to the larger world of art. Students will be expected to research areas of interest within ceramic history. **Fee: A materials fee is required for this course, and an additional course fee applied via student account**
This course is restricted to Graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

CCER-630 Ceramics Elective III (3 Credits)
This is a class specifically designed for non-majors covering the fundamental techniques and aesthetics of working with clay. Topics covered include the forming techniques, clay mixing, basic properties of clay, glazing and firing techniques and fundamental understanding of historical and contemporary practices and applications. The course includes prescribed projects. **Fee: There is a lab fee required for this course**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall, Spring

CCER-698 Ceramics Internship (1-6 Credits)
The Ceramics Internship will provide students with the option to work in the ceramics field. Students may apply for internships to businesses based on the availability of positions and business job needs. Students must obtain permission of an instructor and complete the Internship Permission Form to enroll.
Prerequisites: This class is restricted to students in CCER-MFA with department permission.
Typically Offered: Fall, Spring

CCER-699 Ceramics Co-op (0 Credits)
Cooperative Education will provide Ceramic students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in CCER-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CCER-790 Ceramics Thesis Initiation (6 Credits)
Ceramics Thesis Initiation is the third of a four-semester sequential class covering the advanced aesthetics and techniques of ceramics and culminating in the Master's of Fine Art thesis. Students will develop a topic of investigation for the Master's of Fine Arts thesis, select a graduate thesis committee, and begin the planning, research, and development of a body of creative work. This program is structured on the basis of the individual student's needs, interests and background preparation determined through research and faculty consultation. There will be a strengthening of ceramics techniques, design fundamentals and encouragement of personal expression. Student will be encouraged to evaluate new techniques, materials and concepts. This course is the prequel to the Master's of Fine Arts thesis, proposed by the student and approved by the faculty. **Fee: There is a lab fee required for this course**
Prerequisites: CCER-702 or equivalent course and student standing in the CCER-MFA program.
Contact Hours: Studio 12
Typically Offered: Fall

CCER-799 Ceramics Independent Study (1-6 Credits)
Ceramics Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser will propose a course of study. Ceramics Independent Study students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll. **NOTE: Student must have a minimum 3.0 GPA **
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring

CCER-887 Ceramics Part-Time Co-op (0 Credits)
Cooperative Education will provide Ceramic students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in CCER-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CCER-890 Ceramics Thesis Resolution (9 Credits)
Ceramics Thesis Resolution is final course covering the advanced aesthetics and techniques of ceramics. Working from an approved topic of investigation for the Master's Thesis, students work independently and create a body of work supported by a written Thesis paper. In consultation with a selected graduate Thesis Committee, students plan, research, and develop a body of creative work for exhibition and review. This program is structured on the basis of the individual student's needs, interests and background preparation determined through research and faculty consultation. There will be a strengthening of ceramic techniques, design fundamentals and encouragement of personal expression. Student will be encouraged to evaluate new techniques, materials and concepts. **Fee: There is a lab fee required for this course**
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Thesis 12
Typically Offered: Spring

CET Graduate Courses (GRCS)

GRCS-701 Research Methods (3 Credits)
Understanding research and academic writing are foundational skills for all graduate students regardless of degree culmination. This is a graduate-level survey course on research design/methods and analysis, with the goal of all students becoming better consumers of research, and preparing those who choose an empirical research degree culmination and future doctoral pursuits. The course provides a broad overview of the process and practices of research in applied contexts. Content includes principles and techniques of research design, sampling, data collection, and analysis including the nature of evidence, types of research, defining research questions, sampling techniques, data collection, data analysis, issues concerning human subjects and research ethics, and challenges associated with conducting research in real-world contexts. Research strategies using library sources, including academic databases and citation management, are emphasized; as are academic writing skills, including adherence to academic style. The analysis component of the course provides an understanding of statistical methodology used to collect and interpret data found in research as well as how to read and interpret data collection instruments.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

Chemical Engineering (CHME)

CHME-610 Advanced Thermodynamics (3 Credits)
The course extends the concepts of energy, entropy, phase equilibrium and multi-component mixtures from ideal to real fluids via the introduction of state functions, fluid models and generalized conditions for equilibrium of solutions and phases. Models for real-fluid behavior are implemented in the context of actual chemical processes. Additionally, real-fluid behavior is linked to molecular properties in order to introduce predictive approaches to fluid behavior.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-611 Statistical Thermodynamics (3 Credits)
This course draws a connection between molecular scale phenomena and concepts in undergraduate chemical engineering thermodynamics. The ideal gas law is derived from first principles, entropy is defined from a molecular perspective, and chemical potential (and fugacity) is viewed as a derivative of the partition function rather than an “ad-hoc” correction parameter for vapor-liquid equilibrium. Using the thermodynamic ensembles and multivariable calculus, a unified approach to convert between all thermodynamic variables is presented. A special emphasis is provided on the phase separation of gas-mixtures and liquid-mixtures to enable the design of solvents for applications.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-620 Advanced Transport Phenomena (3 Credits)
Fundamentals of fluid flow are examined on a differential scale. Local differential equations governing fluid flow are derived from their corresponding integral forms using classical integral theorems. The form of these equations in various coordinate systems is examined. Exact solutions of differential equations are considered under both steady state and transient conditions, as are typical approximations to those equations such as creeping, potential, lubrication, and boundary layer flows. The theoretical basis of these approximations are unified via asymptotic theory. Forces on surfaces are determined by coupling differential velocity and pressure fields with appropriate integral representations.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-640 Advanced Reaction Engineering (3 Credits)
The application of ideal reactor concepts and analyses is extended to the design, modeling and performance evaluation of reactors used in manufacturing processes. Catalytic reactions are discussed in terms of mechanisms and kinetics, and used to design, model and evaluate the performance of fixed bed, suspended bed and other types of catalytic reactors. Concepts of mass transport limitations and non-ideal flows are introduced to provide the framework for the analysis of deviations from ideal behavior experienced by real reactors.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-650 Electrochemical Engineering (3 Credits)
The course focuses on applications of electrochemical phenomena with examples of practical materials and processes. Fundamental considerations will include charge transfer at electrode/electrolyte interphases, surface modification by electrodeposition and etching, and corrosion. Electroanalytical techniques will be described including potentiometry, voltammetry, and electrochemical impedance analysis. Applications of electrochemical engineering will be summarized in detail for batteries, capacitors, and fuel cells; including conventional materials and fabrication techniques. A special emphasis on the use of nanomaterials in electrochemical engineering will be investigated.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-651 Soft Matter & Molecular Self-assembly (3 Credits)
Much of the modern research takes place at the interface of physical and life sciences. Soft matter systems (e.g., emulsions, liquid crystals, gels, colloids) bridge scientific communication across disciplines and produce a unique synergy between theory and experiments. Principles of soft matter are highly visual and easily extended to biological self-assembly and food science. This course provides essential tools to understand the behavior of soft matter at the meso- and micro- scale. This course will also provide representative examples of the latest experimental research with soft matter systems (e.g., DNA, proteins, particle tracking, active matter, and external force field activation). Specialized guest lectures and exposure to open-source software will be featured along the course. This course is restricted to Graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

CHME-654 Fundamentals and Applications of Optical Materials (3 Credits)
This course discusses light-matter interactions, mechanisms for color generation, optical properties of various materials, and the optical materials' biology, lighting, display, and energy related applications. Luminescence, fluorescence, the related materials and applications are discussed systematically. Research updates on surface enhanced Raman spectroscopy, super-resolution imaging and single-molecule catalysis will be introduced. Finally, applications of optical materials in biomedical, energy and lighting fields are discussed. Students also learn how to utilize materials' optical properties to study reaction kinetics with hands on experiences. By the end of this course, students will be able to explain basic optical phenomena in materials, to understand how optical materials be used in various applications, and to relate materials' optical properties or colors with material type, structure and physical properties. This course is restricted to CHME-BS/MS, CHME-MS or BME/CHME PhD students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-660 Battery Design and Manufacturing (3 Credits)
The course examines battery technologies with a focus on lithium-ion chemistry. Fundamental electrochemical processes at the surface and bulk of electrodes are described. Lithium-ion material properties are summarized including synthesis and characterization techniques. Students learn how to engineer electrodes to meet specific battery designs through material selection and manufacturing techniques which includes slurry formulation and mixing, electrode coating, and calendaring. Cell form factors (coin, cylindrical, prismatic, and pouch) and fabrication are overviewed with in lab manufacturing experience in the RIT Battery Prototyping Center. Finally, cell electrochemical testing and characterization techniques are detailed to understand battery performance. By the end of the course, students will be able to critically evaluate media reports and journal publications describing electrochemical energy storage devices.
Contact Hours: Lecture 3
Typically Offered: Spring

CHME-670 Biochemical Engineering and Assay Development (3 Credits)
This course is an elective designed to give a broad overview of some topics in the biological engineering field, with emphasis on chemical engineering applications in the biological products industry. The course will be divided into an introductory unit involving the drug development process followed by four separate units. The next unit will focus on enzyme and cell growth kinetics in batch systems. The next part of the class will focus on bioreactor development for cellular products in batch, fed-batch, and continuous systems, and several downstream bioseparation processes, including centrifugation, chromatography and filtration. The final unit will focus on assay development strategies and targeted pathways, including cell death, drug metabolism and toxicity, and cancer.
This course is restricted to Graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

CHME-689 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor. The level of complexity is commensurate with an upper-level undergraduate technical course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-699 Graduate Co-op (0 Credits)
Up to six months of full-time, paid employment in the chemical engineering field. See the Department Graduate Program Director or RIT's Office of Career Services and Cooperative Education for further details.
Prerequisites: Graduate standing in Chemical Engineering, completed at least 18 credits and students with at least a 3.0 cumulative GPA.
Typically Offered: Fall, Spring, Summer

CHME-709 Advanced Engineering Mathematics (3 Credits)
The course begins with a pertinent review of linear and nonlinear ordinary differential equations and Laplace transforms and their applications to solving engineering problems. It then continues with an in-depth study of vector calculus, complex analysis/integration, and partial differential equations; and their applications in analyzing and solving a variety of engineering problems. Topics include: ordinary and partial differential equations, Laplace transforms, vector calculus, complex functions/analysis, complex integration. Chemical engineering applications will be discussed throughout the course.
Prerequisites: Graduate Standing in Chemical Engineering.
Contact Hours: Lecture 3
Typically Offered: Fall

CHME-777 Graduate Internship (3 Credits)
This course is used by students as a qualifying capstone experience to their M.S. degree. Students must submit a 1-page proposal for the internship, to be approved by an employing supervisor and the Chemical Engineering department prior to enrolling. The work may involve research and/or design project with demonstration of acquired knowledge. The project scope should be developed with the intent of being completed in a single academic semester. In all instances, an evaluation report submitted to the employing supervisor of the work is required to satisfy the capstone experience.
Prerequisites: Graduate Standing in Chemical Engineering.
Contact Hours: Internship 3
Typically Offered: Fall, Spring, Summer

CHME-789 Special Topics (3 Credits)
The chemical engineering curriculum are provided under the title of Special Topics. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CHME-792 Project with Paper (3 Credits)
This course is used by students as a qualifying capstone experience to their M.S. degree. The student must demonstrate an acquired competence in a topic that is chosen in conference with a faculty advisor. The work may involve a research and/or design project with demonstration of acquired knowledge. The project scope should be designed with the intent of being completed in a single academic semester. In all instances, a final report determined by the faculty advisor/ supervisor of the work are required to satisfy the capstone experience.
Prerequisites: Graduate Standing in Chemical Engineering.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

CHME-799 Independent Study (1-4 Credits)
Allows graduate students an opportunity to independently investigate, under faculty supervision, aspects of the field of chemical engineering that are not sufficiently covered in existing courses. Proposals for independent study activities are subject to approval by both the faculty member supervising the independent study and the department head.
Typically Offered: Fall, Spring, Summer

Chemistry (CHEM)

CHEM-670 Graduate Chemistry Writing (1 Credit)
Chemists are required to communicate information about their research, laboratory, and themselves in writing. This course is designed to develop these skills. Students will learn how to write a curriculum vitae, resume, laboratory overview, short and long research abstracts, and scientific research articles using the various formats and styles used by chemists. An integral part of the writing of a research article is the initial formulation of the research hypothesis and design of experiments to test the hypothesis. This course will also review and stress the importance of these components.
Prerequisites: Graduate standing in CHEM-MS.
Contact Hours: Lecture 1
Typically Offered: Fall

CHEM-699 Chemistry Graduate Co-op (0 Credits)
Cooperative work experience for graduate chemistry students. Credit 0
Typically Offered: Fall, Spring, Summer

CHEM-771 Graduate Chemistry Seminar I (1 Credit)
Chemists are required to communicate information about their research, laboratory, and themselves orally. Graduate Chemistry Seminar I is the first in a series of four courses designed to develop the ability to assimilate useful information and organize a chemistry seminar while increasing a student's breadth and depth of knowledge of chemical research topics. This seminar requires the students to attend weekly chemistry seminars and write seminar summaries. Additionally, each student will present a seminar on their proposed research that also summarizes the scientific literature related to the research.
Prerequisites: Graduate standing in CHEM-MS.
Contact Hours: Lecture 1
Typically Offered: Fall

CHEM-772 Graduate Chemistry Seminar II (1 Credit)
Chemists are required to communicate information about their research, laboratory, and themselves orally. Graduate Chemistry Seminar II is the second in a series of four courses designed to develop the ability to assimilate useful information and organize a chemistry seminar while increasing a student's breadth and depth of knowledge of chemical research topics. This seminar requires the students to attend weekly chemistry seminars and write seminar summaries.
Prerequisites: CHEM-771 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Spring

CHEM-773 Graduate Chemistry Seminar III (1 Credit)
Chemists are required to communicate information about their research, laboratory, and themselves orally. Graduate Chemistry Seminar III is the third in a series of four courses designed to develop the ability to assimilate useful information and organize a chemistry seminar while increasing a student's breadth and depth of knowledge of chemical research topics. This seminar requires students to attend weekly chemistry seminars and write seminar summaries throughout the four semesters. Additionally, each student must invite, organize, host, and introduce an external seminar speaker to participate in the Chemistry Seminar Series.
Prerequisites: CHEM-772 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Fall

CHEM-774 Graduate Chemistry Seminar IV (1 Credit)
Professional chemists are required to communicate information about their research, laboratory, and themselves orally. Graduate Chemistry Seminar IV is the fourth in a series of four courses designed to develop the ability to assimilate useful information and organize a chemistry seminar while increasing a student's breadth and depth of knowledge of chemical research topics. This seminar requires the students to attend weekly chemistry seminars and write seminar summaries. Additionally, each student will present a seminar summarizing their thesis research at RIT which serves as the public portion of their thesis defense.
Prerequisites: CHEM-773 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Spring

CHEM-780 Chemistry Project (1-4 Credits)
Chemistry project accomplished by the MS student for an appropriate topic as arranged between the candidate and the project advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CHEM-781 Continuation of Project (0 Credits)
This course is a graduate course for students enrolled in the Project track of the MS Chemistry Program. (Enrollment in this course requires permission from the School of Chemistry and Materials Science offering the course.)
Typically Offered: Fall, Spring, Summer

CHEM-789 Graduate Special Topics (1-3 Credits)
This is a master-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

CHEM-790 Research & Thesis (1-6 Credits)
Dissertation research by the candidate for an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CHEM-791 Continuation of Thesis (0 Credits)
Continuation of Thesis

CHEM-799 Independent Study (1-3 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for a masters-level student.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Cognitive Science (COGS)

COGS-600 Foundations in Research (3 Credits)
This introduction to research comprises two parts. The first part introduces interdisciplinary cognitive science and its impact in society together with foundational notions about the research process (including responsible conduct of research) and publication practices and grant writing. The second part provides an entry point to later methods courses by establishing shared computational foundations.
Contact Hours: Lecture 3
Typically Offered: Fall

COGS-610 Laboratory Methods (3 Credits)
Scientists use a wide range of experimental methods to elucidate the function of the human brain and mind. This course will provide an overview of these methods, in order to allow students to understand a wide range of scientific studies and to be able to select an appropriate method for a specific research topic. Such methods include neuroimaging, psychophysiology, single-cell recordings, computational modeling, and cognitive psychology and behavioral methods that use measures such as response time and decision accuracy to test theories concerning the nature of mental processes and representations.
Contact Hours: Lecture 3
Typically Offered: Fall

COGS-621 Foundations of Scientific Computing (3 Credits)
This course will introduce students to foundational concepts in numerical computation that are useful for engineering and the mathematical, computational, and physical sciences. Topics will include floating-point arithmetic, error analysis, linear and nonlinear equations, numerical solution of systems of algebraic equations, constrained and unconstrained optimization, polynomial interpolation, numerical differentiation and integration, numerical solution of ordinary differential equations, truncation error, and basic methods for sampling stochastic processes. Implementation of various numerical methods and solvers will be done in Python, MATLAB, and R. Connections to computational modeling of cognition will be made throughout the course as motivating examples for various key concepts and tools.
Prerequisites: COGS-600 and (PSYC-640 or PSYC-717) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

COGS-711 Philosophical Foundations in Cognitive Science (3 Credits)
This course will introduce students to the philosophical foundations of cognitive science. Topics will include the nature and distribution of consciousness, including cognitive, neurobiological, and informational theories; theories of cognition, including computational-representational and non-representational “EEE” (embodied/emergent/enactive) theories; theories of emotion, affect, valence, and motivation; theories of action and agency, and evolutionary theory. All of these discussions will be cutting-edge research in human and nonhuman animal cognition. The class will also include a discussion of competing conceptual, inferential, and conceptual strategies across the disciplines that comprise cognitive science.
Prerequisites: COGS-600 or equivalent course.
Contact Hours: Lecture 3

COGS-720 Teaching Practicum (3 Credits)
In addition to research and research leadership, doctoral education also prepares students for teaching in their area in higher education academic environments. This course is for students with at least one year of experience in the Cognitive Science PhD program. The course will develop knowledge and practical skills for teaching and assessment, and discuss related topics such as diversity and inclusion, cognitive science education research, and evaluation of teaching. Students will develop a portfolio of teaching-related materials focused on their discipline.
Prerequisites: COGS-600 and (PSYC-640 or PSYC-717 or COGS-610) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

COGS-760 Foundations of Cognitive Modeling (3 Credits)
This course will introduce students to the mathematical and philosophical foundations of cognitive modeling as well as the key concepts and tools needed for developing and applying cognitive architectures. Furthermore, the course will survey seminal papers as well as leading computational frameworks used in understanding human cognition and intelligence.Topics will include fundamentals of signal detection theory, probability modeling and information theory, the Lens Model, statistical (Bayesian) modeling of various cognitive actions and behavior, dynamical systems, symbolic and sub-symbolic representations, and simulation using artificial neural networks. Students will learn how to use one or more major cognitive architectures, e.g., MicroSAINT, Act-R, Soar, Nengo, and build basic computational models of cognitive processes, including those related to categorization, language, memory, decision making, and reasoning, fitting and evaluating their models to different kinds of behavioral data.
Contact Hours: Lecture 3
Typically Offered: Biennially

COGS-761 Graduate Psycholinguistics (3 Credits)
This graduate seminar gives an advanced introduction to psycholinguistics which investigates the cognitive mechanism that allows humans to produce, comprehend and learn language. It discusses some of the central topics in the field, including (1) an historical overview of the field; (2) a survey of behavioral, neurological, and computational methodologies; (3) a review of empirical results and theoretical perspectives; (4) a roadmap for future directions that are likely to advance the field.
Contact Hours: Seminar 3
Typically Offered: Biennially

COGS-762 Animal Cognition (3 Credits)
This course draws on latest findings in comparative cognition sciences, broadly construed, to examine fundamental questions about the evolution of mind on Earth and what that can tell us about the nature of mind wherever it is found—whether in human beings, nonhuman animals, or machines.
Contact Hours: Lecture/Lab 3
Typically Offered: Biennially

COGS-765 Psycholinguistics of Signed Languages (3 Credits)
The study of how humans comprehend and produce language has traditionally been informed by research into spoken language processing. In this course, students will explore the utility of psycholinguistic theories for understanding the processing of signed languages, with a focus on what can be learned about the human capacity for language by also considering the modality in which a language is expressed. The focus will be on the perception and production of signed language, from infancy to adulthood. The course will cover empirical and theoretical discussions of the concept of critical periods, age of acquisition effects, delayed first language learning and second-language learning. Finally, the course will consider how language oppression and socio- cultural factors have resulted in large variability in how signed languages are processed.
Contact Hours: Lecture 3
Typically Offered: Biennially

COGS-766 Neuroplasticity in Deaf and Blind Individuals (3 Credits)
This graduate seminar focuses upon understanding the human brain as a multisensory processor that integrates information from across multiple modalities in order to make flexible and adaptive decisions. Through readings and class discussion we will explore what studies of sensory processing in deaf and blind individuals reveal about the nature of the multisensory brain, and the implications for understanding how deaf and blind people successfully navigate the world.
Contact Hours: Lecture 3
Typically Offered: Biennially

COGS-768 Deaf Vision (3 Credits)
How do linguistic and sensory experiences during development impact how we use language and think? Through the lens of deafness and sign language, it becomes possible to understand the ubiquitous nature of human language and language processing, the relation between cognition and language, and the neural organization of language. By comparing perception, language processing, and cognition for two different modalities, visual-manual versus auditory-spoken, we are able to ask, how does our language impact the way our brains are organized, how our brains function, and how we perceive the world? This class aims to provide answers to these questions with a theoretical and empirical cognitive science approach. The study of deafness and sign language allows cognitive scientists to address questions about the nature of linguistic and cognitive systems that otherwise could not be easily addressed. Students will learn about general theories of multisensory integration, brain function, visual perception, systems of visual attention, and executive function. Although research present is within the bulwark of cognitive science, such knowledge has implications for application within clinical and educational settings.
Contact Hours: Lecture 3
Typically Offered: Biennially

COGS-780 Cognitive Science Research (1-6 Credits)
Doctoral students in the Ph.D. in Cognitive Science are expected to conduct research under the supervision and guidance of their faculty advisor. In this course, taken early in the academic program, students will work with their advisor to design, implement, and conduct an empirical investigation based upon an agreed research topic in the field of Cognitive Science. This course is taken prior to the qualifying examination and is required for all students in the Ph.D. in Cognitive Science. Although the course may be repeated, a maximum of 6 credit hours of COGS-799 can be counted towards meeting degree requirements for the Ph.D. in Cognitive Science.
Typically Offered: Fall, Spring, Summer

COGS-800 Cognitive Science Qualifying Examination (0 Credits)
Doctoral students in the Ph.D. in Cognitive Science are expected to conduct independent research under the supervision and guidance of their faculty advisor. In order to advance to doctoral dissertation courses, students must first pass COGS-800 Cognitive Science Qualifying Examination. This course entails a defense of the research conducted in COGS-780 to a faculty committee that has been approved by the Graduate Program Director.
Prerequisites: COGS-780 or equivalent course.
Typically Offered: Fall, Spring, Summer

COGS-801 Cognitive Science Research Colloquium (0 Credits)
The seminar will meet weekly every semester for 12 times (excluding the first and last weeks of the semester). Each week will feature a different presenter. The presenters will include speakers invited to RIT and RIT faculty members who are active in research relevant to Cognitive Science, as well as the students in the Cognitive Science PhD program when they have progressed to the level that they will have worthwhile research to present to their classmates and the program faculty.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

COGS-880 Cognitive Science Dissertation Research (1-6 Credits)
This course is to fulfill the work plan agreed by the student and the dissertation adviser. The guiding principle of the Dissertation Research course is to complete the doctoral dissertation research proposed by the doctoral candidate and approved by the candidate's dissertation committee. The course consists of carrying out the thesis research, including collection and analysis of data, and completion and public defense of the dissertation document for partial fulfillment of the requirements of the PhD degree in Cognitive Science. This course can only be taken after successful completion of COGS-800 Cognitive Science Qualifying Examination.
Prerequisites: COGS-800 or equivalent course.
Typically Offered: Fall, Spring, Summer

COGS-887 Cognitive Science Dissertation Proposal (0 Credits)
Doctoral students in the Ph.D. in Cognitive Science are expected to conduct independent research under the supervision and guidance of their faculty advisor that makes a novel and significant contribution to the field of Cognitive Science. In order to advance to candidacy for the degree and submit a doctoral dissertation, students must first pass COGS-887 Cognitive Science Proposal Defense. This course entails a defense of the proposed dissertation research conducted in COGS-880/COGS-888 to a faculty committee that has been approved by the Graduate Program Director.
Prerequisites: COGS-800 or equivalent course. Co-requisites: COGS-880 or COGS-888 or equivalent course.
Typically Offered: Fall, Spring, Summer

COGS-888 Continuation of Dissertation (0 Credits)
Doctoral students in the Ph.D. in Cognitive Science are expected to conduct research under the supervision and guidance of their faculty advisor. After completion of all degree requirements, with the exception of COGS-890 Cog Sci Dissertation and including completion of at least 60 semester credit hours, students may register for COGS-888 Cog Sci Continuation of Dissertation in order to maintain their status in the Ph.D. in Cognitive Science program.
This course is restricted to COGS-PHD students.
Typically Offered: Fall, Spring, Summer

Color Science (CLRS)

CLRS-600 Fundamentals of Color Science (3 Credits)
This asynchronous online course provides a technical introduction to color science and the CIE system of colorimetry. Topics covered include color perception, color measurement, color spaces, and applications. The course is intended for students with a technical background who are interested in adding an elective course in color science to their graduate program and for practitioners in the color field interested in a more thorough understanding of the science behind colorimetry. Cannot be taken for program credit by Color Science MS and PhD students.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Summer

CLRS-601 Principles of Color Science (3 Credits)
This course covers the principles of color science including theory, application, and hands-on experience incorporated into the lectures. Topics include color appearance (hue, lightness, brightness, chroma, saturation, colorfulness), colorimetry (spectral, XYZ, xyY, L*a*b*, L*C*abhab, ΔE*ab, ΔE00), the use of linear algebra in color science and color imaging, metamerism, chromatic adaptation, color inconstancy, color rendering, color appearance models (CIECAM02), and image appearance models (S-CIELAB, iCAM).
Prerequisites: Graduate standing in CLRS-MS, IMGS-MS, CLRS-PHD or IMGS-PHD.
Contact Hours: Lecture 3
Typically Offered: Fall

CLRS-602 Color Physics and Applications (3 Credits)
This course explores the relationship between a material's color and its constituent raw materials such as colorants, binding media, substrates, and overcoats. These can be determined using a variety of physical models based on absorption, scattering, luminescence, and interference phenomena. These models enable the production of paints, plastics, colored paper, printing, and others to have specific colors. Accompanying laboratories will implement and optimize these models using filters, artist opaque and translucent paints and varnishes including metallic and pearlescent colorants, and inkjet printing. Statistical techniques include principal component analysis and linear and nonlinear optimization.
Prerequisites: CLRS-601 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CLRS-689 Special Topics (1-4 Credits)
This is an introductory graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall or Spring or Summer

CLRS-699 Color Science Graduate Co-op (0 Credits)
Cooperative work experience for graduate color science students.
Typically Offered: Fall, Spring, Summer

CLRS-720 Computational Vision Science (3 Credits)
Computational Vision Science This course provides an introduction to modern computer-based methods for the measurement and modeling of human vision. Lectures will introduce the experimental techniques of visual psychophysics including threshold measurement, psychometric functions, signal detection theory, and indirect, direct, and multidimensional scaling. Lectures will also introduce the MATLAB technical computing environment and will teach how to use MATLAB to run computer-based psychophysical experiments and to analyze experimental data and visualize results. Laboratory exercises will provide practical experience in using computer-based tools to conduct psychophysical experiments and to develop computational models of the results. Prior experience in vision science and/or scientific computing will be helpful but is not required.
Prerequisites: Graduate standing in CLRS-MS, IMGS-MS, CLRS-PHD or IMGS-PHD.
Contact Hours: Lecture 3
Typically Offered: Fall

CLRS-750 Historical Research Perspectives (1 Credit)
Historical Research Perspectives is a weekly forum in which students will learn about historical and classic topics in color science. The course focuses on journal club discussions of papers selected by the students and faculty. It also includes oral presentations from students, laboratory staff, and faculty as well as visiting speakers from within and external to RIT. Students will prepare their own oral presentations and written assignments based on the course readings and independent research. Students will develop professional skills required for formal scientific presentations and writing.
Prerequisites: Graduate standing in CLRS-MS or CLRS-PHD.
Contact Hours: Seminar 1
Typically Offered: Fall

CLRS-751 Research and Publication Methods (2 Credits)
Color Science Seminar II is a weekly forum in which students will learn about current research topics in color science. The course focuses on journal club discussions of papers selected by the students and faculty. It also includes oral presentations from students, laboratory staff, and faculty as well as visiting speakers from within and external to RIT. Students will prepare their own oral presentations and written assignments based on the course readings and independent research. Students will further develop professional skills required for formal scientific presentations and writing. A draft thesis or dissertation proposal will also be prepared.
Prerequisites: CLRS-750 or equivalent course.
Contact Hours: Seminar 2
Typically Offered: Spring

CLRS-780 Color Science Graduate Project (1-4 Credits)
This course is a faculty-directed exploration of appropriate advanced multi-disciplinary topics that are not part of the formal curriculum. The level of study is appropriate for student in their final two years of study.
Typically Offered: Fall, Spring, Summer

CLRS-789 Special Topics (1-4 Credits)
This is an advanced graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures. This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

CLRS-790 Research & Thesis (1-6 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CLRS-791 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring, Summer

CLRS-799 Color Science Independent Study (1-4 Credits)
Typically Offered: Fall, Spring, Summer

CLRS-820 Modeling Visual Perception (3 Credits)
This course presents the transition from the measurement of color matches and differences to the description and measurement of color appearance in complex visual stimuli. This seminar course is based mainly on review and student-led discussion of primary references. Topics include: appearance terminology, appearance phenomena, viewing conditions, chromatic adaptation, color appearance modeling, image appearance, image quality, and material appearance.
Prerequisites: CRLS-601 and CLRS-720 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CLRS-889 Special Topics (1-4 Credits)
This is an Ph.D.-level advanced graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

CLRS-890 Research & Thesis (1-6 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CLRS-891 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring, Summer

Communication (COMM)

COMM-605 Social Media Analytics and Research (3 Credits)
This course focuses on social media research and ethics of applying various methodological approaches to study public data, users and messages. Students will be introduced to a variety of techniques and concepts used to obtain, monitor and evaluate social media content with a focus on how the analytics could inform communication strategies. During the course, students will also learn how to design and evaluate social media-based research studies.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall or Spring

COMM-606 Digital Storytelling (3 Credits)
This course provides students with a comprehensive understanding of digital storytelling through an analysis of current trends as well as by utilizing hands-on workshop experiences. Students will develop skills such as content strategy, digital storytelling best practices, content production, and audience analysis. Students in the course will develop critical skills to conceptualize, develop and execute an effective digital storytelling project.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall or Spring

COMM-702 Communication Theories (3 Credits)
Over the course of this term we will cover mass communication theory from its inception as a field of study, to major trends, followed by current applications of previous paradigms, and finally into the development of new theoretical frameworks. While the main focus of this course is the integration of current mass communication theory with an individual and organizational online presence, we will also focus on how digital platforms can inform the future of theoretical research and vice versa. From a practical perspective, students will be able to apply these theories to their integrative approaches in creative digital communication and design.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Seminar 3
Typically Offered: Fall

COMM-703 Research Methods in Communication (3 Credits)
This course is designed to introduce students to qualitative and quantitative research methods in communication and guide them in choosing the appropriate method for their thesis research project. Topics may include research perspectives, ethics and IRB, variables, sampling methods, reliability and validity, survey, experiments, content analysis, in-depth interview, focus group, observations/ethnography, and mixed methods.
Prerequisites: COMM-702 or equivalent course.
Contact Hours: Seminar 3
Typically Offered: Spring

COMM-708 Communication Education (3 Credits)
An analysis of and practicum in teaching communication in higher education. Students explore teaching and learning styles, the role of technology in higher education, and teaching assessment methods. Students create teaching resources and gain teaching experience in a college classroom.
Typically Offered: Spring

COMM-709 Digital Advertising (3 Credits)
This course aims to help students understand the strategic use of digital media from both scholarly and professional perspectives, considering both brand and audience viewpoints. This course will cover the types and practices of digital advertising, including search engine optimization, paid search advertising, display advertising, email marketing, social media marketing, and reputation management.
Contact Hours: Seminar 3
Typically Offered: Fall or Spring

COMM-710 Visual Communication (3 Credits)
This course explores visual communication, the process through which individuals -- in relationships, organizations, and societies -- create and interpret visual messages. A variety of theories from the disciplines of art history, psychology, communication theory, and graphic design will be discussed to develop methods for analyzing mediated messages. Students analyze visual messages from the following media: print photography, video, film, and the internet.
This course is restricted to COMMTCH-MS Major students.
Typically Offered: Fall or Spring

COMM-714 Strategic Communication (3 Credits)
This course will introduce students to the theory and practice of strategic communication in advertising, public relations, health communication, crisis/risk communication, and/or political communication. This course will cover problem identification, audience research, message creation, and execution of strategic communication activities. It will also cover ethics and strategic communication through digital media. By the end of the course, students should be able to analyze and execute various components to help solve problems or achieve an organization's goals and objectives.
Contact Hours: Seminar 3
Typically Offered: Fall

COMM-715 Communication Design Principles (3 Credits)
An introduction to design theory, history, and design for communication. In a practical, project-oriented setting, students will learn design theory and practice image analysis. Students will apply research, theory, and methodology to create visual communication artifacts using graphic design software.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall or Spring

COMM-716 Communication and Identity (3 Credits)
This course engages students in an analytical and applied exploration of the connection between self, identity, communication, media, and society. Drawing from classical and contemporary readings, as well as current events, the course will address topics such as identity and discourse, performance, intersectionality, and representation. Communication has been central to the development of ideas about collective and individual identities. Therefore, the course encourages students to critically examine the political implications of identity construction in our social world. Finally, the course examines how popular notions of identity function in media texts, corporate settings, and digital environments.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

COMM-717 Artificial Intelligence and Communication (3 Credits)
Communication has been impacted by automation and advances in information technology, and now artificial intelligence is changing how we interact with socio-technical systems. In this course, we will explore historical, ethical, computational, and cultural perspectives to understand the implications of algorithmic processes on communication and society. During the course, students will learn how to analyze various digital products and identify the potential consequences of algorithmic systems on various demographics.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

COMM-720 Thesis Preparation Seminar (0 Credits)
An introduction to graduate study and research in communication including the theoretical, conceptual, and methodological parameters of communication and its sub-disciplines. Participants will interact with the faculty teaching required and elective communication courses. Attention will be drawn to scholarly writing and research design. When possible, the course is organized in conjunction with the department's colloquium series.
This course is restricted to COMMTCH-MS Major students.
Contact Hours: Seminar 1
Typically Offered: Spring

COMM-789 Special Topics Communication (3 Credits)
An in-depth examination of a selected aspect of the communication discipline (e.g. strategic communication, technical communication, visual communication, technology-mediated communication, advertising, public relations, journalism). Special Topics in Communication can be taken multiple times provided the topic being studied has changed. (Prerequisite: varies by topic)
Contact Hours: Seminar 3
Typically Offered: Fall or Spring

COMM-799 Independent Study in Communication (1-3 Credits)
A guided study culminating in a research project that allows students to pursue a subject independently with faculty guidance. Focuses on designing, conducting, and completing an independent study project.
Typically Offered: Fall, Spring, Summer

COMM-800 Communication Thesis/Project (1-6 Credits)
A guided research project that focuses on designing, conducting, and completing a research project. The project culminates in a public presentation and defense.
Typically Offered: Fall, Spring, Summer

COMM-801 Comprehensive Exam (0 Credits)
This course requires permission of Director of Graduate Programs/School of Communication.
Typically Offered: Fall, Spring, Summer

COMM-890 Continuation of Thesis/Project (0 Credits)
A guided research study culminating in an original, systematic, and scholarly study of a significant communication problem. Focuses on designing, conducting, and completing an independent research project. The progress of each project is publicly defended.
Typically Offered: Fall, Spring, Summer

COMM-999 Co-op (0 Credits)
One semester of work experience in a professional setting related to the communication major.
Typically Offered: Fall, Spring, Summer

Computer Engineering (CMPE)

CMPE-610 Analytical Topics in Computer Engineering (3 Credits)
This course begins by reviewing signal and system analysis techniques for analyzing linear systems. It includes Fourier techniques and moves on to present fundamental computational techniques appropriate for a number of applications areas of computer engineering. Other topics include symbolic logic and optimization techniques.
Prerequisites: CMPE-480 and MATH-231 and MATH-241 and MATH-251 or equivalent courses. Co-requisites: CMPE-795 and ECEP-795 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-630 Digital Integrated Circuit Design (3 Credits)
This course will cover the basic theory and techniques of Digital Integrated Circuit Design in CMOS technology. Topics include CMOS transistor theory and operation, design and implementation of CMOS circuits, fabrication process, layout and physical design, delay and power models, static and dynamic logic families, testing and verification, memory and nanoscale technologies. Laboratory assignments and project facilitate in hands-on learning of circuit-level design and simulation, layout and parasitic extractions, pre and post-layout verification and validation, full-custom flow and Synthesis based flow, using industry standard CAD tools.
Prerequisites: CMPE-260 and EEEE-282 and (EEEE-380 or EEEE-381) or equivalent courses.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Fall, Spring

CMPE-640 Control Systems (3 Credits)
This course introduces students to the study of linear control systems, their behavior and design and use in augmenting engineering system performance. This is accomplished through classical control methods that employ the use of Laplace transforms, block diagrams, root locus, and frequency domain diagrams. Topics include: Laplace transform review, system modeling for control, fundamentals of time response behavior, stability analysis, steady-state error and design, feedback control properties, PID control, root locus analysis and design, and frequency response design.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-655 Multiple Processor Systems (3 Credits)
The course introduces basic concepts of parallel and high-performance computing and current methodologies and trends in the design and programming of multiprocessor systems. Theoretical models of parallel computing and performance metrics are studied and contrasted with practical parallel system architectures, programming environments, and benchmarking techniques. Parallel architectures are classified according to mode and degree of parallelism, memory organization, and type and typology of interconnection networks used in the design. The suitability of various architectures in meeting demands is studied in depth including the study of representative examples of current commercial machines. Students will complete programming assignments on a parallel computer illustrating practical issues. A review and analysis of a commercial parallel processor system or an active research area is required; written review presented in class.
Prerequisite: CMPE-550 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CMPE-660 Reconfigurable Computing (3 Credits)
The objective of this course is to present the foundations of reconfigurable computing methodologies from both hardware and software perspectives. Topics covered are: architectures of modern field programmable gate arrays (FPGAs), digital system design methodologies using FPGAs, hardware-software co-design with embedded processors, hardware optimization techniques, system level integration under operating system, dynamic reconfiguration. Laboratory projects in which students will acquire a solid capability of Xilinx CAD tools and FPGA devices are required. The projects include the whole design flow: design of the system, VHDL modeling, software and hardware development, FPGA verification.
Prerequisites: CMPE-260 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Studio 3
Typically Offered: Fall

CMPE-661 Hardware and Software Design for Cryptographic Applications (3 Credits)
The objective of this course is to build knowledge and skills necessary for efficient implementations of cryptographic primitives on reconfigurable hardware. The implementation platform will be a field programmable gate array (FPGA) containing a general purpose processor and additional reconfigurable fabric for implementations of custom hardware accelerators. In the studio format, team projects require design of selected cryptographic primitives followed by comparison and contrast of various implementation alternatives, such as software, custom FPGA hardware, and hybrid hardware-software co-design. Project teams are ideally composed of one Computer Engineering student and one Software Engineering or Computer Science student. Computer Engineering students lead the hardware design portions of each project, and Software Engineering and Computer Science students lead the software development portions. Topics may include binary finite field arithmetic, block ciphers, hash functions, counter mode of operation for block ciphers, public key cryptosystems, hardware/software co-design methodologies with FPGAs, software development and profiling, high level synthesis, on-chip buses, hardware/software interfaces, custom hardware accelerators and side channel attacks.
Prerequisites: CMPE-260 or CMPE-240 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Studio 2
Typically Offered: Spring

CMPE-663 Real-time & Embedded Systems (3 Credits)
This first course in a graduate elective sequence will begin by presenting a general road map of real-time and embedded systems. The course will be conducted in a studio class/lab format with lecture material interspersed with laboratory work. This course will introduce a representative family of microcontrollers that will exemplify unique positive features as well as limitations of microcontrollers in embedded and real-time systems. These microcontrollers will then be used as external, independent performance monitors of more complex real-time systems. The majority of the course will present material on a commercial real-time operating system and using it for programming projects on development systems and embedded target systems. Some fundamental material on real-time operating systems and multiprocessor considerations for real-time systems will also be presented. Examples include scheduling algorithms, priority inversion, and hardware-software co-design.
Prerequisites: CMPE-380 or SWEN-220 or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-664 Modeling of Real-Time Systems (3 Credits)
This course introduces the modeling of real-time software systems. It takes an engineering approach to the design of these systems by analyzing system models before beginning implementation. UML will be the primary modeling methodology. Non-UML methodologies will also be discussed. Implementations of real-time systems will be developed manually from the models and using automated tools to generate the code.
Prerequisite: SWEN-220 or CSCI-251 or CMPE-380 or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-665 Performance Engineering of Real-Time and Embedded Systems (3 Credits)
This course discusses issues of performance in real-time and embedded systems. Techniques for profiling the resource usage of a system and for measuring the effect of increasing system requirements will be covered. The control of physical systems will motivate the need for performance tuning of a real-time system. Students will write programs running under a real-time operating system that can maintain control of a physical system. The course will discuss and experiment with performance trade-offs that can be made using hardware-software co-design.
Prerequisite: SWEN-220 or CSCI-251 or CMPE-380 or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-670 Data and Communication Networks (3 Credits)
This course gives an overview of the technologies, architectures, and protocols used to build various types of computer and communication networks. The course emphasizes various network design problems and solution approaches. Specific issues covered include framing and coding, error detection, multiple access control, addressing, routing, flow and congestion control, scheduling, and switching.
Prerequisites: CMPE-380 and MATH-251 or equivalent courses or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CMPE-675 Robotics: Embedded and Autonomous Systems (3 Credits)
This course covers an overview of robotics topics with an AI influence. Includes hands-on laboratory with low level microcontroller programming driving a Lynxmotion 4WD chassis. Course has a strong emphasis on robotics related input and output device inter-facing. Course topics include microcontrollers, control systems, vision, path planning localization, and machine learning. Term project of student choosing emphasizes a specific robotic topic.
Prerequisites: CMPE-380, CMPE-460 and CMPE-480 or equivalent courses or graduate standing in the CMPE-MS program.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Summer

CMPE-677 Machine Intelligence (3 Credits)
Machine intelligence teaches devices how to learn a task without explicitly programming them how to do it. Example applications include voice recognition, automatic route planning, recommender systems, medical diagnosis, robot control, and even Web searches. This course covers an overview of machine learning topics with a computer engineering influence. Includes Matlab programming. Course topics include unsupervised and supervised methods, regression vs. classification, principal component analysis vs. manifold learning, feature selection and normalization, and multiple classification methods (logistic regression, regression trees, Bayes nets, support vector machines, artificial neutral networks, sparse representations, and deep learning).
Prerequisites: CMPE-380 and CMPE-480 and MATH-251 or graduate standing in the CMPE-MS, CMPE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-679 Deep Learning (3 Credits)
Deep learning has been revolutionizing the fields of object detection, classification, speech recognition, natural language processing, action recognition, scene understanding, and general pattern recognition. In some cases, results are on par with and even surpass the abilities of humans. Activity in this space is pervasive, ranging from academic institutions to small startups to large corporations. This course emphasizes convolutional neural networks (CNNs) and recurrent neural networks (RNNs), but additionally covers reinforcement learning and generative adversarial networks. In addition to achieving a comprehensive theoretical understanding, students will understand current state-of-the-art methods, and get hands-on experience at training custom models using popular deep learning frameworks.
Prerequisites: CMPE-677 or equivalent course and students in CMPE-BS or CMPE-MS programs.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-680 Digital Image Processing Algorithms (3 Credits)
Emphasizes both theory and implementation of image processing algorithms. Two- dimensional filtering, sampling, and transforms are introduced and used for image enhancement, compression, restoration, segmentation, and applications in color and video processing. Project assignments involve Matlab implementation of algorithms and paper reviews.
Prerequisites: CMPE-480 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 4
Typically Offered: Fall

CMPE-685 Computer Vision (3 Credits)
This course covers both fundamental concepts and the more advanced topics in Computer Vision. Topics include image formation, color, texture and shape analysis, linear filtering, edge detection and segmentation. In addition, students are introduced to more advanced topics, such as model based vision, object recognition, digital image libraries and applications. Homework, literature reviews and programming projects are integrated with lectures to provide a comprehensive learning experience.
Prerequisites: CMPE-480 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-699 Graduate Co-op (0 Credits)
Graduate co-op aims to enhance the educational experience of graduate students through full-time paid employment during an academic term at positions in the Computer Engineering field. Registration is optional and is recommended for summer term only after the completion of all course work.
Typically Offered: Fall, Spring, Summer

CMPE-730 Advanced Digital Integrated Circuit Design (3 Credits)
This course covers techniques for high-performance, low power and reliability in digital integrated circuit design from a systems perspective. Emphasis will be on the most important design challenges, being the impact of scaling, interconnect, signal integrity, power and timing. Presentation and term paper based on current research articles is required. Laboratory assignments are based on real time applications. Design process starting from logic synthesis down to layout synthesis will be covered in the laboratory, with industry standard CAD tools.
Prerequisites: CMPE-530 or CMPE-630 or equivalent course.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Spring

CMPE-731 Design and Test of Multi-Core Chips (3 Credits)
Massive levels of integration following Moore's Law is making modern multi-core chips all-pervasive in several domains ranging from scientific applications like weather forecasting, astronomical data analysis, bioinformatics applications to even consumer electronics. This course introduces students to current and future trends in IC Design. Students learn to identify bottlenecks in designing state-of-the-art multicore System-on-Chips (SoCs) and propose solutions to such design challenges from a cross-layer perspective spanning multiple levels of abstraction in the design process. Low-power and high-speed testing of multicore chips is an important design issue in Design for Testability (DFT) of such massive multicore systems. In this course students learn various issues and solutions to ongoing challenges in SoC testing. The instruction will rely on lectures, textbooks, seminal and cutting edge publication articles and term projects. Students will be evaluated based on homework assignments, class presentations, examinations and projects.
Prerequisites: CMPE-530 or CMPE-630 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-750 Advanced Computer Architecture (3 Credits)
The goal of this course is to acquire a good understanding of important current and emerging design techniques, machine structures, technology factors, and evaluation methods that will determine the form of high-performance advanced programmable processor architectures in the 21st Century. The topics covered include Simultaneous Multithreading (SMT), Vector Processing, Digital Signal Processing (DSP), Media Architectures and Processors, Re-Configurable Computing and Processors, Advanced Branch Prediction Techniques, and Redundant Arrays of Disks (RAID). The course also provides an introduction to the main concepts of parallelism including single-chip multiprocessors.
Prerequisite: CMPE-550 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 4
Typically Offered: Fall

CMPE-755 High Performance Architectures (3 Credits)
This course will focus on learning and understanding the available hardware options to satisfy the needs of high performance and computational intensive applications. Special attention will be paid to single platform massively parallel devices, their programming and efficient use of the hardware resources. The course will include hands on work with the actual device, lab work, and technical reports and conference paper reading as a relevant source information.
Prerequisite: CMPE-350 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-757 Quantum Computing (3 Credits)
Prerequisites: MATH-241 and CMPE-260 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-765 Brain Inspired Computing (3 Credits)
This course is primarily designed for graduate students and will expose them to theoretical and practical aspects of brain-inspired computing. It will offer students the opportunity to understand how the human brain computes to achieve intelligent behavior and how this understanding guides the development of new neural algorithms. We will identify the key developments and large issues at stake, and study brain inspired systems in the context of pragmatic applications. At the end of the course the students are expected to have expanded their knowledge of how the brain processes information, and how one can develop neuromorphic algorithms to tackle emergent spatio-temporal problems.
Prerequisites: CMPE-260 and MATH-251 or equivalent course or graduate standing in CMPE-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-770 Wireless Networks (3 Credits)
This course will give an overview of the technologies, architectures and protocols used to build various types of computer and communication networks - wired or wireless. The emphasis will be placed on discussions of various network design problems and solution approaches. Specific issues covered in this course include: framing and coding, error detection, multiple access control, addressing, routing, flow and congestion control, scheduling and switching.
Prerequisites: CMPE-570 or CMPE-670 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-784 Cognitive Radios and Networks (3 Credits)
This course studies multiple aspects of cognitive radios and their operation in a cognitive network. Cognitive radios are an artificial intelligence agent that, instead of operating in the more common three-dimensional physical space that surround us, it learns and operates in the "virtual" space of the radio spectrum. Topics to be covered include an overview of wireless channels and wireless communications, cognitive radios network paradigms, spectrum sensing and dynamic spectrum access, spectrum exploration and exploitation through game theory and machine learning, cross-layer cognitive radios and cognitive networking.
Prerequisite: CMPE-570 or CMPE-670 or equivalent course or graduate standing in the CMPE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CMPE-785 Comprehensive Exam (0 Credits)
Comprehensive Exam
This course is restricted to Graduate students.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Spring

CMPE-788 Machine Learning for Cybersecurity Analytics (3 Credits)
This course is a semester-long project-based course, where students learn to select and apply machine learning and data science (ML/DS) techniques to solve cybersecurity problems. Through learning-by-doing, students will discover cybersecurity challenges and how ML/DS can help overcome the challenges as well as the limitations of ML/DS. Students will explore and choose appropriate ML/DS approaches, design and conduct experiments with open-domain cybersecurity data, and deduce and present findings to practice analytical and critical thinking skills. The course will progress in tightly guided and coupled stages: data and feature analysis, literature review and problem discovery, ML technique exploration, experimental design, result interpretation and analysis, professional project dissemination, and constructive peer reviews.
Prerequisites: CSEC-520 or EEET-520 or CMPE-610 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CMPE-789 Special Topics (3 Credits)
Graduate level topics and subject areas that are not among the courses typically offered are provided under the title of Special Topics. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
This class is restricted to students in the CMPE-BS, CMPE-MS or CMPE-BS/MS programs.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CMPE-790 Thesis (1-9 Credits)
Thesis research investigates an independent problem to demonstrate professional maturity. A formal written thesis and an oral defense are required. The student must obtain the approval of an appropriate faculty adviser to guide the thesis before registering.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CMPE-792 Graduate Project (3 Credits)
Graduate Project is a scholarly undertaking that addresses an immediate and practical problem with tangible outcomes. A formal report, presentation, or demonstration is required. The student must obtain the approval of an appropriate faculty adviser to guide the project before registering.
This class is restricted to students in the CMPE-MS, CMPE-BS/MS program.
Typically Offered: Fall, Spring, Summer

CMPE-795 Graduate Seminar (0 Credits)
The graduate seminar prepares graduate students to effectively conduct their thesis research and expose them to current research in various areas of computer engineering. Current literature topics are reviewed through interactive presentations and discussions.
Co-requisites: CMPE-610 or equivalent course.
Typically Offered: Fall

CMPE-796 Thesis & Project Initiation Seminar (0 Credits)
The objective of this seminar is to engage the students in the preparation and completion of their thesis Proposal. The students will learn about the resources available at RIT to support their work as well as general guidelines and practices that should lead to a good thesis proposal.
Prerequisites: CMPE-795 or equivalent course.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

CMPE-799 Independent Study (1-3 Credits)
Allows graduate students an opportunity to independently investigate, under faculty supervision, aspects of the field of computer engineering that are not sufficiently covered in existing courses. Proposals for independent study activities are subject to approval by both the faculty member supervising the independent study and the department head.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Computer Science (CSCI)

CSCI-603 Computational Problem Solving (3 Credits)
This course focuses on the application of computational thinking using a problem-centered approach. Specific topics include: expression of algorithms in pseudo-code and a programming language; elementary data structures such as lists, trees and graphs; problem solving using recursion; and debugging and testing. Assignments (both in class and homework) requiring a pseudo-code solution and implementation in a programming language are an integral part of the course. Note: This course serves as a bridge course for graduate students and cannot be taken by undergraduate students without permission from the CS Undergraduate Program Coordinator.
This course is restricted to students in COMPSCI-MS.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-605 Advanced Object-Oriented Programming Concepts (3 Credits)
This course focuses on identifying advanced object-oriented programming concepts and implementing them in the context of specific problems. This course covers advanced concepts such as event-driven programming, design patterns, distributed and concurrent programming, and the use, design and implementation of applications. Assignments (both in class and as homework) requiring a solution to a problem and an implementation in code are an integral part of the course. Note: This course serves as a bridge course for graduate students and cannot be taken by undergraduate students without permission from the CS Undergraduate Program Coordinator.
This course is restricted to students in COMPSCI-MS.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-610 Foundations of Computer Graphics (3 Credits)
Foundations of Computer Graphics is a study of the hardware and software principles of interactive raster graphics. Topics include an introduction to the basic concepts, 2-D and 3-D modeling and transformations, viewing transformations, projections, rendering techniques, graphical software packages and graphics systems. The course will focus on rasterization techniques and emphasize the hardware rasterization pipeline including the use of hardware shaders. Students will use a standard computer graphics API to reinforce concepts and study fundamental computer graphics algorithms. Programming projects and a survey of the current graphics literature will be required. Note: students who complete CSCI-510 may not take CSCI-610 for credit.
Prerequisite: (CSCI-603 or CSCI-605 with a grade of B or better) or (CSCI-243 or SWEN-262). May not take and receive credit for CSCI-610 and CSCI-510. If earned credit for/or currently enrolled in CSCI-510 you will not be permitted to enroll in CSCI-610.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-620 Introduction to Big Data (3 Credits)
This course provides a broad introduction to the exploration and management of large datasets being generated and used in the modern world. First, practical techniques used in exploratory data analysis and mining are introduced; topics include data preparation, visualization, statistics for understanding data, and grouping and prediction techniques. Second, approaches used to store, retrieve, and manage data in the real world are presented; topics include traditional database systems, query languages, and data integrity and quality. Case studies will examine issues in data capture, organization, storage, retrieval, visualization, and analysis in diverse settings such as urban crime, drug research, census data, social networking, and space exploration. Big data exploration and management projects, a term paper and a presentation are required. Sufficient background in database systems and statistics is recommended.
Prereq: (CSCI-603 or CSCI-605 with a grade of B or better) or (CSCI-320 or SWEN-344). May not take & receive credit for CSCI-620 & CSCI-420/420H. If earned credit for/or currently enrolled in CSCI-420/420H you will not be permitted to enroll in CSCI-620.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

CSCI-621 Foundations of Database System Implementation (3 Credits)
This course provides a broad introduction to database management systems including data modeling, the relational model, and SQL. Database system implementation issues are covered next, where the focus is on data structures and algorithms used to implement database management systems. Topics include physical data organizations, indexing and hashing, query processing and optimization, database recovery techniques, transaction management, concurrency control, and database performance evaluation. Current research topics in database system implementation are also explored. Programming projects, a term paper, and presentations will be required. Note: Students who take this course may not take CSCI-421 for credit.
Prerequisites: CSCI-620 or CSCI-420 or CSCI-420H or equivalent course. May not take and receive credit for CSCI-621 and CSCI-421. If earned credit for/or currently enrolled in CSCI-421 you will not be permitted to enroll in CSCI-621.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-622 Data Security and Privacy (3 Credits)
This course examines policies, methods and mechanisms for securing enterprise and personal data and ensuring data privacy. Topics include data integrity and confidentiality; access control models; secure database architectures; secure transaction processing; information flow, aggregation, and inference controls; auditing; securing data in contemporary (relational, XML and other NO SQL) database systems; data privacy; and legal and ethical issues in data protection. Programming projects are required.
Prerequisites: CSCI-620 or CSCI-420 or CSCI-420H or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-630 Foundations of Artificial Intelligence (3 Credits)
An introduction to the theories and algorithms used to create artificial intelligence (AI) systems. Topics include search algorithms, logic, planning, machine learning, and applications from areas such as computer vision, robotics, and natural language processing. Programming assignments and oral/written summaries of research papers are required.
Prerequisites:((CSCI-603 or CSCI-605) &CSCI-661) with grades of B or better or ((CSCI-243 or SWEN-262)&(CSCI-262 or CSCI-263)).If you have earned credit for CSCI-331 or you are currently enrolled in CSCI-331 you won't be permitted to enroll in CSCI-630.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-631 Foundations of Computer Vision (3 Credits)
An introduction to the underlying concepts of computer vision and image understanding. The course will consider fundamental topics, including image formation, edge detection, texture analysis, color, segmentation, shape analysis, detection of objects in images and high level image representation. Depending on the interest of the class, more advanced topics will be covered, such as image database retrieval or robotic vision. Programming assignments are an integral part of the course. Note: students who complete CSCI-431 may not take CSCI-631 for credit.
Prerequisites:(CSCI-603 and CSCI-605 and CSCI-661 with grades of B or better) or ((CSCI-243 or SWEN-262) and (CSCI-262 or CSCI-263)) or equiv courses. If earned credit for/or currently enrolled in CSCI-431 you will not be permitted to enroll in CSCI-631.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-632 Mobile Robot Programming (3 Credits)
This course covers standard and novel techniques for mobile robot programming, including software architectures, reactive motion control, map building, localization and path planning. Other topics may include multiple robot systems, robot vision and non-traditional and dynamic robots. Students will implement various algorithms in simulation as well as on a real robot, and investigate and report on current research in the area. Course offered every other year.
Prerequisites: CSCI-630 or CSCI-331 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-633 Biologically Inspired Intelligent Systems (3 Credits)
There have been significant advances in recent years in the areas of neuroscience, cognitive science and physiology related to how humans process information. In this course students will focus on developing computational models that are biologically inspired to solve complex problems. A research paper and programming project on a relevant topic will be required. A background in biology is not required.
Prerequisites: (CSCI-603 and CSCI-605 and CSCI-661 with grades of B or better) or ((CSCI-243 or SWEN-262) and (CSCI-262 or CSCI-263)) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-635 Introduction to Machine Learning (3 Credits)
This course offers an introduction to supervised machine learning theories and algorithms, and their application to classification and regression tasks. Topics include: Mathematical background of machine learning (e.g. statistical analysis and visualization of data), neural models (e.g. Convolutional Neural Networks, Recurrent Neural Networks), probabilistic graphical models (e.g. Bayesian networks, Markov models), and reinforcement learning. Programming assignments are required.
Prerequisites: (CSCI-603 or CSCI-605 with a grade of B or better) or ((CSCI-243 or SWEN 262) and (MATH-251 or STAT-205)) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-636 Information Retrieval (3 Credits)
An introduction to the theories and techniques used to construct search engines. Topics include search interfaces, traditional retrieval models (e.g., TF-IDF, BM25), modern retrieval techniques (e.g., neural reranking and retrieval), search engine evaluation, and search applications (e.g., conversational IR, enterprise search). Students will also review current IR research, provide written summaries of current research papers, and complete a group project in which they will design and execute experiments for search engine components.
Prerequisites:(CSCI-603 and CSCI-605 and CSCI-661 with grades of B or better, including familiarity with computer science concepts) or CSCI-331 or equivalent courses. Students may not take and receive credit for both CSCI-636 and CSCI-536.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-641 Advanced Programming Skills (3 Credits)
The goal of this course is to introduce the students to a programming paradigm and an appropriate programming language chosen from those that are currently important or that show high promise of becoming important. A significant portion of the learning curve occurs through programming assignments with exemplary solutions discussed later in class. The instructor will post specifics prior to registration. With the approval of the program coordinator, the course can be taken for credit more than once, provided each instance deals with a different paradigm and language. A term project involving independent investigation is also required. Note: students who complete CSCI-541 may not take CSCI-641 for credit.
Prerequisites: (CSCI-603 or CSCI-602) and (CSCI-605 or CSCI-604) or equivalent courses with grades of B or better or successful completion of CSCI-344.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-642 Secure Coding (3 Credits)
This course covers concepts, principles, and practices of secure coding. It explores secure development and engineering techniques, practical defensive programming techniques, and modern tools for delivering secure programs. The role of software verification and validation, including testing and formal methods, is stressed. The course also focuses on the design of modern secure programming languages and the role of the compiler in generating defensive code. The societal need for secure programming is also highlighted. Note: Programming projects, presentations, and a research report will be required.
Prerequisites: (CSCI-603 and CSCI-605 with grades of B or better) or (CSEC-742) or (CSCI-243 or SWEN-262 or CSEC-201) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-651 Foundations of Computer Networks (3 Credits)
This course is an introduction to the concepts and principles of computer networks. Students will design and implement projects using application protocols, and will study transport, network, and data link protocols and algorithms. The course also includes an introduction to local area networks, data transmission fundamentals, and network security. Programming projects and reading research papers will be required.
Prerequisites: (CSCI-605 with grade of B or better) or (CSCI-243 or SWEN-262) or equivalent course and sufficient background in statistics. Students cannot take and receive credit for this course if they have taken CSCI-351.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-652 Distributed Systems (3 Credits)
An introduction to the study of distributed systems. The course covers distributed system architectures such as client-server and peer-to-peer, distributed system design issues such as communication, fault tolerance, coordination, and deadlock, distributed system middleware such as remote method invocation (RMI) and tuple space, and the theory of distributed algorithms such as logical clocks and leader election. Students will also learn about ethical and legal concerns in computing and research. Programming projects are required.
Prerequisites: (CSCI-603 with grade of B or better) or (CSCI-243 or SWEN-262) or equivalent course and sufficient background in Operating Systems.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-654 Foundations of Parallel Computing (3 Credits)
This course is a study of the hardware and software issues in parallel computing. Topics include an introduction to the basic concepts, parallel architectures and network topologies, parallel algorithms, parallel metrics, parallel languages, granularity, applications, parallel programming design and debugging. Students will become familiar with various types of parallel architectures and programming environments.
Prerequisites: (CSCI-603 and CSCI-605 and CSCI-661 with grades of B or better) or ((CSCI-243 or SWEN-262) and (CSCI-262 or CSCI-263)) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-655 Foundations of Cybersecurity (3 Credits)
This course provides a graduate-level introduction to cybersecurity principles and practices, and emphasizes policies and mechanisms for building secure and trusted computer systems. It will cover cybersecurity principles, policies and mechanisms; core knowledge areas of data, software, component, connection, system, human, organizational and societal security; and crosscutting concepts of confidentiality, integrity, availability, risk, adversarial thinking, and systems thinking. Topics in privacy, and legal and ethical aspects will also be emphasized. The course also explores the current research in cybersecurity. Presentations, reports and projects are required.
CSCI-605 and (CSCI-660 or CSCI-661) with B or better in all courses or CSEC-600 and CSEC-604 with B or better in both courses or CSCI-250 and (CSCI-262 or CSCI-263). Students may not take and receive credit for both CSCI-455 and CSCI-655.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-661 Foundations of Computer Science Theory (3 Credits)
This course provides an introduction to the theory of computation, including formal languages, grammars, automata theory, computability, and complexity. This course serves as a bridge course for graduate students and cannot be taken by undergraduate students without permission from the CS Undergraduate Program Coordinator. Note: Students who complete CSCI 262 or CSCI 263 may not take CSCI 661 for credit.
This course is restricted to students in COMPSCI-MS.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-662 Foundations of Cryptography (3 Credits)
This course provides an introduction to cryptography, its mathematical foundations, and its relation to security. It covers classical cryptosystems, private-key cryptosystems (including DES and AES), hashing and public-key cryptosystems (including RSA). The course also provides an introduction to data integrity and authentication. Note: students who complete CSCI-462 may not take CSCI-662 for credit.
Prerequisites:(CSCI-603 and CSCI-605 and CSCI-661 with grades of B or better) or ((CSCI-243 or SWEN-262) and (CSCI-262 or CSCI-263)) or equiv courses. If earned credit for/or currently enrolled in CSCI-462 you will not be permitted to enroll in CSCI-662.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-664 Computational Complexity (3 Credits)
This course provides an introduction to computational complexity theory. It covers the P=NP problem, time and space complexity, randomization, approximability, and relativization.
Prerequisites: (CSCI-661 or CSCI-660 or CSCI-262 or CSCI-263) and (CSCI-665 or CSCI-261 or CSCI-264) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-665 Foundations of Algorithms (3 Credits)
This course provides an introduction to the design and analysis of algorithms. It covers a variety of classical algorithms and their complexity and will equip students with the intellectual tools to design, analyze, implement, and evaluate their own algorithms. Note: students who take CSCI-261 or CSCI-264 may not take CSCI-665 for credit.
Prerequisites: (CSCI-603 and CSCI-605 and CSCI-661 with grades of B or better) or ((CSCI-243 or SWEN-262) and (CSCI-262 or CSCI-263)) or equivalent courses. This course is restricted to COMPSCI-MS, COMPSCI-BS/MS, or COMPIS-PHD students.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

CSCI-686 Graduate Professional Seminar (3 Credits)
This course provides students with skills required to succeed as Computer Science professionals, balancing the divergent needs of computing technology, employee, employer, and societal needs. Topics covered include skills in professional communication; skills to determine and effectively address needs of diverse audiences; research skills such as the ability to perform a literature review, design and conduct studies; team participation and management skills; conflict management; and skills to handle legal, ethical and societal challenges faced by CS professionals.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

CSCI-687 Graduate Research Seminar (3 Credits)
This course provides students with the theoretical background and practical application of various research methods that can be used in computing and information sciences. The course provides an overview of the research process and literature review, and provides initial study in correlation and experimental research methods and design. Students will analyze several existing research studies and design and conduct studies.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

CSCI-699 Computer Science Graduate Co-op (0 Credits)
Students perform professional work related to Computer Science for which they are paid. Students work full time during the term for which they are registered. Students must complete a student co-op work report for each term for which they are registered; students are also evaluated each term by their employer. A satisfactory grade is given for co-op when both a completed student co-op work report and a completed, corresponding employer evaluation are received and when both documents are generally consistent. Co-op is an optional part of the MS in Computer Science degree. Graduate students are eligible to do a maximum of 364 days of co-op and students must register for co-op by the end of add/drop period for the appropriate term. See the CS graduate program coordinator or RIT's Office of Cooperative Education and Career Services for further details.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSCI-709 Topics in Computer Science (3 Credits)
This course examines current topics in Computer Science. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific seminar course in this area. Specific course instances will be identified as belonging to no cluster; hence, such courses will count only as general Computer Science electives.
Contact Hours: Lecture/Lab 3

CSCI-711 Global Illumination (3 Credits)
This course will investigate the theory of global illumination (GI) in computer image synthesis. Seminal computer graphics papers will be used to explore the various components of the GI pipeline and explain how the path of light in a virtual scene can be simulated and used to create photorealistic imagery. The course will emphasize the theory behind various GI rendering tools and libraries available for image synthesis. The student will put theory into practice via a set of programming assignments and a capstone project. Topics will include light and color, three-dimensional scene specification, camera models, surface materials and textures, GI rendering methods, procedural shading, tone reproduction, and advanced rendering techniques. Readings and summaries of Computer Graphics literature will be required.
Prerequisites: CSCI-610 or CSCI-510 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-712 Computer Animation: Algorithms and Techniques (3 Credits)
This course takes a look at computer animation from a programmer's perspective. It will investigate the theory, algorithms and techniques for describing and programming motion for virtual 3D worlds. Approaches that will be explored include keyframing systems; kinematics, motion of articulated figures, procedural and behavioral systems, and the use of motion capture data. This course is a programming-oriented course with major deliverables including the implementation of techniques presented in lecture as well as a final project concentrating on an area of a student's choice. Students enrolling in this course are expected to have proficiency in the use of at least one 3D API (e.g. OpenGL, DirectX, Java3D). Readings and summaries of Computer Graphics literature will be required. Offered every other year.
Prerequisites: CSCI-610 or CSCI-510 or 4005-762 or 4003-570 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-713 Applied Perception in Graphics and Visualization (3 Credits)
The goal of this course is to introduce students to the field of applied perception in graphics and visualization and demonstrate how it has contributed to the development of better display systems and computer graphics rendering techniques. The delivery of the course material will be done primarily through lectures with biweekly programming assignments based upon the techniques presented in class. Students will also be exposed to a wide range of technical papers and be expected to make classroom presentations on selected topics in the field of applied perception in graphics and visualization.
Prerequisites: CSCI-610 or CSCI-510 or 4005-762 or 4003-571 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-714 Scientific Visualization (3 Credits)
Visualizations of scientific data are helpful in order to understand complex, n-dimensional behavior of simulations. This course covers techniques that are needed to visualize n-dimensional data sets produced by real scientific simulations. Topics include: Visualization design, discrete visualization techniques, scalar and volume visualization techniques and perception of visualizations. Additionally topics such as distributed file systems, specialized file systems and distributed computing needed in order to create the visualizations will be covered. A team project and presentations are required. Course offered every other year.
Prerequisites: CSCI-610 or CSCI-510 or 4005-762 or 4003-572 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-715 Applications in Virtual Reality (3 Credits)
This course will investigate the application of virtual reality software and technology within a given domain. Working in sets of technical teams, students will collectively investigate and solve a large-scale visualization task within that problem domain. Focus of individual student teams may include (but is not limited to) distributed VR framework, viewing applications, interaction with VR devices / displays, and audio in virtual environments. Students will be required to read and summarize selected articles from VR literature, as well as papers specific to the problem domain being investigated, to assist in making design decisions. A report or survey of one aspect of using a virtual reality system within the given domain is also required. Students should have a strong programming background and a proficiency in a 3D API (OpenGL, DirectX, or Java3D). Students with expertise in distributed systems and an interest in Graphics or virtual reality are also encouraged to register. Offered every other year.
Prerequisites: CSCI-610 or CSCI-510 or 4005-762 or 4003-573 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

CSCI-716 Computational Geometry (3 Credits)
Computational Geometry is a subfield of algorithm theory that involves the design and analysis of efficient algorithms for problems involving geometric input and output. In this course the focus will be largely on problems in 2-dimensional space (lines, line segments, polygons, planes, polyhedral, curved objects, etc.) with occasional inclusion of higher dimensional problems. There are many fields of computer science that deal with solving problems of a geometric nature. These include computer graphics, computer vision and image processing, robotics, computer-aided design and manufacturing, computational fluid-dynamics, and geographic information systems, to name a few. One of the goals of this computational geometry course is to provide the basic geometric tools necessary to solve problems in these fields. Note: Programming projects are required.
Prerequisites: CSCI-261 or CSCI-264 or CSCI-665 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-719 Topics in Computer Graphics (3 Credits)
This course examines current topics in Computer Graphics. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. Specific course instances presented will be identified as belonging to the Computer Graphics and Visualization cluster.
Contact Hours: Lecture 3

CSCI-720 Big Data Analytics (3 Credits)
This course provides a graduate-level introduction to the concepts and techniques used in data mining. Topics include the knowledge discovery process; prototype development and building data mining models; current issues and application domains for data mining; and legal and ethical issues involved in collecting and mining data. Both algorithmic and application issues are emphasized to permit students to gain the knowledge needed to conduct research in data mining and apply data mining techniques in practical applications. Data mining projects, a term paper, and presentations are required.
Prerequisites: CSCI-620 or CSCI-420 or CSCI-420H or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSCI-721 Foundations of Data Cleaning and Preparation (3 Credits)
This course provides an introduction to the concepts and techniques used in preparing data for subsequent data mining. Topics include the knowledge discovery process; data exploration and its role; data extraction, cleaning, integration and transformation; handling numeric, unstructured, text, web, and other forms of data; and ethical issues underlying data preparation and mining. Data cleaning projects, a term paper, and presentations are required. Note: Students who take this course may not take CSCI-521 for credit.
Prerequisites: CSCI-620 or CSCI-420 or CSCI-420H or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-722 Data Analytics Cognitive Comp (3 Credits)
Building on prior knowledge of data analytics, this course brings in the impact of natural language processing and cognitive computing on data analysis. Topics include an overview of natural language processing; data mining, information retrieval and knowledge processing; corpus identification and preparation; training and test data and methods; current research in the field; and ethical concerns. Students will apply the concepts learned in class through team projects, programming assignments, presentations, and a research paper.
Prerequisites: CSCI-620 or CSCI-420 or CSCI-420H or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-723 Advanced Database Skills: Graph Databases (3 Credits)
This course starts with an introduction to advanced topics in relational databases, including their implementation and advanced SQL queries. Discussions about benefits and drawbacks of relational databases will arise, which will be the foundation for introducing new types of NoSQL databases; that is, column, key-value, and graph databases. This course will then focus on the rationale, implementation, and storing and querying capabilities of graph databases. Assignments of various kinds will be used to assess individual performance of students. Additionally, the course requires a team-based project in which students will analyze and implement state-of-the-art approaches over graph databases. Teams will present the results of their projects in class.
Prerequisites: CSCI-320 or CSCI-620 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-724 Web Services and Service Oriented Computing (3 Credits)
This course introduces fundamental concepts of Web services and the Service-Oriented Computing (SOC) paradigm, and reviews seminal work, current research, and modern practices in these areas. Topics in Web Services include XML; reference model (WSDL, UDDI, SOAP); service coordination and composition; and service security and privacy. Big data analytics in SOC will also be covered, such as large scale service data retrieval and storage, service clustering and classification, service recommendation, and service discovery. Students will apply the concepts learned in the class through programming assignments and a comprehensive term project.
Prerequisites: CSCI-620 or CSCI-420 or CSCI-420H or CSCI-652 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-725 Advanced Database Skills: NoSQL and NewSQL Data Systems (3 Credits)
This course examines how database systems evolved to meet the workloads of modern applications. Limitations of relational databases led to NoSQL systems that are highly scalable and provide flexible data modeling but sacrifice important consistency properties. More recently, “NewSQL” data systems seek to understand and address fundamental scalability bottlenecks while maintaining relational database consistency. This course will describe shortcomings of relational databases for certain data management tasks and the specific challenges addressed by NoSQL and NewSQL database systems. Case studies will investigate both established and state-of-the-art systems. Students will critique and present existing work in the area and complete a research project individually or in teams that explores an outstanding problem in the area.
Prerequisites: CSCI-320 or CSCI-620 or (DSCI-633 and ISTE-608) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-729 Topics in Data Science for Computer Scientists (3 Credits)
This course examines current topics in Data Science. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. Specific course instances will be identified as belonging to the Data Science cluster, the Security cluster, or both.
Contact Hours: Seminar 3
Typically Offered: Fall, Spring

CSCI-731 Advanced Computer Vision (3 Credits)
This course examines advanced topics in computer vision including motion analysis, video processing and model based object recognition. The topics will be studied with reference to specific applications, for example video interpretation, robot control, road traffic monitoring, and industrial inspection. A research paper, an advanced programming project, and a presentation will be required.
Prerequisites: CSCI-631 or CSCI-431 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-732 Image Understanding (3 Credits)
This course explores the theory and methodologies used to interpret images in terms of semantic content. Techniques from image processing and pattern recognition are extended for the purpose of scene understanding using both a bottom-up and a top-down approach. Topics include human visual perception, knowledge representation, object recognition, contextual classification, scene labeling, constraint propagation, interpretation trees, semantic image segmentation, 3D models and matching, active vision, and reasoning about images. Programming projects are required. Offered every other year.
Prerequisites: CSCI-631 or CSCI-431 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-734 Foundations of Security Measurement and Evaluation (3 Credits)
The course will introduce students into the algorithmic foundations and modern methods used for security evaluation. It will combine a theoretical revision of the methods and models currently applied for computer security evaluation and an investigation of computer security through study of user's practice. The students will be required to complete a few home assignments, to deliver a class presentation, to implement a team project, to lead the team's work and to undertake research on the topic assigned.
Prerequisites: CSCI-651 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CSCI-735 Foundations of Intelligent Security Systems (3 Credits)
The course will introduce students to the application of intelligent methodologies applications in computer security and information assurance system design. It will review different application areas such as intrusion detection and monitoring systems, access control and biological authentication, firewall structure and design. The students will be required to implement a course project on design of a particular security tool with an application of an artificial intelligence methodology and to undertake research and analysis of artificial intelligence applications in computer security.
Prerequisites: CSCI-630 or CSCI-651 or CSCI-331 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

CSCI-736 Neural Networks and Machine Learning (3 Credits)
The course will introduce students into the current state of artificial neural networks. It will review different application areas such as intrusion detection and monitoring systems, pattern recognition, access control and biological authentication, and their design. The students will be required to conduct research and analysis of existing applications and tools as well as to implement a course programming project on design of a specified application based on neural networks and/or fuzzy rules systems.
Prerequisites: CSCI-630 or CSCI-331 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

CSCI-739 Topics in Artificial Intelligence for Computer Scientists (3 Credits)
This course examines current topics in Artificial Intelligence. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. Specific course instances will be identified as belonging to the Artificial Intelligence cluster, the Computer Graphics and Visualization cluster, the Security cluster, or some combination of these three clusters.
Contact Hours: Seminar 3
Typically Offered: Fall

CSCI-740 Programming Language Theory (3 Credits)
This course is an introduction to the formal study of programming languages, demonstrating important intellectual tools for the precise description of programming languages and investigating the essential features of programming languages using these tools. Topics include: dynamic semantics (such as operational semantics); static semantics (such as type systems); proofs by induction on structures and derivations; formal treatment of essential programming-language features (such as assignment, scope, functions, objects, and threads). Both written and programming assignments will be required.
Prerequisites: (CSCI-603 and CSCI-605 and CSCI-661) with grades of B or better or ((CSCI-262 or CSCI-263) and CSCI-344) or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

CSCI-742 Compiler Construction (3 Credits)
This course discusses design and implementation of language processors and translators. Topics include lexical, syntactic, and semantic descriptions, algorithms for analysis tools, and programming techniques, as well as interpreters and code generation for typical computer architectures. Teams of students will be required to design and implement a programming language with nested block structure and data aggregates.
Prerequisites: (CSCI-603 and CSCI-605 and CSCI-661) with grades of B or better or ((CSCI-262 or CSCI-263) and CSCI-344) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-746 Software Development Tools (3 Credits)
This course investigates and evaluates various software tools used in the development of software. Topics include simple dependency-based tools such as make and ant as well as full-featured integrated development environments. Working with and proposing modeling languages for such tools is an important part of the course. Programming projects will be required.
Prerequisites: (CSCI-603 and CSCI-605 and CSCI-661) with grades of B or better or ((CSCI-262 or CSCI-263) and CSCI-344) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-749 Topics in Languages and Tools (3 Credits)
This course examines current topics in Languages and Tools. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. Specific course instances will be identified as belonging to the Languages and Tools cluster, the Security cluster, or both clusters.
Contact Hours: Lecture 3

CSCI-750 Fundamentals of Cloud Computing (3 Credits)
This course examines the fundamental building blocks and current practices of cloud computing. It explores distributed computing models and technologies, Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), Software-as-a-Service (SaaS), virtualization and containerization, software-defined environments (SDE), microservices-enabled architecture, cloud-class storage systems, big data processing frameworks, federated clouds, cloud-hosted applications, security and privacy, legal and ethical considerations, and other advanced and research topics in cloud computing. Case studies will investigate both established and state-of-the-art systems. Students will critique and present existing work and develop a deeper understanding and limitations of the state-of-the-art cloud systems. They will also propose and complete a research project individually or in teams, and write a conference/journal quality paper.
Prerequisites: CSCI-351 or CSCI-652 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

CSCI-759 Topics in Systems (3 Credits)
This course examines current topics in Systems. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. Specific course instances will be identified as belonging to the Distributed Systems cluster, the Architecture and Operating Systems cluster, the Security cluster, or some combination of these three clusters.
Contact Hours: Lecture 3

CSCI-761 Topics in Advanced Algorithms (3 Credits)
This course focuses on advanced algorithms and data structures in a specialized area of computer science or in a specific scientific domain. Both practical and theoretical aspects of algorithms will be explored to provide coverage of the state of the art and shortcomings of computing in the specialized area. This includes proofs of correctness and complexity analysis of the algorithms. Students will write a term paper that explores the current state of research in the area or reports on the student's implementation and experiments with algorithms for a chosen problem. Students will also be required to make presentations. The instructor will post the specifics of each course offering before the registration. With the approval of the program coordinator, this course can be taken for credit more than once, provided each instance concerns a different specialized area or domain.
Prerequisites: CSCI-261 or CSCI-264 or CSCI-665 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-762 Advanced Cryptography (3 Credits)
This course investigates advanced topics in cryptography. It begins with an overview of necessary background in algebra and number theory, private- and public-key cryptosystems, and basic signature schemes. The course will cover number theory and basic theory of Galois fields used in cryptography; history of primality algorithms and the polynomial-time test of primality; discrete logarithm based cryptosystems including those based on elliptic curves; interactive protocols including the role of zero-knowledge proofs in authentication; construction of untraceable electronic cash on the net; and quantum cryptography, and one or more of digital watermarking, fingerprinting and stenography. Programming will be required.
Prerequisites: CSCI-662 or CSCI-462 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-764 Quantum-Resistant Cryptography (3 Credits)
Quantum-Resistant Cryptography (QRC) refers to cryptographic systems that are secure against attacks from both quantum and classical computers. Such systems may be achieved through classical (i.e. non-quantum) means. The security of many commonly used cryptographic protocols (especially Public Key cryptosystems and Digital Signatures) would be compromised if general-purpose, large-scale, fault-tolerant quantum computers became a reality. This course covers the consequences of Quantum Computing and why it poses a threat to currently used cryptographic systems, and then discusses cryptosystems designed to be resistant to such attacks. Students will describe and utilize the designs recommended by NIST for Quantum-Resistant encryption algorithms and explain their security advantages over classical cryptosystems.
Prerequisites: CSCI-462 or CSCI-662 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSCI-769 Topics in Theory (3 Credits)
This course examines current topics in Theory. This is intended to allow faculty to pilot potential new graduate offerings. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area. Specific course instances will be identified as belonging to the Theory cluster, the Security cluster, or both clusters.
Contact Hours: Seminar 3

CSCI-787 Master's Thesis Proposal and Preparation (3 Credits)
Students work with a supervising faculty member to complete their MS thesis proposal, and do additional background preparation (e.g., programming, study, exercises, and analysis) for the subject area and specific problem(s) to be addressed in their thesis. By the end of the semester, a thesis proposal must be submitted and approved by the student's advisor and thesis committee. Additional deliverables as set by the advisor are also required (e.g., source code, bibliographies, notes, presentations, etc.).
Contact Hours: Independent Study 1
Typically Offered: Fall, Spring, Summer

CSCI-788 Computer Science MS Project (3 Credits)
Project capstone of the master's degree program. Students select from a set of possible projects and confirm that they have a project adviser. Students enroll in a required colloquium component that meets weekly, during which they present information, related to their projects. Projects culminate with delivery of a final report and participation in a poster session open to the public.
Restricted to students in COMPSCI-MS and COMPSCI-BS/MS programs.
Contact Hours: Colloquium 3, Project 3
Typically Offered: Fall, Spring, Summer

CSCI-790 Computer Science MS Thesis (6 Credits)
Thesis capstone of the master's degree program. Student must submit an acceptable thesis proposal in order to enroll. It is expected that the work would lead to a paper of the caliber of those generally acceptable to a national conference.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSCI-799 Computer Science Graduate Independent Study (1-3 Credits)
Students work with a supervising faculty member on topics of mutual interest. A student works with a potential faculty sponsor to draft a proposal that describes what a student plans to do, what deliverables are expected, how the student's work will be evaluated, and how much credit will be assigned for successful completion of the work. The faculty sponsor proposes the grade, but before the grade is officially recorded, the student must submit a final report that summarizes what was actually accomplished.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSCI-888 CS Graduate Summer Co-op (0 Credits)
Students perform professional work related to Computer Science for which they are paid. Students must complete a student co-op work report for each term for which they are registered; students are also evaluated each term by their employer. A satisfactory grade is given for co-op when both a completed student co-op work report and a completed, corresponding employer evaluation are received and when both documents are generally consistent. When registered for co-op, students are considered by RIT to have full-time status. In order to register for co-op for summer term, we expect that students will work a minimum of 10 weeks and work a minimum of 35 hours per week. Note: Co-op is an optional part of the MS in Computer Science degree.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Summer

CSCI-909 Proposal Development (0 Credits)
MS Students who are preparing for their capstone experience.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Computing & Info Sciences-PhD (CISC)

CISC-807 Teaching Skills Workshop (2 Credits)
Teaching is a valuable and desirable skill for PhD students. This workshop course provides an introduction to the concepts and skills needed for quality teaching in higher education. Students will be provided with lecture, reading, and class activities centered on building skills in educational analysis, design, and assessment. Prerequisites: Limited to students in the Ph.D. program. Class 2, Credit 2 (F)
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 2
Typically Offered: Spring

CISC-810 Research Foundations (3 Credits)
This course provides students with the theoretical background and practical experience with a variety of research techniques and methods. The course provides an overview of the research process along with opportunities for hands-on projects. Major topics for the course include: formulating research questions, conducting literature reviews, selecting appropriate methodologies, data sampling, analyzing statistics, qualitative techniques, technical writing research papers, and presentation skills. (Knowledge in probability and statistics, or permission of instructor)
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Fall

CISC-820 Quantitative Foundations (3 Credits)
This course provides an introduction in the fundamentals of working with quantitative information. Topics include matrix algebra (matrices, vectors, direct and indirect methods for solving linear systems, eigenvectors, singular value decomposition, least-squares systems) optimization (convex analysis, gradient descent, Newton's method, interior-point methods), statistics (random variables, p-values, hypothesis testing, confidence intervals) and data exploration (clustering, dimensionality reduction, curve fitting). Note: Knowledge in probability and statistics calculus, and computer programming or permission of instructor is required.
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Fall

CISC-830 Cyberinfrastructure Foundations (3 Credits)
Cyberinfrastructure integrates all parts of large-scale computing including a set of software, services, and tools in order to solve large-scale computing problems. This course will give an overview of the problems and solutions of large-scale computing, e.g., Large Hydron Collider. Students will design and develop new tools for cyberinfrastructure. Presentations and written reports are required. Note: Knowledge in data structure and object-oriented design, or permission of instructor is required.
This class is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Spring

CISC-835 Connectivity (3 Credits)
This course studies commonalities underlying a variety of networks including social networks, communication networks, biological networks, the Web, and even an abstract model of networks like graphs. Topics include basic graph theory, graph algorithms, fundamental and emerging concepts in networking, and the analytical and heuristic tools that people use to develop and analyze connectivity in networks. Computing and programming exercises will be required to provide hands-on experience with selected tools and technologies. Note: CSCI-651 or equivalent knowledge in concepts and principles of computer networks, or permission of instructor is required.
Prerequisites: CSCI-651 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CISC-849 PhD Seminar (3 Credits)
Current advances in computing and information sciences.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CISC-860 Optimization Methods (3 Credits)
In this course, the basic knowledge and skills of optimization will be introduced. Students will learn how to recognize, formulate, and solve linear and nonlinear optimization problems. The concentration will be focused on the algorithms and applications, with the necessary theories presented in a comprehensive way. The characteristics of linear and nonlinear programming problems will be discussed with the corresponding solutions, such as the simplex method and Karmarkar's method for linear optimization, and Newton's method and Powell's method for nonlinear optimization. Students are required to complete a project on a given problem, or a problem of their own choices but approved by the course instructor, to gain practical experience. Note: Knowledge in linear algebra and calculus, experiences in computer programming/MATLAB, or permission of instructor is required.
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Fall

CISC-861 Numerical Methods (3 Credits)
This course introduces the knowledge and skills of numerical methods. Numerical methods are the bases of computational analysis to approximate complicated formulations whose analytical solutions are unavailable or infeasible. Numerical methods provide computational algorithms to solve mathematical problems, for example, integration, differentiation, and large systems of linear or nonlinear equations. The course is focused on the algorithms and applications, presented with the rationales, benefits, and limitations so that students can choose the appropriate methods with the highest computational efficiency, stability, and accuracy based on the characteristics of the problems. Students are required to complete a project on a given problem, or a problem of their own choice but approved by the course instructor, to gain practical experience. Note: Knowledge in linear algebra and calculus, experiences in computer programming/MATLAB, or permission of instructor is required.
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Spring

CISC-862 Computational Modeling and Simulation (3 Credits)
Everyone uses modeling and simulation even without being aware of it. This course talks about mathematical and computational modeling and simulation as the tools to solve complex problems in the real world. Topics are divided by the category of modeling method: phenomenological models vs. mechanistic models. For mechanistic models, the course will cover differential equations (including variational principle to construct the differential equations, solutions to ordinary differential equations (ODE), and classical ODE systems) and cellular automaton in detail, and mention other mechanistic models. Similarly, for phenomenological models, the course will cover regression and neural networks in detail, and introduce other phenomenological models such as networks and power-law distributions. In parallel, paper review and discussion will serve as case studies of modeling of real-world complex systems, illustrating application domains. Course projects are required. Note: Knowledge in probability and statistics, linear algebra and calculus, experiences in computer programming/MATLAB, or permission of instructor is required.
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Spring

CISC-863 Statistical Machine Learning (3 Credits)
This course will cover the theory and practice of statistical machine learning, focusing on computational methods for supervised and unsupervised data analysis. Specific topics include Bayesian, maximizing a posteriori (MAP), and maximum likelihood (ML) parameter estimation, regularization and sparsity-promoting priors, kernel methods, adaptive basis function methods, the expectation maximization algorithm, Monte Carlo methods, variational methods, and models for data with temporal or hierarchical structure. Applications to regression, categorization, clustering, and dimensionality reduction problems are illustrated by examples. Each student will complete several problem sets, including both mathematical and computer implementation problems. Probability and Statistics I, Linear Algebra, and Introduction to Computer Programming. Familiarity with a numerical mathematics package (e.g. Matlab, Maple, Mathematica) is helpful but not required.
This course is restricted to students with graduate standing in GCCIS, KGCOE, or COS.
Contact Hours: Lecture 3
Typically Offered: Spring

CISC-864 Medical Imaging and Image Informatics: Principles and Algorithms (3 Credits)
Tomographic medical images, along with computer-aided image processing and understanding methods, have been widely utilized in clinical practice for health evaluation and disease detection. This course focuses on the principles of medical imaging technology, i.e. physiological origins, data acquisition and image formation, as well as algorithmic strategies for quantitative understanding of various medical images. It provides students with a general physics-signal-system understanding of the medical imaging modalities. The course also addresses the clinical needs, the technical problems, and the rationales and strategies of quantitative image analysis. Current and potential clinical applications will be used as illustrations throughout the course. The course also strives to demonstrate the general process of conducting applied research, from problem finding through scientific analysis, solution proposal, implementation, experimentation and evaluation. Note: Knowledge in probability and statistics, linear algebra, calculus, and image processing/computer vision, experiences in computer programming or MAT/LAB, or permission of instructor is required.
This course is restricted to students in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Spring

CISC-865 Deep Learning (3 Credits)
Deep learning represents a set of emerging techniques in machine learning that has quickly become prevalent in the analysis of big data. The power and potential of this recent breakthrough in intelligent computer systems has been demonstrated through many successes. Deep learning systems are the current best performer in computer vision and speech processing. A wide variety of active researches are being conducted to leverage the capability of deep learning for achieving automation in areas such as autonomous driving, robotics, and automated medical diagnosis. There is a crucial need to educate our students on such new tools. This course gives an in-depth coverage of the advanced theories and methods in deep learning including basic feedforward neural networks, convolutional neural networks, recurrent neural networks including long short-term memory models, deep belief nets, and autoencoders. It will make an emphasis on approaches with practical relevance, and discusses a number of recent applications of deep networks applications in computer vision, natural language processing and reinforcement learning.
Prerequisites: CISC-863 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CISC-866 Deep Learning for Visual Analytics (3 Credits)
Deep learning is an area of machine learning that has enabled enormous progress on long-standing problems in visual analytics and machine perception. This course will start with a graduate-level introduction to deep learning, and review neural networks and related theory in machine learning that is needed to understand how deep learning algorithms work. After gaining the prerequisite background knowledge, the class will review the latest deep learning algorithms for computer vision and machine perception. Students will read and present recent papers on visual analytics topics, including eye tracking, image classification, video understanding, model explanation, etc. The course will make an emphasis on approaches with practical relevance, and prepare students to use state-of-the-art deep learning algorithms for processing and understanding highly structured data such as images, videos, and time-series. Students are expected to have programming experience and to be comfortable with probability, linear algebra and calculus. No prior background in machine learning or pattern recognition is required.
Prerequisites: CSCI-631 or equivalent course and graduate standing in the COMPIS-PHD program.
Contact Hours: Lecture 3
Typically Offered: Fall

CISC-890 Dissertation and Research (1-32 Credits)
Students will perform use-inspired original research in the interaction, informatics, and infrastructure areas of computing and information sciences applied to specific domain(s). Students will receive guidance from their advisor(s) in choosing an appropriate topic and activity. Note: Permission of the Ph.D. Director is required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CISC-896 Colloquium in Computing and Information Sciences (0 Credits)
This course develops the student's knowledge and understanding of various contemporary research issues, especially in the interdisciplinary areas of computing and information sciences. The student will get involved by attending a number of research presentations and discussions. The choice of topics considered may vary and will be determined by the instructor.
This course is restricted to students in the COMPIS-PHD program.
Typically Offered: Fall, Spring

CISC-897 PHD Research Co-op (0 Credits)
This course provides an opportunity for PhD students to complete a formal internship in a business, industry, government, educational, or research setting. The internship provides students with the opportunity to gain familiarity with practical research problems and methods. Students gain experience working in collaborative research teams with a variety of researchers, focusing on problems of multiple scales, using techniques that go beyond those available at RIT. Note: Completion of Research Potential Assessment and adviser approval; permission of the Ph.D. Director are required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CISC-898 Continuation of Dissertation and Research (0 Credits)
Students will continue their use-inspired original research in the interaction, informatics, and infrastructure areas of computing and information sciences applied to specific domain(s). Students will receive guidance from their advisor(s) on research directions and activities. Note: Successful completion of Dissertation Proposal Defense and adviser approval; permission of the PhD Director is required.
Typically Offered: Fall, Spring, Summer

CISC-899 Independent Study (1-6 Credits)
PhD students will work with supervising faculty on a project or research study of mutual interest. The design and evaluation will be determined through discussion with the supervising faculty and documented through completion of an independent study form. The independent study must be approved by the PhD Director. Note: Permission of the instructor and PhD Director is required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Computing Intra-College Studies (CINT)

CINT-628 Introduction to Applied Informatics (3 Credits)
Informatics is about systems that store, process, analyze, and communicate information. Information begins as data – and of particular interest today is the large data sets that are evolving in many fields. Data sets are acted upon by tools can be applied to a variety of problems across many fields. This course provides an overview of issues within informatics, and common solutions. Through hands-on examples, the course demonstrates a general problem-solving approach from problem identification, algorithm selection, data cleaning, and analysis.
Contact Hours: Lecture 1
Typically Offered: Spring, Summer

CINT-634 Infrastructure Systems (3 Credits)
This course will explain the underlying processes that surround networked systems. Students will learn the basics of computer connectivity, from low level devices through server farms and cloud computing. Virtualization is explained with attention toward practical applications and hands on experience. Students will be able to describe the functions of key hardware and software components within infrastructure systems.
Contact Hours: Lecture 1
Typically Offered: Fall

Computing Security (CSEC)

CSEC-600 Introduction to Computing Security (3 Credits)
This is a graduate level introduction to the field of computing security. An extensive overview of various branches of computing security areas will be presented including concepts, issues, and tools that are critical in solving problems in computing security domain. Students will have opportunities to learn essential techniques in protecting systems and network infrastructures, analyzing and monitoring potential threats and attacks, devising and implementing security solutions for organizations large or small.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

CSEC-601 Research Methods and Proposal Development (3 Credits)
Students in the graduate program not only learn skills, they also learn how to learn, including how to do research. This course covers the process of research: how to survey an area, how to formulate a research question, how to design a study and develop a well-supported solution, and finally, how to communicate, by writing a paper or proposal or by giving a formal talk. The course includes writing, presentations, and also basic statistics (design of experiments). Students are then exposed to problems in the field of computing security, in the form of invited talks from faculty; they are expected to explore the area, specify a problem, and develop a proposal for their Masters' project or Masters' thesis. The final deliverable of the course is a formal proposal with a timeline, signed by a faculty member who is willing to serve as the student's advisor.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-603 Enterprise Security (3 Credits)
This course is designed to provide students with the advanced concepts needed to establish network security strategies to ensure adequate protection for the corporate environment and yet provide accessibility for the corporate community.
This course is restricted to students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-604 Cryptography and Authentication (3 Credits)
In this course, students will gain in depth knowledge of cryptography and authentication. Students will explore various cryptographic algorithms and authentication protocols, focusing on their design and implementation. Students will also work on a research or implementation project, based on cryptographic algorithms and/or authentication protocols. The applications of cryptography and authentication in the areas of computer networks and systems will also be investigated. This course requires prior knowledge in Discrete Mathematics.
Prerequisites: (MATH-190 and BS/MS students in Computing Security) or students matriculated in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-620 Cyber Analytics and Machine Learning (3 Credits)
The course provides students an opportunity to explore methods and applications in cyber analytics with advanced machine learning algorithms including deep learning. Students will learn how to use machine learning methods to solve cybersecurity problems such as network security, anomaly detection, malware analysis, etc. Students will also learn basic concepts and algorithms in machine learning such as clustering, neural networks, adversarial machine learning, etc. A key component of the course will be an independent exploratory project to solve a security program with machine learning algorithms. Students taking this course should have knowledge in Discrete Math, Probability and Statistics, and Linear Algebra. Students should also be able to program in Python.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-622 Side Channel Analysis (3 Credits)
Side-channel analysis (SCA) is an offensive security technique that targets not the formal description of a security-critical system, but the implementation of it. Examples of side channels include—but are not limited to—latency measurements, power consumption, electro-magnetic radiation, and acoustic emanations. This is a young but very active field within applied computer security. Modern processors are equipped with numerous features to improve the average performance of software, including—but not limited to—low-latency execution pipelines, various caches, prediction, speculative execution, and multi-layered parallelism. These mechanisms can often be used as side channels to attack implementations of security-critical systems by using leakage to recover critical data or state that should remain secret. This course provides an overview of these modern SCA concepts, explains how to establish and construct these channels, demonstrates how to apply SCA techniques, and furthermore basic methods to prevent them. Students will also be exposed to current literature covering research in side-channel analysis. Students will program in C and need a strong understanding of the design of modern computer architectures.
Prerequisites: (CSEC-201 or CSEC-742) and (CSCI-462 or CSEC-362 or CSEC-604) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-630 Trusted Computing and Trusted Execution (3 Credits)
This course covers some of the foundational technologies for establishing trust in modern computing systems, including classic methods (e.g., boot chain-of-trust, secure boot, exception/privilege levels, and Trusted Platform Modules - TPMs) and more recent trusted computing architectures such as ARM TrustZone and Intel Secure Guard eXtensions (SGX), which are increasingly popular and widely adopted in both academic research and industry. The latter part of the course will touch upon more advanced and research-oriented aspects in the intersection of trusted computing and various realms of Computing Security & Privacy. A key component of the course will be an exploratory research project aiming to use trusted computing technologies to address a security/privacy problem. To be successful in this course students should be knowledgeable in applied cryptography and basic security technologies.
Prerequisite: CSEC-604 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-635 Open Source Software Security (3 Credits)
The Free and Open-Source Software (FOSS) movement promotes the principles of software freedom, collaboration, and innovation, allowing users to access, modify, and share software without restrictions. FOSS is good for software security because it promotes transparency, allowing anyone to review the source code for vulnerabilities and ensuring that security flaws are more likely to be discovered and fixed quickly: "given enough eyeballs, all bugs are shallow" –Eric S. Raymond (Linus's law) In this course, we use OpenSSL—one of the most security-critical FOSS projects of our time—as a case study on the evolution of an FOSS project in response to vulnerabilities reported by security researchers. We study, discuss, and present their discovery, potential exploitation, mitigation, and disclosure. We also learn how to effectively contribute to FOSS projects and we will explore vulnerability lifecycles of past open source software vulnerabilities.
Prerequisites: (CSEC-201 or CSEC-742) and (CSCI-462 or CSEC-362 or CSEC-604) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-659 Seminar in Computing Security (3 Credits)
This course offers an opportunity to learn about a specific seminar topic in more depth. The course description will be replaced by the specific instance of the seminar, as it is proposed by faculty.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CSEC-669 Wireless Security (3 Credits)
This course aims to equip students with an understanding of wireless communication concepts and wireless networks principles towards a comprehensive exploration of their vulnerabilities and security protocols. Students will also gain practical experience through a series of lab activities on wireless system administration and attack/defense techniques, along with a project typically involving software-defined radios and a literature review to explore analyzing and/or securing modern wireless networks. The course begins with a primer on wireless security concepts from a physical-layer perspective. It then covers and discusses various generations of security protocols for IEEE 802.11 (Wi-Fi) systems, security of cellular networks, security of wireless protocols for Internet-of-Things (IoT), and other selected trending topics such as machine learning in wireless security, connected vehicles security, and quantum-resistant protocols.
Prerequisites: (CSEC-600 and (CSCI-462 or CSEC-604 or CSCI-662)) or CMPE-670 or equivalent courses.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Summer

CSEC-677 Disaster Recovery Planning and Business Continuity (3 Credits)
Cybersecurity professionals are increasingly being called upon to apply their knowledge to the development of disaster recovery and business continuity plans. This course will explore disaster recovery planning and business continuity in depth using current tools and techniques. Business requirements will be analyzed from the budget, business needs and risk management perspective. Students will examine the principles and best practices for developing and implementing effective disaster recovery plans using emerging technologies to ensure organizational resilience in the face of natural and man-made disasters.
Prerequisites: CSEC-600 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-699 Graduate Co-op (0 Credits)
Students perform professional work related to the field of computing security for which they are paid. Students work full-time during the term for which they are registered. Students must complete a student co-op work report for each term for which they are registered; students are also evaluated each term by their employer. A satisfactory grade is given for co-op when both the student's work report and the employer evaluation have been completed. Co-op is an optional part of the MS in Computing Security degree.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSEC-720 Deep Learning Security (3 Credits)
This course covers the intersection of cybersecurity and deep learning technologies such as CNNs, LSTMs, GANs, and Transformers. Topics include the application of deep learning to traffic analysis, deepfake detection, malware classification, and fooling deep learning classifiers with adversarial examples. Students will present research papers, perform several exercises to apply attack and defense techniques, and complete a final research project. Prior experience with machine learning concepts and implementation is required, but necessary details on deep learning will be covered.
Prerequisites: CSEC-620 or CSCI-630 or CSCI-631 or CSCI-635 or CMPE-677 or IDAI-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-730 Advanced Computer Forensics (3 Credits)
This course provides students with the latest techniques and methods needed for extracting, preserving and analyzing volatile and nonvolatile information from digital devices. Students will gain exposure to the spectrum of available computer forensics tools along with developing their own tools for “special need” situations. The core forensics procedures necessary for ensuring the admissibility of evidence in court, as well as the legal and ethical implications of the process, will be covered on both Unix and Windows platforms, under multiple file systems. Therefore, students must possess a knowledge of available filesystems on both platforms.
Prerequisites: CSEC-600 or NSSA-221 or equivalent course. This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-731 Web Server and Application Security Audits (3 Credits)
This course discusses the processes and procedures to perform a technical security audit of web servers and web based applications. Students will not only explore Web Servers and Applications/Services threats, but also apply the latest auditing techniques to identify vulnerabilities existing in or stemming from web servers and applications. Students will write and present their findings and recommendations in audit reports on web servers and application vulnerabilities. To be successful in this course students should be knowledgeable in a scripting language and comfortable with the administration of both Linux and Windows platforms.
Prerequisites: CSEC-600 or equivalent course. This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-732 Mobile Device Forensics (3 Credits)
Techniques and limitations related to the seizure and interrogation of a variety of digital devices will be explored. Various mobile phone and tablet platforms will be interrogated with the intent of gaining better access and understanding of the organization of data in the devices. The infusion of digital storage and identification devices such as MP3 players, RFID and tokens into our everyday lives requires the study of their weaknesses and forensic exploit-ability. As personal information is frequently gathered and stored on these devices, the loss of a device could adversely affect individuals and organizations. The examination, collection, and removal of such information will be studied. To be successful in this course students should be knowledgeable in basic networking, systems, and security technologies.
Prerequisites: This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-733 Information Security Risk Management (3 Credits)
This course will provide students with an introduction to the principle of risk management and its three key elements: risk analysis, risk assessment and vulnerability assessment. Students will also learn the differences between quantitative and qualitative risk assessment, and details of how security metrics can be modeled/monitored/controlled and how various types of qualitative risk assessment can be applied to the overall assessment process. Several industry case studies will be studied and discussed. Students will work together in teams to conduct risk assessments based on selected case studies or hypothetical scenarios. Finally, they will write and present their risk assessment reports and findings.
Prerequisites: This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-741 Internet of Things Security (3 Credits)
As the world becomes more and more connected as ever before via various kinds of devices and systems on the Internet, called the Internet of Things (IoT), the associated security and privacy-related issues also become increasingly challenging. This course is designed for students who wish to advance their knowledge in the Internet of Things security. It provides students opportunities to explore security and privacy-related issues manifested by various kinds of IoT devices and systems such as sensors, sensor networks, SCADA systems, vehicular systems, consumer IoT devices, etc.
Prerequisites: CSEC-600 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-742 Computer System Security (3 Credits)
The importance of effective security policies and procedures coupled with experience and practice is emphasized and reinforced through research and practical assignments. Organization and management of security discipline and response to threats is studied. Case studies of effective and failed security planning and implementation will be examined and analyzed. The issues influencing proper and appropriate planning for security and response to attacks will be studied. To be successful in this course students should be knowledgeable in networking, systems, and security technologies.
Prerequisites: CSEC-600 or equivalent course. This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Fall

CSEC-743 Computer Viruses and Malicious Software (3 Credits)
Computer malware is a computer program with malicious intent. In this course, students will study the history of computer malware, categorizations of malware such as computer viruses, worms, Trojan horses, spyware, etc. Other topics include, but are not limited to, basic structures and functions of malware, malware delivery mechanism, propagation models, anti-malware software, its methods and applications, reverse engineering techniques. Students will conduct research to understand the current state of the computer malware defense and offense.
Prerequisites: CSEC-600 or equivalent course. This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Summer

CSEC-744 Network Security (3 Credits)
Students will examine the areas of intrusion detection, evidence collection, network auditing, network security policy design and implementation as well as preparation for and defense against attacks. The issues and facilities available to both the intruder and data network administrator will be examined and evaluated with appropriate laboratory exercises to illustrate their effect. The students will be provided with an understanding of the principles and concepts of wired and wireless data network security. Students will perform a series of laboratory or homework experiments in order to explore various mechanisms for securing data networks including physical layer mechanisms, filters, applications and encryption. Students will engage in attack/defend scenarios to test their deployments against other teams. Students should be knowledgeable in networking technologies.
Prerequisites: CSEC-600 or equivalent course. This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-750 Covert Communications (3 Credits)
Students will be introduced to the history, theory, methodology and implementation of various kinds of covert communications. Students will explore future techniques and uses of covert communications. More specifically students will explore possible uses of covert communications in the management of botnets. To be successful in this course students should be knowledgeable in networking, systems, and security technologies.
Prerequisites: This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-751 Information Security Policy and Law (3 Credits)
This course explores Information Security Policy development and deployment as well as laws (US and International) that impact information security. Students in this class will develop policies and analyze how policy impacts an organization. Students will also determine how federal, state, and international laws impact the information security policies of an organization.
Prerequisites: This course is restricted to BS/MS students in Computing Security and students in the COMPSEC-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-759 Graduate Seminar in Computing Security (3 Credits)
This course explores current topics in Computing Security. It is intended as a place holder course for faculty to experiment new course offerings in Computing Security undergraduate program. Course specific details change with respect to each specific focal area proposed by faculty.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

CSEC-769 Emerging Topics Wireless Security (3 Credits)
This course focuses on security in current and emerging systems and protocols of the modern wireless ecosystems, aiming at advancing students' understanding of these systems while providing an insight into state-of-the-art wireless security research trends. The course covers a primer on wireless communications and introduces prominent wireless systems and their security protocols. Along with reviewing research approaches in wireless security, students then study and discuss several recent papers on current topics, including Wi-Fi and cellular networks security; physical-layer security; security of wireless protocols for IoT, connected vehicles, and GPS; and other selected topics. Students will also practice the steps of a research process by completing a small project, from critically reviewing the literature to evaluating a novel idea on a hardware testbed, and finally presenting their findings.
Prerequisites: CSEC-569 or CSEC-669 or CSEC-741 or EEEE-707 or ENGR-707 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CSEC-790 MS Thesis (1-6 Credits)
This course is one of the capstone options in the MS in Computing Security program. It offers students the opportunity to investigate a selected topic and make an original contribution which extends knowledge within the computing security domain. Students must submit an acceptable proposal to a thesis committee (chair, reader, and observer) before they may be registered by the department for the MS Thesis. Students must defend their work in an open thesis defense and complete a written report of their work before a pass/fail grade is awarded. As part of their original work, students are expected to write and submit an article for publication in a peer reviewed journal or conference.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSEC-791 MS Project (1-3 Credits)
This course is one of the capstone options in the MS in Computing Security program. It offers students the opportunity to investigate a selected topic within the computing security domain. A project involves some type of practical development with a deliverable. This may include development with computer equipment, software packages, and programming/scripting languages. Alternately, it may be the development and demonstration of an innovative process that addresses a current computing security issue or problem. Students must submit an acceptable proposal to a project committee (chair, and reader) before they may be registered by the department for the MS in CSEC Project. Students must defend their work in an open project defense and complete a written report of their work before a letter grade is awarded. A well-written professional report is required that details current thinking on the topic in the professional literature, the design and implementation of development that was done, and a critical evaluation of the results.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSEC-793 Capstone for Computing Security (3 Credits)
This course is one of the capstone options in the MS in Computing Security program. Students will apply their knowledge to solve real-world problems in the areas of computing security. Students will work on an individual semester-long project involving some type of practical development with a deliverable. This may include development with computer equipment, software packages, and programming or scripting languages. Alternately, it may be the development and demonstration of an innovative process that addresses a current computing security issue or problem. A well-written professional report is required that details current thinking on the topic in the professional literature, the design and implementation of development that was done, and a critical evaluation of the results. The students will also present their findings in an open forum. Students are expected to submit a short proposal before they can be enrolled in the class.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Spring

CSEC-799 Independent Study (1-3 Credits)
The graduate independent study offers students the opportunity to investigate a topic not covered in an available course in the MS program in conjunction with a faculty sponsor. Working cooperatively, the faculty sponsor and the student draft a proposal of the work to be completed, the deliverables expected from the student, the number of credits assigned, and the means by which the student's work will be evaluated. The proposal must be approved by the graduate program director before a student can be registered for independent study.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

CSEC-909 Proposal Development (0 Credits)
This course is part of a capstone experience for graduate students who are beginning the capstone experience. Students will submit an accepted proposal as a prerequisite for the formal thesis.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Construction Management (CONM)

CONM-620 Transportation and Construction Industry Dynamics (3 Credits)
This course deals with dynamics in a variety of infrastructure industries, in particular the transportation and construction industry. Conceptual frameworks, case discussions, and skill-oriented activities are applied to each topic. Topics include group dynamics, leadership and power, the influence of technology, communications, motivation, and organizational design and development for government agencies and engineering firms in the transportation and construction industry. Class sessions and assignments are intended to help participants acquire the skills managers need to improve organizational relationships and performance in the Transportation and Construction Industry. Organization flowcharts of engineering firms and federal, state, county, and municipal government agencies with an emphasis on the department of transportation will be covered with an in-depth discussion on intra- and inter- agencies interaction and private-public partnership.
Contact Hours: Lecture 3
Typically Offered: Spring

CONM-630 Advanced Construction Scheduling Techniques (3 Credits)
This course examines different types of schedules used in the construction process including bar charts, Critical Path Method (CPM), and Project Evaluation and Review Technique (PERT). Develops an understanding of the forward and backward passes for both the activity-on-arrow (AOA) and activity-on-node (AON) analyses. Analysis of cost and resource loaded schedules. Explains linear and repetitive schedules. Introduces advantages/disadvantages of delay analysis techniques. Industry scheduling software is introduced.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-640 Economics of Transportation and Supply Chains (3 Credits)
The course covers cutting-edge areas of transportation and supply chains, including: effects of the pandemic, innovation, infrastructure, dynamic pricing, safety, public-private partnerships, and regulation. This course will feature guest speakers who will present and discuss different facets of the economics of transportation, supply chains. The course emphasizes applying economic concepts to transportation issues in the United States and around the globe, using all modes of transportation including air, road, rail, trucking, maritime, pipelines, and transit. Examples include the role of transportation , the substitution of communications for transportation, road pricing, parking pricing, the development of autonomous vehicles and platooning, spectrum for transportation safety and connected vehicles, transportation equity, energy efficiency and electric vehicles and electrification of the transportation system, and the role of GPS as a free utility.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-641 Geographic Information Systems for Smart Transportation Infrastructure (3 Credits)
This course provides comprehensive instruction in the underlying concepts and principles of geographic information system (GIS) technology and its application to the design and analysis of transportation infrastructure systems. The focus is applications in transportation of spatial data acquisition, geoprocessing, geostatistical methods; visualization, and querying of spatial data; network modeling, terrain mapping, and spatial analysis. Special attention is given to the formulation and use of transportation models, visualization, and analysis of transportation systems within GIS environment.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-650 Transportation and Construction Leadership and Management (3 Credits)
Introduction to leadership and management principles applicable to the construction industry including those associated with strategic planning, construction processes, communications, ethical behavior, human resources development, financial management, and risk management. There will be an emphasis on safety and loss prevention management, insurance and risk management, marketing construction services, and bonding requirements for construction companies.
This course is restricted to CONSMGT-MS students.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-661 Construction Cost Analysis and Management (3 Credits)
An introduction to direct cost estimating for construction projects. The estimating techniques covered include quantity take-off, labor productivity, and pricing (labor, material, and equipment). Drawings, sketches, and specifications are used as a basis for developing quantities involving site work, concrete, masonry, steel, carpentry, and finishes. Students also use software tools to aid in developing takeoff quantities. Different estimate structures and various types of estimates are examined. Direct and indirect construction costs are explored along with approaches for estimating overhead costs and profit. Topics include a logistical study of pre-construction cost analysis and construction management procedures, including conceptual estimating, project cost analysis and control, value engineering, life-cycle costing, feasibility studies, project financial and economic modeling, and quantitative risk analysis techniques. Students may receive credit for only this course or CVET-561, not both.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-689 Special Topics: (1-3 Credits)
Special Topics is an experimental graduate course intended as a means for offering innovative topics not currently reflected in either the civil engineering technology or construction management curriculums. This is offered periodically, watch for titles in the course listing each semester. Special Topics course offerings may be co-listed with an undergraduate Special Topics course.
Enrollment in this course is restricted to students with graduate standing in CONSMGT-MS or EHSM-MS.
Typically Offered: Fall or Spring or Summer

CONM-690 Sustainable Building Design and Construction (3 Credits)
Course material will focus on the design, engineering, and construction of sustainable buildings and how the construction manager guides the project team to meet the owner's objectives of a sustainable facility. Students will explore the primary differences and similarities between the different green building rating systems. Students will critically assess and prepare written communications regarding the current and evolving practices, and potentials of sustainable building construction and design and prepare them with the skills to determine value-to-cost differences between "green" and conventional designs. Students may receive credit for this course or CVET-505, not both.
Contact Hours: Lecture 3
Typically Offered: Spring

CONM-699 Cooperative Work Education (0 Credits)
This course provides the student with practical, current, industrial experience in a job related to Smart Cities, Transportation, and Construction Management. Students can apply lessons learned in the classroom to Co-op assignments and vice-versa.
Typically Offered: Fall, Spring, Summer

CONM-710 Smart Cities, Transportation, and Construction Seminar (3 Credits)
The seminar will set forth specific topics under the general subject of Smart Cities, Transportation, and Construction. Cost analysis and productivity improvement related to the construction projects are also covered in the seminar. Experts from multiple areas (e.g., Smart Cities, Infrastructure, Transportation, Safety Systems, Water Supply, Energy Networks, and Construction Management) are invited to give presentations and lead discussions during the seminar.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CONM-718 Construction Operations and Productivity (3 Credits)
A study of construction operations with emphasis on productivity enhancement focusing on an integrated approach to planning, modeling, analysis, and design of construction operations. This includes productivity concepts; data collection; analysis of productivity data and factors affecting productivity; means for improving production and study of productivity improvement programs.
This course is restricted to CONSMGT-MS students.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-742 Remote Sensing and Image Analysis for Smart Transportation Infrastructure Application (3 Credits)
This course introduces the use of Global Positioning Systems and Remote Sensing for field mapping and data acquisition in transportation infrastructure. Accuracy, data standards, GPS equipment, and mission planning are explored. Students will progress through different levels of equipment ranging from recreational-grade GPS receivers to professional data loggers and survey-grade receivers. Students will learn the introductory concepts of satellite sensors, satellite image capture, processing of satellite images, and its application for transportation issues. Specifically, students will learn how to interpret different features on digital images, detailed assessments of digital images for various transportation issues. In a field setting, students will learn how to configure and utilize a real-time kinematic (RTK) GPS system with the base station and rover. The course will introduce students to satellite images for projects works in transportation. Students will gain valuable hands-on experience through field exercises and practical service-learning projects.
Contact Hours: Lecture 3
Typically Offered: Spring

CONM-743 Smart Cities Infrastructure Monitoring (3 Credits)
Smart City Infrastructure has been identified as a promising potential application domain for the Internet of Things (IoT) with a wide range of possible services that can benefit City Administration/Municipal Governance. The Internet of things (IoT) is the internetworking of physical devices, e.g., vehicles, construction equipment, crops, the human body, buildings, and other items, each embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. This course provides an overview of IoT applied while architecting smart city infrastructure monitoring applications. Students will learn the fundamentals of IoT infrastructure and networking technologies including hardware, smart city sensors, IoT cloud technologies, and IoT communication protocols. The students will develop smart city infrastructure monitoring solutions using IoT-focused design methods. The course will run as a hands-on, multi-discipline project-oriented course, with project discussions, presentations, and demonstrations led by the student teams.
Contact Hours: Lecture 3
Typically Offered: Spring

CONM-744 Smart Cities Infrastructure Data Analytics (3 Credits)
Smart City Infrastructure has been identified as a promising potential application domain that requires Big Data Analytics. This course introduces state#of#the#art data analytical concepts, techniques, and algorithms to solve problems in smart city infrastructure. It provides theory and approaches for data collection, data visualization, and data exploration, and applications in Smart City Infrastructure area. Data modeling utilizing the statistical methods of linear and logistic regression, big data analysis, and modeling software such as PYTHON and SQL are emphasized. Students then engage in case study exercises in which small groups of students develop and present a big data concept for a specific Smart City Infrastructure Applications. This includes practical exercises to familiarize students with the format of big data. It also provides a first hands-on experience in handling and analyzing large, complex data structures for Smart City Infrastructure.
Contact Hours: Lecture 3
Typically Offered: Spring

CONM-745 Transportation Systems Management and Operations (3 Credits)
The course provides students with an introduction to Transportation Systems Management and Operations (TSMO). TSMO skills gained from this course will allow students to better understand the current needs of managing and operating Transportation Infrastructure. TSMO is designed to provide a basic understanding of how transportation infrastructure is operated to meet the mobility needs of transportation system users. The focus is on interconnecting planning, design, organization, construction, and maintenance functions of transportation systems leading to a comprehensive understanding of the interdependencies involved in establishing and sustaining the TSMO. The course is designed primarily to serve as a TSMO refresher for practitioners and at the same time for aspiring professionals to gain the necessary foundational background to take up careers in TSMO.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-760 Construction Client Development (3 Credits)
This course introduces and develops techniques for construction client development, including: the structured sales approach; the referral system; building upon successful projects; exploring how satisfied clients can contribute to winning future construction contracts; the cost and the value of keeping all stakeholders satisfied; the requisite skills for successful construction project sales and how they differ from other professions in the organization. Students will analyze case studies of successful and unsuccessful construction contracts.
Contact Hours: Lecture 3
Typically Offered: Fall

CONM-788 Thesis Planning (3 Credits)
Students will rigorously develop their thesis research ideas, conduct literature reviews, identify and plan methodologies, prepare schedules, and gain a clear understanding of the expectations of the faculty and the discipline. Each student will be required to prepare a committee approved thesis research proposal and may begin work on their thesis.
Prerequisite: GRCS-701 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CONM-790 Thesis (3 Credits)
The graduate thesis is a formal research document that empirically relates theory with practice. A formal written thesis and oral defense are required.
Prerequisites: CONM-744 or equivalent course.
Contact Hours: Thesis 3
Typically Offered: Spring

CONM-795 Comprehensive Examination (0 Credits)
A written comprehensive exam is one of the non-thesis methodologies for completion of the MS degree. This course will provide a forum for independent review of the main concepts of the program core subject areas. The student will take a written examination at the conclusion of the course and must receive a passing grade of at least 80% to be successful. Students will have one additional opportunity to pass this examination if their initial attempt is unsuccessful.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall

CONM-797 Graduate Project (3 Credits)
This course provides an opportunity for students to demonstrate their capabilities developed through their course of study to design, develop and/or evaluate a Smart Cities, Transportation, and Construction Management related project culminating in a written report or manuscript and presentation.
Contact Hours: Project 3
Typically Offered: Spring

Criminal Justice (CRIM)

CRIM-650 AI, Policy and Law (3 Credits)
Artificial intelligence (AI) presents many complex issues for society, as technological developments have greatly outpaced public policy. Moreover, the open and commercialized nature of AI tools provides criminals and other adversarial actors with new advantages yet to be effectively countered. This class looks at the legal and policy frameworks and practices needed to build an ecosystem of privacy, security, and trust that will help ensure stakeholders that AI is being developed and deployed in an ethical, safe, and reliable manner. The class will also discuss how organizations are designing their own practices for operationalizing trustworthy or ethical AI in various sectors including law enforcement and criminal justice, commercial sectors, medical and biological research, among others. Students will be given a foundation in the emerging laws, regulations, and policies regarding AI, as well as insight on the broader process of how laws and policies need to adapt for other rapidly emerging technologies. We will explore in detail several approaches currently being considered, including regulatory approaches, standards, and considerations for national and international security. The course also will explore certain other legal issues arising in connection with AI, such antitrust and competition law, intellectual property and proprietary rights matters, and concerns for future technologies (quantum computing, AI and synthetic biology, etc.).
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

CRIM-660 Project Based Learning in Criminal Justice (3 Credits)
This course engages students in research that builds on problem identification and analysis in criminal justice. Topics may include exploration of community issues and views on justice, health and medical approaches to crime problems, practitioner orientations and practices relative to specific issues in criminal justice, and applications of new techniques, such as data science, to contemporary problems. Students will apply theoretical frameworks towards understanding the scope and nature of the problem in the form of working papers. The class culminates in a final project which will involve analysis and evaluation research components addressing the underlying problem/issue/program in consultation with the instructor.
Restricted to students in CRIM-BS/MS or CRIM-MS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

CRIM-700 Pro-Seminar in Criminal Justice Theory (3 Credits)
In this pro-seminar, students examine the theoretical foundation of criminal justice. This course integrates studies of criminal justice systems, enforcement organizations, judicial decision-making, courtroom communities and correctional systems by focusing on the study of governmental social control premised on punishment or blameworthiness. It examines the underlying causes and patterns of official responses to behavior that may be labeled criminal, and the structures, policies, and practices of criminal justice.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Fall

CRIM-701 Statistics (3 Credits)
The purpose of this course is to provide students with training in quantitative analysis of social science data. Students will develop a conceptual understanding of techniques, the ability to recognize the appropriate selection of techniques, and the ability to use those statistical measures and interpret their results. Students will gain experience with inferential statistics through the level of commonly used multivariate analyses. The prerequisite for this course will be a strong undergraduate foundation in statistical analysis. With the consent of their adviser and the graduate coordinator, qualified students may substitute more specialized statistics courses or courses in such areas as geographical information systems (GIS).
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Fall

CRIM-702 Pro-Seminar in Research Methods (3 Credits)
This seminar will focus on the principles and techniques of research with a special focus on evaluation research. The course will cover research conceptualization and design, development of appropriate measures, collection and analysis of data using a wide range of methods. Students will gain a thorough understanding of the research process as well as the policy implications and consequences of research and evaluation. Students will also begin to develop a thesis research proposal.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Fall

CRIM-703 Advanced Criminology (3 Credits)
This course will provide students with a detailed understanding of the theories that have guided criminological research and policy. Subject matter will cover the major influences in criminology: the classical school, the Chicago School, strain theories, socialization, and learning theories, and conflict theories, among others. The prerequisite for this course will be a strong undergraduate foundation in theories of crime and criminality.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Spring

CRIM-704 Crime, Justice and Community (3 Credits)
This course provides an overview of the role of communities in crime and criminal justice. The course begins by providing a foundation in community theory. Students will gain an understanding of the critical dimensions and attributes that define community. The course will emphasize how these critical community functions and dimensions are related to both crime and justice system responses to crime. The course will involve an examination of community-based theory and research, with a special emphasis on the criminology of place and how crime and justice system response patterns are embedded in particular social structures. Students will study the extent to which structural characteristics and social processes are related to crime. Finally, the course will examine how communities and the justice system can collaborate to promote public safety and produce more equitable justice system responses.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Spring

CRIM-705 Interventions and Change in Criminal Justice (3 Credits)
This course will focus on theory and research regarding the effectiveness of broad anti-crime strategies and specific intervention efforts at the local, state, national and international level. Theoretical explanations of crime and ideological orientations towards crime will be linked with the crime control and prevention strategies associated with those perspectives. Each strategy of crime control/prevention (including deterrence, incapacitation, rehabilitation, and community crime prevention) will be assessed in terms of research findings on its effectiveness. Detailed attention will be given to prevention/control strategies aimed at both juvenile and adult offenders. Programs will also be examined in the broader context of the ideology and philosophy of justice. Students will become familiar with the state of the art in crime and justice related interventions by studying the theory, practice and evaluation of contemporary crime and justice interventions.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Spring

CRIM-706 Current Issues In CJ (3 Credits)
This course provides an examination of current issues in criminal justice with an emphasis on the application of evaluation, management, theory and ethics to analysis of criminal justice policy, The goal is to engage students in discussion of current issues with their peers and with experts in the field.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Fall

CRIM-710 Pro-Seminar in Law and Policy (3 Credits)
The course will consider the processes of policy development and analysis in criminal justice with a particular emphasis on the intersection of policy and law. The legal and political environments of criminal justice policy will be examined in study of the development of federal crime policy. Additionally, the roots, development, legal context and impact of major policies such as contemporary policing strategies, problem solving courts and restorative justice will be explored.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Biennially

CRIM-711 Directed Readings in Criminal Justice (3 Credits)
This course will be tailored to individual students' research interests as they explore areas of inquiry that may become topics for their thesis research. An emphasis will be placed on building a theoretically informed research question via existing literature and research in criminal justice and other disciplines (economics, psychology, sociology, and so on). Parallel to that effort, students will work to identify locally relevant research questions, potential research designs, and possible projects and/or agencies with whom which to conduct this research.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Fall

CRIM-712 Crime And Media (3 Credits)
This course is designed to analyze and critique the mainstream media's coverage of criminal justice issues, and to study how that coverage impacts society at large. The course will scrutinize, compare and contrast crime coverage of different eras, and will also discuss how that coverage is changing today with around-the-clock media outlets and ubiquitous social media. Among the issues studied will be the impact of crime coverage on public policy; the impact of televised trials; the editorial decisions made daily in newsrooms across America about the placement and priority of crime news; the trademarks that can catapult a crime story into local, regional or even national prominence; and the occasional alliances between law enforcement and media.
This class is restricted to CRIM-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Biennially

CRIM-775 Criminal Justice Capstone (3 Credits)
The criminal justice capstone involves guided research on a topic approved by the instructor. The capstone requires students to develop, design and complete an original research project. Satisfactory completion involves the execution of a substantial research paper and includes a public oral presentation.
Contact Hours: Project 3
Typically Offered: Fall, Spring

CRIM-799 Independent Study (1-6 Credits)
A program of study executed by an individual student with assistance and guidance by an instructor, outside a regular classroom setting. Guidelines for designing and gaining approval for an independent study are provided in College of Liberal Arts Policy I.D.

CRIM-800 Thesis in Criminal Justice (1-6 Credits)
The master's thesis in criminal justice involves independent research on an approved topic judged by a faculty committee and under the supervision of one faculty member. The thesis requires students to develop, design and complete an original research project; orally defend the thesis before the thesis committee and the public; and submit a bound copy to the library. Students will meet weekly with their thesis chair.
Prerequisites: CRIM-700 and CRIM-701 and CRIM-702 and CRIM-703 and CRIM-704 and CRIM-705 or equivalent courses.
Typically Offered: Fall, Spring, Summer

CRIM-890 Continuation of Thesis (0 Credits)
The Continuation of Thesis offers the opportunity to fulfill the work plan agreed by the student and the thesis adviser in commencing the thesis project in criminal justice. The goal of the course is to complete the thesis research proposed in a thesis proposal.
Typically Offered: Fall, Spring, Summer

Data Science (DSCI)

DSCI-601 Applied Data Science I (3 Credits)
This is the first of a two course applied data science seminar series. Students will be introduced to the data science masters program along with potential projects which they will develop over the course of this series in con-junction with the applied data science directed studies. Students will select a project along with an advisor and sponsor, develop a written proposal for their work, and investigate and write a related work survey to refine this proposal with their findings. Students will begin preliminary design and implementation of their project. Work will be presented in class for peer review with an emphasis on developing data science communication skills. This course will keep students up to date with the broad range of data science applications.
Prerequisites: SWEN-601 and DSCI-633 and STAT-614 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

DSCI-602 Applied Data Science II (3 Credits)
This is the second of a three course applied data science seminar series. Students will design an implementation plan and preliminary documentation for their selected applied data science project, along with an in class presentation of this work. At the end of the semester students will present preliminary demos of their project and write a preliminary project report. Writing and presentations will be peer reviewed to further enhance data science communication skills. This course will keep students up to date with the broad range of data science applications.
Prerequisite: DSCI-601 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

DSCI-603 Applied Data Science III (1 Credit)
This is the final course in the three course applied data science seminar series. Students will complete the implementation of their projects under guidance of their advisor and sponsor. Students will present a mid-term and final demo, and participate in a project poster session. Students will complete their final project report or thesis in the case of thesis track students. Peer reviews will be made of presentations, posters and final reports/theses for mastery of data science communication skills. This course will keep students up to date with the broad range of data science applications.
Prerequisites: DSCI-602 or equivalent course. Co-requisites: DSCI-682 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Fall

DSCI-623 Introduction to Data Science: Management (3 Credits)
This course introduces students to the problems and issues in managing large sets of data, focusing on modeling, storing, searching, and transforming large collections of data for analysis. The course will cover database management and information retrieval systems, including relational database systems, massively parallel/distributed computation models (e.g., MapReduce/Hadoop) and various NoSQL (e.g., key-value, document, column, and graph) systems that are designed to handle extremely large-scale and complex data collections. Emphasis is placed on the application of large-scale data management techniques to particular domains. Programming projects are required.
Graduate Computing and Information Sciences
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

DSCI-633 Foundations of Data Science and Analytics (3 Credits)
A foundations course in data science, emphasizing both concepts and techniques. The course provides an overview of data analysis tasks and the associated challenges, spanning data preprocessing, model building, model evaluation, and visualization. The major areas of machine learning, such as unsupervised, semi-supervised and supervised learning are covered by data analysis techniques including classification, clustering, association analysis, anomaly detection, and statistical testing. The course includes a series of assignments utilizing practical datasets from diverse application domains, which are designed to reinforce the concepts and techniques covered in lectures. A substantial project related to one or more data sets culminates the course.
This course is restricted to DATASCI-MS, INFOST-MS, SOFTENG-MS, COMPSCI-MS, or COMPIS-PHD Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

DSCI-640 Neural Networks (3 Credits)
This course will cover modern and deep neural networks with a focus on how they can be correctly implemented and applied to a wide range of data types. It will cover the backpropagation algorithm and how it is used and extended for deep feedforward, recurrent and convolutional neural networks. An emphasis will be placed on the implementation, design, testing and training of neural networks. The course will also include an introduction to using a modern neural network framework.
Prerequisites: SWEN-601 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

DSCI-644 Software Engineering for Data Science (3 Credits)
This course focuses on the software engineering challenges of building scalable and highly available big data software systems. Software design and development methodologies and available technologies addressing the major software aspects of a big data system including software architectures, application design patterns, different types of data models and data management, and deployment architectures will be covered in this course.
Prerequisites: SWEN-601 and DSCI-633 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

DSCI-650 High Performance Data Science (3 Credits)
This course will cover concurrent, parallel and distributed programming paradigms and methodologies with a focus on implementing them for use in applied data science or scientific computing tasks. In particular, the course will focus on developing software using graphical processing units (GPUs) and the message passing interface (MPI); with an emphasis on properly handling large-scale, real-world data as part of these applications. The course will also teach scalability and load balancing techniques for developing efficient distributed systems. Programming assignments are required.
Graduate Computing and Information Sciences
Contact Hours: Lecture 3
Typically Offered: Fall

DSCI-681 Applied Data Science Directed Study I (1 Credit)
This course provides an opportunity for a student to perform a research and/or development of an applied data science project under the supervision of a data science advisor and project sponsor, which will have been proposed and selected during the Applied Data Science I course. Students will have regular meetings with the project advisor and sponsors who will guide the students initial project design and development.
Co-requisites: DSCI-602 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Spring

DSCI-682 Applied Data Science Directed Study II (2 Credits)
This course provides will have a student complete a research and/or development of an applied data science project under the supervision of an data science advisor and project sponsor, which will have been begun during the Applied Data Science II and Applied Data Science Directed Study I courses. Students will have regular meetings with the project advisor sponsors who will guide the students final project design, development and provide feedback on the student's final report or thesis.
Prerequisites: DSCI-681 or equivalent course. Co-requisites: DSCI-603 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall

DSCI-689 Topics In Data Science (1-3 Credits)
This course will cover specialized topics in data science. Such topics are often emerging and not covered in other existing courses or are not covered in a manner that is appropriate for the student in this program. Graduate program standing and specific prerequisites will be noted for a specific special topic.
This course is restricted to DATASCI-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

DSCI-699 Graduate Co-op Experience (0 Credits)
The main goal of this course is to provide a mechanism for graduate students to participate in co-op education, consisting of full-time paid employment in the discipline of Data Science. Co-op education enriches the graduate experience for many students, especially those who are transitioning to software engineering form another discipline or another domain.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

DSCI-700 Part-Time Graduate Co-op Experience (0 Credits)
The main goal of this course is to provide a mechanism for graduate students to continue participating in co-op education after already completing a full-time co-op at the same company. This will consist of part-time paid employment in the discipline of data science. Co-op education enriches the graduate experience for many students, especially those who are transitioning to data science form another discipline or another domain. Part time co-op hours contribute to curricular practical training (CPT). Completion of all bridge courses and 17 semester hours of graduate courses are required for enrollment.
Prerequisite: DSCI-699 or equivalent course.
Typically Offered: Fall, Spring, Summer

DSCI-770 Data Science Masters Thesis (3 Credits)
This course provides the student with an opportunity to develop a thesis project, and analyze and document the project in thesis document form. An in-depth study of a data science topic will be research focused, having built upon the thesis proposal developed prior to this course. The student is advised by their primary faculty advisor and committee. The thesis and thesis defense is presented for approval by the thesis advisor and committee.
Contact Hours: Thesis 3
Typically Offered: Fall, Spring, Summer

DSCI-771 Continuation of Data Science Masters Thesis (0-1 Credits)
This course provides the student with an opportunity to complete their thesis project after having enrolled in the data science thesis course (DSCI-770), if extra time if needed. The student continues to work closely with his/her advisor and thesis committee.
Contact Hours: Continuance 3
Typically Offered: Fall, Spring, Summer

DSCI-781 Continuation of Capstone (0-1 Credits)
This course provides the student with an opportunity to complete their capstone project, if extra time is needed after enrollment in the on campus capstone courses DSCI-601 and DSCI-602 (Applied Data Science I and II) or the online capstone course DSCI-799 (Graduate Capstone). The student continues to work closely with his/her advisor to complete their project.
Prerequisite: DSCI-602 or DSCI-799 or equivalent course.
Contact Hours: Continuance 1
Typically Offered: Fall, Spring, Summer

DSCI-789 Advanced Topics In Data Science (1-3 Credits)
This course will cover advanced specialized topics data science. Such topics are may be emerging and advanced. Specific prerequisites will be noted for each specific special topic.
This course is restricted to DATASCI-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

DSCI-790 Independent Study (1-3 Credits)
This course provides the graduate student an opportunity to explore an aspect of data science independently and in depth, under the direction of an advisor. The student selects a topic and then works with a faculty member to describe the value of the work and the deliverables.
This course is restricted to DATASCI-MS Major students.
Typically Offered: Fall, Spring, Summer

DSCI-799 Graduate Capstone (3 Credits)
This non-class-based experience provides the student with an individual opportunity to explore a project-based or a research-based project that advances knowledge in an area of data science. The student selects a problem, conducts background research, develops the system or devises a research approach, analyses the results, and builds a professional document and presentation that disseminates the project. The report must include a literature review. The final report structure is to be determined by the capstone advisor.
Typically Offered: Fall, Spring

Decision Sciences (DECS)

DECS-743 Operations and Supply Chain Management (3 Credits)
Study of the management of operations and supply chain management. Encompasses both manufacturing and services. Topics include operations and supply chain strategy, ethical behavior, forecasting; work systems, inventory management, capacity and materials planning, lean operation, supply chain design and closed-loop supply chains, global operations, quality management, quality control, and quality improvement, project management; and current issues.
Prerequisites: DECS-782 or MGIS-650 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

DECS-744 Project Management (3 Credits)
A study in the principles of project management and the application of various tools and techniques for project planning and control. This course focuses on the leadership role of the project manager, and the roles and responsibilities of the team members. Considerable emphasis is placed on statements of work and work breakdown structures. The course uses a combination of lecture/discussion, group exercises, and case studies.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

DECS-750 Supply Chain Analytics (3 Credits)
This course provides an overview of quantitative supply chain modeling and analysis. Accordingly, this course will discuss several strategic, tactical, and operational concepts used in improving the distribution of goods and services throughout the supply chain. The course emphasis is on understanding when and how to use these mathematical programming and optimization methods as well as how to interpret the results for actionable information.
Prerequisites: DECS-743 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

DECS-758 Seminar in Decision Sciences (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to decision science. Specific topics will vary depending upon student and faculty interests and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics will normally vary from semester to semester. (instructor-determined)
Contact Hours: Lecture 3

DECS-782 Statistical Analysis for Decision Making (3 Credits)
This is a course in applied statistics emphasizing an understanding of variation and inference (estimation and testing). Topics to be covered include: review of descriptive statistics, normal distribution, sampling distributions, estimation, test of hypothesis for single and two populations, analysis of variance (ANOVA), linear regression, multiple regression and model building. Students will apply these concepts using mini-cases and problem sets that involve both structured and unstructured data sets. The application of appropriate tools will be required.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

DECS-799 Independent Study Decision Sciences (3 Credits)
The student will work independently under the supervision of a faculty adviser. (Instructor approval)
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

DECS-810 Statistical Analysis for Managers (2 Credits)
This course introduces concepts for interpreting and analyzing data as a tool for assisting managers in making complex business decisions. Topics to be covered include: review of descriptive statistics, normal distribution, sampling distributions, estimation, test of hypothesis for single and two populations, linear regression, multiple regression and model building. The application of appropriate statistical tools will be required.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2
Typically Offered: Fall

DECS-864 Systems Support for Operations (2 Credits)
This course focuses on the application of information technology to gain greater efficiency and effectiveness from operational and managerial processes and systems. The conceptual foundations of operations, supply chain management and information technology are surveyed and contemporary approaches analyzed from a managerial perspective.
Contact Hours: Lecture 2
Typically Offered: Summer

DECS-875 Business Simulation (2 Credits)
Teams of students manage a company in a computer simulated oligopoly industry, competing against companies managed by other student teams. The overall purpose of the Business Simulation course is to: enhance the participant's ability to make effective business decisions; encourage cross-functional thinking; foster strategic and systems thinking; and enhance team building and reinforce continuous improvement opportunities.
Prerequisites: MGMT-818 and FINC-845 or equivalent courses.
Contact Hours: Lecture 2
Typically Offered: Summer

Department of Clinical Health Professions (DCHP)

DCHP-799 Independent Study (1-3 Credits)
This course provides the opportunity for independent investigation, under faculty supervision, on a subject matter either not included in existing courses or further investigation of a topic of interest presented in another course. A student-driven, faculty- mentored proposal is drafted that describes the plan of work, deliverables expected, evaluation criteria, and possible credit load.
Typically Offered: Fall, Spring, Summer

Economics (COB) (ESCB)

ESCB-705 Economics and Decision Modeling (3 Credits)
The course focuses on the fundamental economic theories most useful for the management of a firm in a global environment. Microeconomic theories and current events are used to explain the performance of the market system and help managers formulate effective pricing and business decisions. Macroeconomic theories and current events are used to explain the direction of the domestic and global economy to help managers understand the implications, including foreign direct investment, for their companies. Students will learn to explain and predict changes in economic growth, inflation, interest rates, international trade and foreign exchange rates.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ESCB-758 Seminar in Economics (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to economics. Specific topics will vary depending upon student and faculty interests and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics will normally vary from semester to semester. (Instructor determined)
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ESCB-799 Independent Study Economics (1-3 Credits)
The student will work independently under the supervision of a faculty adviser. *Note: Instructor approval
This course requires permission of the Instructor to enroll.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

ESCB-810 Financial Economics (3 Credits)
Economics is an important foundation for business research. This course focuses on the behavior of individuals and firms in various market settings. Classical issues of demand, supply, and market equilibrium, as well as topics more germane to business research such as contracting and theory of firm are covered. Throughout, focus is on developing economic intuition, understanding applications to business research, and accumulating an in-depth understanding of useful economic theories and tools.
Contact Hours: Seminar 3
Typically Offered: Fall

ESCB-830 Econometrics I (3 Credits)
This course is designed for doctoral students and serves as the first of a two-course sequence focused on modern econometric theory and methods. This foundational course covers essential concepts in statistics, including the theory, uses, and application of regression techniques under different conditions. The course will cover common econometric challenges in social sciences research and discuss techniques used to address them. The class adopts a hands-on approach, with students working with data to model and address econometric issues. Familiarity with basic statistics, calculus, and matrix algebra is required.
Prerequisites: MKTG-825 or equivalent course.
Contact Hours: Seminar 3
Typically Offered: Spring

ESCB-835 Econometrics II (3 Credits)
This course is designed for doctoral students and serves as the second of a two-course sequence focused on modern econometric theory and methods. The course builds on the students' knowledge of advanced econometric techniques used in social sciences research. Topics reviewed in foundational econometrics such as matching and causal identification, are examined in greater detail and rigor with a particular focus on issues such as censoring and selection bias. Relevant modeling techniques are reviewed with an emphasis their use in social science research. The class adopts a hands-on approach, with students working with data to model and address econometric issues.
Prerequisites: ESCB-830 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ESCB-840 Microeconomics & Pricing (2 Credits)
This course introduces microeconomic concepts and how they can be employed to examine business decisions such as pricing under conditions of uncertainty. Models and applications are employed that describe the efficient allocation of resources within a firm. Topics include supply and demand, consumer behavior, production, cost and pricing.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2
Typically Offered: Fall

ESCB-841 Macroeconomics (2 Credits)
Fundamental macroeconomic theories will be examined to explain and predict changes in economic growth, employment, inflation, consumer spending, business investment, and foreign trade. Financial markets, domestic and foreign, will be examined to understand changes in interest rates and exchange rates. The likely affects of government spending, taxes, and Federal Reserve Bank policies on the economy and business will be evaluated.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2
Typically Offered: Fall

Economics (ECON)

ECON-620 Environmental Economics (3 Credits)
This graduate course examines the relationship and apparent conflict between economic growth and environmental quality, the economics of environmental issues and policy, the environment as a resource and a public good, and the ability and lack of ability of free markets and governments to deal adequately with pollution and other environmental problems. While there is not a formal prerequisite for the course, some background in economics is very helpful.
Contact Hours: Lecture 3
Typically Offered: Spring

ECON-701 Microeconomics for Graduate Students (3 Credits)
This course develops the tools that are commonly used to study the allocation of resources in a mixed economy of private and public enterprises. This course provides an intensive overview of the microeconomic models underlying the actions of consumers and households, firms, regulators, and other public institutions. These models will be applied to current issues in policy (as it arises in all fields of inquiry).
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Biennially

Education Learning Instruction (EDLI)

EDLI-723 Group Dynamics and Facilitation Skills (3 Credits)
Group dynamics explores current theories and models of how individuals work within groups. The outcome of this analysis is to allow students to learn to effectively manage, lead, and generate results from group processes. The facilitation of groups into teams to achieve stated outcomes is within the group process strategies learned. The outcome of this course is to provide students with an understanding of group dynamics and their impact on organizational interventions with emphasis on team building, facilitation tools, and techniques.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

EDLI-730 Theories of Learning (3 Credits)
This course examines the physiological, psychological, and socio/cultural factors related to learning and development of humans throughout the life cycle, as appropriate for the organization's needs. Selected theories of learning and development are critically analyzed and applied to teaching contexts. Students are expected to critically examine their own assumptions and beliefs about learning, and development and develop an appropriate approach to the task of designing learning based on the organization's workforce and needs. Attention is given to stages of cognitive growth, the development of learning goals, learning environments, and to a variety of theories of learning. Learning styles are discussed as a sub component of learning theories.
Contact Hours: Lecture 3
Typically Offered: Spring

EDLI-733 Instructional Design (3 Credits)
The process of instructional design is both an art and science. The framework of this course is to teach the students how to design instruction regardless of content area to allow learners to successfully achieve stated outcomes. The components of the course include problem identification, needs assessment, analysis of learner's abilities, the design of measurable performance objectives, the development of assessment strategies within the design of instructional materials, and the formative and summative evaluation process.
Contact Hours: Lecture 3
Typically Offered: Spring

EDLI-750 Strategic Career Development (3 Credits)
Strategic Career Development introduces students to traditional and emerging career development theory and its application to workplace issues. Theories such as trait and factor, type, developmental, psychodynamic, work adjustment, life-span, social learning, and career decision-making are covered using a system theory approach. Additional topics include organizational career development, application of theory to modern problems and issues, and contemporary issues in career development. The course is participative and draws heavily on case studies, role-playing, self-assessment, and group work to understand the theory and workplace application issues.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

EDLI-751 Career Counseling Techniques (3 Credits)
This course introduces students to selected theories and techniques for use in counseling clients and/or employees about career issues. Students analyze and practice various counseling scenarios and apply theory. They learn to give and accept feedback related to career counseling skills through the use of role plays. Issues related to careers and the HR professional's roles are explored. The future of career counseling in the workplace is examined as it relates to HR planning.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

EDLI-752 Assessments and Measurements in Human Resource Development (3 Credits)
This course provides and introduction to the fundamentals of assessment and measurement tools used in human resource and organizational development activities. An overview of a variety of instruments will be studied and some will be administered. Reading, lecture and class activities will include theory of test development, criteria for administration, validity, reliability, and assessing best instruments for use.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

EDLI-753 The Student Experience in Higher Education (3 Credits)
This course explores the student experience in higher education. Since students are, arguably, a university's most important customer, how should institutions approach the student experience on and off campus? This course will prompt students to consider the wide range and types of colleges and universities around the world and the models used that form the college experience. These approaches impact students perceptions of the higher education university reputation, marketability, alumni giving, and retention. Topics for investigation include: (1) campus facilities and third places; (2) student services; (3) student activities and athletics; (4) teaching and learning; (5) campus traditions; (6) assessment strategies.
Contact Hours: Lecture 3
Typically Offered: Fall

EDLI-754 Critical Systems in Higher Education (3 Credits)
Higher education is a vital societal component in American and global societies and must be accessible to citizens. This course examines current and historical perspectives of the critical systems in higher education to fund, manage risk, and adhere to lawful practices and lead. All of these systems affect students in areas of accessibility, value, customer service, and the higher education experience. Included is an exploration of how price, cost, and value shape what is provided by and who attends college as well as reviewing current practices and events that continue to shape higher education.
Contact Hours: Lecture 3
Typically Offered: Summer

EDLI-755 Learning Assessment and Evaluation (3 Credits)
In a learning environment assessing the accomplishment of learning outcomes involves designing evaluation instruments, collecting data regarding performance, and calculating the overall impact of learning. Of equal importance is to calculate the costs for the learning program to demonstrate a return on investment to the organization. This outcome is computed through measuring the increased competencies of the learners and determining the value the learning contributes to the organization. To achieve this outcome learners will measure and grade performance for a variety of intellectual learner domains as well as assess the overall program effectiveness through interpretation of data. This is an online class only.
Contact Hours: Lecture 3
Typically Offered: Fall

EDLI-756 Learning Design and Technology (3 Credits)
Learning in the 21st century requires creating an engaging and exciting learning experience whether you are interested in online, classroom-based or blended, and delivery for a school, college or training environment. This course guides you through the process of developing and applying a learning product or solution that addresses a performance gap or educational need in any educational or training experience. The course learning outcome is to develop an instructional strategy proposal, create a learning plan that includes technology to support the learning experience and then evaluate the effectiveness of that learning plan. Course topics include: learning in the 21st century, understanding diversity in learning design, and applying assistive technologies, analyzing task and learner needs; applying instructional design principles with a focus on educational technologies, exploring innovative and emerging technologies; and evaluating strategy. Upon completion of this course, students will be able to: • Demonstrate knowledge of a job analysis/needs analysis and selection of an appropriate model to accomplish learning. • Demonstrate the ability to develop and implement a learning strategy using technology, given the needs of the learners and the organization. • Describe how to conduct a formative evaluation process evaluating the effectiveness and efficiency of the selected learning strategy in the work environment including learner achievement and the organization's needs. • Evaluate technology used for learning and training purposes. This course is open to any graduate status student or department permission.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Summer

EDLI-757 Organization and Leadership in Higher Education (3 Credits)
This course examines features of core functional areas of modern higher education. The course focuses on the administration of higher education institutions and includes (1) historical contexts for higher education; (2) student experience; (3) academic and administrative issues; (4) infrastructural concerns, including planning, technology, and facilities management. This course uses a survey perspective of these areas to provide a foundation for understanding the dimensions found within higher education. This course is open to RIT students with a graduate status, or those with department permission.
Contact Hours: Lecture 3
Typically Offered: Spring

EDLI-758 Design for On-Line Learning (3 Credits)
Online learning has grown to be a significant learning/teaching strategy for higher education. This course will include strategies for interactive learning activities to engage adult learner and achieve learning outcomes using a variety of instructional techniques appropriate for the online learning environment. This course will provide an opportunity to complete an actual work-related learning activity as an alternative to a case-based learning activity.
Contact Hours: Lecture 3
Typically Offered: Fall or Summer

Electrical & Computer Engineering PhD (ECEP)

ECEP-795 Doctoral Seminar (1 Credit)
This seminar course presents topics of contemporary interest to graduate students enrolled in the program. Presentations include off campus speakers, and assistance with progressing on your research. Selected students and faculty may make presentations on current research under way in the department.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

ECEP-796 Research Methods in Electrical and Computer Engineering (2 Credits)
This course introduces students to foundational methods and skill to conduct research in electrical and computer engineering. The course focuses on the core aspects of all doctoral work, consisting of deep thinking about a problem and the ability to create new knowledge through channeling technical knowledge into creative thinking. From the context of research in electrical and computer engineering, this course complements the technically-oriented courses in PhD programs by introducing students to the craft of research, developing skills in systematic and rigorous deductive reasoning, argumentation, and critical thinking and analysis, and encouraging critical creativity by learning of its elements and associated techniques. Examples and case studies are drawn from different areas of electrical and computer engineering.
This class is restricted to Doctoral Program students.
Contact Hours: Lecture 2
Typically Offered: Fall

ECEP-877 Doctoral Internship (0 Credits)
Internship is designed to enhance the educational experience of PhD students through full-time employment. Students must submit a proposal for the internship, to be approved by an employing supervisor and the department prior to enrolling. Students are required to submit an evaluation report at the conclusion of the internship.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Internship 40
Typically Offered: Fall, Spring, Summer

ECEP-889 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ECEP-890 Dissertation and Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students must successfully pass the PhD Candidacy examination prior to enrolling in this course
Contact Hours: Recitation 40
Typically Offered: Fall, Spring, Summer

ECEP-892 Graduate Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students may count a maximum of 9 credits towards degree requirements. If the student enrolls cumulatively in more than 9 credits, the additional credits above 9 will not be counted towards the degree.
Contact Hours: Research 40
Typically Offered: Fall, Spring, Summer

ECEP-899 Independent Study (3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student and instructor must prepare a plan of study and method of evaluation for approval by the program director prior to course registration.
Contact Hours: Independent Study 9
Typically Offered: Fall, Spring, Summer

Electrical Engineering (EEEE)

EEEE-602 Random Signals and Noise (3 Credits)
In this course the student is introduced to random variables and stochastic processes. Topics covered are probability theory, conditional probability and Bayes theorem, discrete and continuous random variables, distribution and density functions, moments and characteristic functions, functions of one and several random variables, Gaussian random variables and the central limit theorem, estimation theory , random processes, stationarity and ergodicity, auto correlation, cross-correlation and power spectrum density, response of linear prediction, Wiener filtering, elements of detection, matched filters.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3, Recitation 1
Typically Offered: Fall, Spring

EEEE-605 Modern Optics For Engineers (3 Credits)
This course provides a broad overview of modern optics in preparation for more advanced courses in the rapidly developing fields of optical fiber communications, image processing, super-resolution imaging, optical properties of materials, and novel optical materials. Topics covered: geometrical optics, propagation of light, diffraction, interferometry, Fourier optics, optical properties of materials, polarization and liquid crystals, and fiber optics. In all topics, light will be viewed as signals that carry information (data) in the time or spatial domain. After taking this course, the students should have a firm foundation in classical optics.
Prerequisite: EEEE-374 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-610 Analog IC Design (3 Credits)
This is a foundation course in analog integrated circuit design and is a prerequisite for the graduate courses in RF & mixed-signal IC design (EEEE-726 and EEEE-730). The course covers the following topics: (1) Review of CMOS technology, MOSFET models and Frequency Response (2) Single-stage amplifiers (3) Current mirrors and biasing (4) Current and voltage references (5) Differential amplifiers (6) Cascoding (7) Feedback and Stability (8) OTAs (9) Matching and layout techniques (10) Multi-stage op-amps (11) Noise Analysis (12) Linearity in analog circuits (13) Switched-cap circuits.
Prerequisites: EEEE-480 or equivalent course or graduate standing in EEEE-MS.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Fall

EEEE-615 Embedded Systems for Mechatronics (3 Credits)
This course introduces the principles of Matlab, Simulink and Embedded Systems through the use of examples, problems, and a hands-on learning approach. Matlab topics include: Matlab basic function usage, matrix manipulation, polynomials, programming loops, operators, logical operations, conditional flow control, m-files, data import/export, plotting, data analysis, custom functions, differential equation solvers, Fourier transforms, systems modeling, and introduction to external interfaces. Simulink topics include: creating a model file, basic block manipulation, interfacing with Matlab, modeling and solutions of systems, creating subsystems, S-functions, and custom blocks. This course introduces embedded systems programming with microprocessors focusing on measuring input, manipulating data, and controlling output. Several systems-level examples are presented.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-617 Microwave Circuit Design (3 Credits)
The primary objective is to study the fundamentals of microwave engineering with emphasis on microwave network analysis and circuit design. Topics include microwave transmission lines such as wave-guides, coax, microstrip and stripline, microwave circuit theory such as S- matrix, ABCD matrices, and even odd mode analysis, analysis and design of passive circuits and components, matching networks, microwave resonators and filters. Microwave circuit design projects will be performed using Ansoft's Designer software.
Prerequisites: EEEE-374 or equivalent course or graduate standing in EEEE-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-620 Design of Digital Systems (3 Credits)
The purpose of this course is to expose students to complete, custom design of a CMOS digital system. It emphasizes equally analytical and CAD based design methodologies, starting at the highest level of abstraction (RTL, front-end)), and down to the physical implementation level (back-end). In the lab students learn how to capture a design using both schematic and hardware description languages, how to synthesize a design, and how to custom layout a design. Testing, debugging, and verification strategies are formally introduced in the lecture, and practically applied in the lab projects. Students are further required to choose a research topic in the area of digital systems, perform bibliographic research, and write a research paper following a prescribed format.
Prerequisites: EEEE-420 and EEEE-480 or equivalent courses or graduate standing in EEEE-MS.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall, Spring

EEEE-621 Design of Computer Systems (3 Credits)
The purpose of this course is to expose students to the design of single and multicore computer systems. The lectures cover the design principles of instructions set architectures, non-pipelined data paths, control unit, pipelined data paths, hierarchical memory (cache), and multicore processors. The design constraints and the interdependencies of computer systems building blocks are being presented. The operation of single core, multicore, vector, VLIW, and EPIC processors is explained. In the first half of the semester, the lab projects enforce the material presented in the lectures through the design and physical emulation of a pipelined, single core processor. This is then being used in the second half of the semester to create a multicore computer system. The importance of hardware/software co-design is emphasized throughout the course. Students are further required to choose a research topic in the area of computer systems, perform bibliographic research, and write a research paper following a prescribed format.
Prerequisites: EEEE-420 or equivalent course or graduate standing in EEEE-MS.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Fall

EEEE-622 Electric Power Transmission & Distribution (3 Credits)
This course deals with the topics related to electric power transmission and distribution. Topics covered in this course include: Three Phase System – Wye and Delta connections, Transformers – equivalent circuit –performance characteristics, Balanced and Unbalanced System Analysis, Transmission and Distribution Line Design Considerations, Transmission Line Protection, Transmission Line Faults and Fault Analysis.
Prerequisites: EEEE-282 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-623 Smart Grids (3 Credits)
This course introduces topics of smart energy systems, namely, distributed generation, renewable energy sources, energy storage, microgrids, energy information, communication, and security requirements. Topics covered include analysis, modeling, control, and design of microgrids. Concepts and applications dealing with smart metering, demand side management, renewable energy sources integration, information layer and cybersecurity solutions with case studies will be discussed by students' self-learning reading and presentations in class.
Prerequisite: EEEE-622 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-624 Advances in Power Systems (3 Credits)
This course will introduce the details of electric power markets and the techniques to better use the available resources. Topics include the description of steam generation and renewable energy sources. Formulation of the cost associated with the generation and the optimization methods to minimize this cost in the economic dispatch problem. Unit commitment. Optimal power flow formulation and its solution methods. Introduction to smart grid technologies and challenges.
Prerequisite: EEEE-622 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-625 Lab Applications in Mechatronics (3 Credits)
This course provides a culminating experience for the mechatronics engineering certificate, relying upon the completed course work and culminating in development of laboratory experiences related to mechatronics. Students enrolled in the course will design and prepare a novel lab experiment and complete lab experiments created by peers. (BS in Engineering)
Prerequisites: EEEE-451 or equivalent course.
Contact Hours: Laboratory 1, Lecture 2

EEEE-629 Antenna Theory (3 Credits)
The primary objective is to study the fundamental principles of antenna theory applied to the analysis and design of antenna elements and arrays including synthesis techniques and matching techniques. Topics include antenna parameters, linear antennas, array theory, wire antennas, microstrip antennas, antenna synthesis, aperture antennas and reflector antennas. A significant portion of the course involves design projects using some commercial EM software such as Ansoft Designer, Ansoft HFSS and SONNET and developing Matlab codes from theory for antenna synthesis and antenna array design. The measurement of antenna input and radiation characteristics will be demonstrated with the use of network analyzers, and spectrum analyzers in an anechoic chamber.
Prerequisites: EEEE-374 or equivalent course or graduate standing in EEEE-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-630 Biomedical Instrumentation (3 Credits)
Study of fundamental principles of electronic instrumentation and design consideration associated with biomedical measurements and monitoring. Topics to be covered include biomedical signals and transducer principles, instrumentation system fundamentals and electrical safety considerations, amplifier circuits and design for analog signal processing and conditioning of physiological voltages and currents as well as basic data conversion and processing technology. Laboratory experiments involving instrumentation circuit design and test will be conducted.
Prerequisites: EEEE-380 or equivalent course. Corequisites: EEEE-480 or equivalent course.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

EEEE-631 Biomed Sensors & Transducers I (3 Credits)
Biological entities represent one of the most difficult environments in which to obtain or generate accurate and reliable signals. This course will discuss the techniques, mechanisms and methods necessary to transfer accurate and reliable information or signals with a biological target. Various biomedical sensor and transducer types including their characteristics, advantages, disadvantages and signal conditioning will be covered. Discussions will include the challenges associated with providing a reliable and reproducible interface to a biological entity, the nature and characteristics of the associated signals, the types of applicable sensors and transducers and the circuitry necessary to drive them.
Prerequisite: EEEE-480 and EEEE-353 or equivalent course.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Spring

EEEE-632 Fundamental Electrophysiology (3 Credits)
Investigation and study of the concepts and underlying mechanisms associated with electrical signals in mammalian biology and physiology with a significant emphasis on methods, techniques and understanding of electrical potential distribution and current flow derived from circuit analysis. Intended to provide engineers with insight into the relationship between the study of electricity and its applicability to a wide variety of physiological mechanisms ranging from intracellular communication and control to cognitive function and bodily movement. Successful completion of the course will require generation of a significantly in-depth analysis report on some electrophysiological phenomenon or mechanism.
Prerequisites: EEEE-281 and MEDS-251 and EEEE-374 and MATH-221 or equivalent courses.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

EEEE-633 Biomedical Signal Processing (3 Credits)
Discussion and study of the methods and techniques that may be optimally employed for the fixed and adaptive processing of information with biological and physiological origin. The challenges and unique features of these types of signals will be discussed and application of known signal processing techniques that accommodate linear, non-linear and stochastic signals for the purpose of analysis, detection and estimation, monitoring and control will be studied. Successful participation in the course will entail completion of a project involving incorporation of these techniques in a biomedical application.
(Permission of instructor or graduate standing)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-636 Biorobotics/Cybernetics (3 Credits)
Cybernetics refers to the science of communication and control theory that is concerned especially with the comparative study of automatic control systems (as in the nervous system and brain and mechanical-electrical communications systems). This course will present material related to the study of cybernetics as well as the aspects of robotics and controls associated with applications of a biological nature. Topics will also include the study of various paradigms and computational methods that can be utilized to achieve the successful integration of robotic mechanisms in a biological setting. Successful participation in the course will entail completion of at least one project involving incorporation of these techniques in a biomedical application. Students are required to write an IEEE conference paper on their projects.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Spring

EEEE-646 Power Electronics (3 Credits)
The course involves the study of the circuits and devices used in the control and conversion of power. Devices include diodes, BJTs, power MOSFETS, IGBTs and thyristors. Power conversion includes rectifiers (ac-dc), dc-dc, ac-ac and inverters (dc-ac). DC circuit topologies include Buck Converter, Boost Converter, Buck-Boost Converter, and the Cuk converter.
Prerequisites: EEEE-282 or equivalent course.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Spring

EEEE-647 Artificial Intelligence Explorations (3 Credits)
The course will start with the history of artificial intelligence (AI) and its development over the years. There have been many attempts to define and generate artificial intelligence. As a result of these attempts, many AI techniques have been developed and applied to solve real life problems. This course will explore a variety of AI techniques and their applications and limitations. Some of the AI topics to be covered in this course are intelligent agents, problem-solving, knowledge and reasoning, uncertainty, decision making, machine learning, reinforcement learning, and real-world applications of AI. Students are expected to have solid programming skills, understanding of probability and linear algebra, and statistics. Students will write a conference-style paper based on a research project.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-661 Modern Control Theory (3 Credits)
This course deals with a complete description of physical systems its analysis and design of controllers to achieve desired performance. The emphasis in the course will be on continuous linear systems. Major topics are: state space representation of physical systems, similarities/differences between input-output representation (transfer function) and state spate representations, conversion of one form to the other, minimal realization, solution of state equations, controllability, observability, design of control systems for desired performance, state feedback, observers and their realizations.
Co-requisites: EEEE-707 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-663 Real-Time & Embedded Systems (3 Credits)
This first course in a graduate elective sequence will begin by presenting a general road map of real-time and embedded systems. The course will be conducted in a studio class/lab format with lecture material interspersed with laboratory work. This course will introduce a representative family of microcontrollers that will exemplify unique positive features as well as limitations of microcontrollers in embedded and real-time systems. These microcontrollers will then be used as external, independent performance monitors of more complex real-time systems. The majority of the course will present material on a commercial real-time operating system and using it for programming projects on development systems and embedded target systems. Some fundamental material on real-time operating systems and multiprocessor considerations for real-time systems will also be presented. Examples include scheduling algorithms, priority inversion, and hardware-software co-design.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-664 Performance Engineering of Real Time and Embedded Systems (3 Credits)
This course discusses issues of performance in real-time and embedded systems. Techniques for profiling the resource usage of a system and for measuring the effect of increasing system requirements will be covered. The control of physical systems will motivate the need for performance tuning of a real-time system. Students will write programs running under a real-time operating system that can maintain control of a physical system. The course will discuss and experiment with performance trade-offs that can be made using hardware-software co-design.
Prerequisites: EEEE-663 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

EEEE-665 Modeling of Real Time Systems (3 Credits)
This course introduces the modeling of real-time software systems. It takes an engineering approach to the design of these systems by analyzing system models before beginning implementation. UML will be the primary modeling methodology. Non-UML methodologies will also be discussed. Implementations of real-time systems will be developed manually from the models and using automated tools to generate the code.
Prerequisites: EEEE-663 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

EEEE-669 Fuzzy Logic & Applications (3 Credits)
In this course students are introduced to fuzzy systems and their applications in areas like control systems, signal and image processing, communications etc. Major topics are: Fuzzy sets and set operations, Evaluations of the rule sets using different implications, composition, aggregation and defuzzification methods. Applications in control systems: Development of fuzzy logic controllers for both linear and nonlinear systems & analysis and simulation studies of the designed systems. Function approximation using fuzzy systems. Students are also required to search published research works in other application areas like signal/image processing, communication, pattern recognition etc. and present their results to the class.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-670 Pattern Recognition (3 Credits)
This course provides a rigorous introduction to the principles and applications of pattern recognition. The topics covered include maximum likelihood, maximum a posteriori probability, Bayesian decision theory, nearest-neighbor techniques, linear discriminant functions, and clustering. Parameter estimation and supervised learning as well as principles of feature selection, generation and extraction techniques, and utilization of neural nets are included. Applications to face recognition, classification, segmentation, etc. are discussed throughout the course.
Prerequisites: EEEE-602 and EEEE-707 and EEEE-709 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-678 Digital Signal Processing (3 Credits)
In this course, the student is introduced to the concept of multi rate signal processing, Poly phase Decomposition, Transform Analysis, Filter Design with emphasis on Linear Phase Response, and Discrete Fourier Transforms. Topics covered are: Z- Transforms, Sampling, Transform Analysis of Linear Time Invariant Systems, Filter Design Techniques, Discrete Fourier Transforms (DFT), Fast Algorithms for implementing the DFT including Radix 2, Radix 4 and Mixed Radix Algorithms, Quantization Effects in Discrete Systems and Fourier Analysis of Signals.
Prerequisites: EEEE-707 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

EEEE-679 Analog Filter Design (3 Credits)
A study of the various techniques for the design of filters to meet the given specifications. The emphasis is on the design of active filters using op amps. The following topics are discussed in detail: Review of transfer functions, Bode diagrams and the analysis of op amp circuits; ideal filter characteristics, approximations to the ideal filter using Butterworth, Chebyshev and Bessel-Thompson polynomials; standard filter stages; magnitude and frequency scaling; low-pass filter design; design of high-pass, band-pass and band-reject filters; passive ladder filter network design; frequency dependent negative resistance networks; switched capacitor filters.
Prerequisite: EEEE-480 and EEEE-353 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Biennially

EEEE-683 Mechatronics (3 Credits)
The advanced topics on analysis, control and optimization of high-performance electromechanical systems are covered. Studies and learning are focused on electromechanical motion devices, amplifiers, controllers-drivers, multi-degree-of-freedom sensors, data acquisition, and, control systems. High-fidelity modeling, data-intensive simulations and experimental studies are pertain to industrial control systems as well as supervisory control and data acquisition systems. Novel sensing technologies, analog and digital control algorithms, and optimal design schemes are considered with applications to industrial platforms. Case studies include aerial, automotive, energy, robotic and servo systems.
Prerequisites: EEEE-353 or MECE-320 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-685 Principles of Robotics (3 Credits)
An introduction to a wide range of robotics-related topics, including but not limited to sensors, interface design, robot devices applications, mobile robots, intelligent navigation, task planning, coordinate systems and positioning image processing, digital signal processing applications on robots, and controller circuitry design. Pre- requisite for the class is a basic understanding of signals and systems, matrix theory, and computer programming. Software assignments will be given to the students in robotic applications. Students will prepare a project, in which they will complete software or hardware design of an industrial or mobile robot. There will be a two-hour lab additional to the lectures. Students are required to write an IEEE conference paper on their projects.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

EEEE-689 Fundamentals of MEMS (3 Credits)
Microelectromechanical systems (MEMS) are widely used in aerospace, automotive, biotechnology, instrumentation, robotics, manufacturing, and other applications. There is a critical need to synthesize and design high performance MEMS which satisfy the requirements and specifications imposed. Integrated approaches must be applied to design and optimized MEMS, which integrate microelectromechanical motion devices, ICs, and microsensors. This course covers synthesis, design, modeling, simulation, analysis, control and fabrication of MEMS. Synthesis, design and analysis of MEMS will be covered including CAD.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-692 Communication Networks (3 Credits)
This course covers communication networks in general and the internet in particular. Topics include layers service models, circuit and packet switching, queuing, pipelining, routing, packet loss and more. A five-layer model is assumed and the top four levels are covered in a top-down approach: starting with the application layer, going down through the transport layer to the network layer and finally the data link layer. Emphasis is placed on wireless networks and network security. Students would perform a basic research assignment consisting of a literature survey, performance analysis and dissemination of results in written and oral presentation.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-693 Digital Data Communication (3 Credits)
Principles and practices of modern digital data communication systems. Topics include pulse code transmission and error probabilities, M-ary signaling and performance, AWGN channels, band-limited and distorting channels, filter design, equalizers, optimal detection for channels with memory, synchronization methods, non-linear modulation, and introduction to multipath fading channels, spread spectrum and OFDM. Students would perform a basic research assignment consisting of a literature survey, performance analysis and dissemination of results in written and oral presentation.
Prerequisites: EEEE-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-694 Sensor Array Processing for Wireless Communications (3 Credits)
This course offers a broad overview of sensor-array processing, with a focus on wireless communications. It aims at providing the students with essential and advanced theoretical and technical knowledge that finds direct application in modern wireless communication systems that employ multi-sensor arrays and/or apply user-multiplexing in the code domain (CDMA). Theory and practices covered in this course can be extended in fields such as radar, sonar, hyperspectral image processing, and biomedical signal processing. Topics covered: uniform linear antenna arrays (inter-element spacing and Nyquist sampling in space); linear beamforming, array beam patterns, array gain, and spatial diversity; interference suppression in the absence of noise (null-steering beamforming); optimal beamforming in AWGN (matched filter); optimal beamforming in the presence of colored interference; estimation of filters from finite measurements and adaptive beamforming (SMI and variants, RLS, LMS and variants, CMA, and AV); BPSK demodulation with antenna arrays (multiple users and AWGN); BPSK demodulation in CDMA (multiple users and AWGN); ML and subspace methods (MUSIC, root MUSIC, Minimum-norm, Linear Predictor, Pisarenko) for Direction-of-arrival estimation; BPSK demodulation with antenna arrays in CDMA systems (space-time processing).
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-695 Optimization Methods for Engineers (3 Credits)
This course is designed to help the interested engineering students to develop working knowledge of optimization and, specifically, to develop the skills and background needed to recognize, formulate, and solve convex optimization problems. Convex optimization problems emerge naturally in the design and analysis of systems across the entire engineering spectrum. First, the course will briefly review basic concepts of linear algebra and calculus. Second, students will be introduced to optimization (problem formulation, feasibility sets, etc.) and principles of convexity, including convex functions, convex sets, convex problems and properties thereof. Then, an array of algorithmic numerical methods will be studied for the solution of convex problems, covering, among other topics, gradient methods, coordinate descent, Lagrangian duality, saddle points, optimality conditions etc. Last, the course will focus on how to formulate and solve convex problems in engineering, including convex approximation of non-convex problems and regularization. Many practical application examples will be studied from diverse areas of engineering. Through a series of assignments and in-class examples, students will learn how to practically solve optimization problems in MATLAB, using state-of-the-art toolboxes.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-699 Graduate Co-op (0 Credits)
One semester of full-time, paid employment in the electrical engineering field. See the graduate program coordinator or RIT's Office of Cooperative Education for further details.
Typically Offered: Fall, Spring, Summer

EEEE-707 Engineering Analysis (3 Credits)
The course trains students to utilize mathematical techniques from an engineering perspective, and provides essential background for success in graduate level studies. The course begins with a pertinent review of matrices, transformations, partitions, determinants and various techniques to solve linear equations. It then transitions to linear vector spaces, basis definitions, normed and inner vector spaces, orthogonality, eigenvalues/eigenvectors, diagonalization, state space solutions and optimization. Applications of linear algebra to engineering problems are examined throughout the course. Topics include: Matrix algebra and elementary matrix operations, special matrices, determinants, matrix inversion, null and column spaces, linear vector spaces and subspaces, span, basis/change of basis, normed and inner vector spaces, projections, Gram-Schmidt/QR factorizations, eigenvalues and eigenvectors, matrix diagonalization, Jordan canonical forms, singular value decomposition, functions of matrices, matrix polynomials and Cayley-Hamilton theorem, state-space modeling, optimization techniques, least squares technique, total least squares, and numerical techniques. Electrical engineering applications will be discussed throughout the course.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

EEEE-709 Advanced Engineering Mathematics (3 Credits)
The course begins with a pertinent review of linear and nonlinear ordinary differential equations and Laplace transforms and their applications to solving engineering problems. It then continues with an in-depth study of vector calculus, complex analysis/integration, and partial differential equations; and their applications in analyzing and solving a variety of engineering problems especially in the areas of control, circuit analysis, communication, and signal/image processing. Topics include: ordinary and partial differential equations, Laplace transforms, vector calculus, complex functions/analysis, complex integration, and numerical techniques. Electrical engineering applications will be discussed throughout the course.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

EEEE-710 Advanced Electromagnetic Theory (3 Credits)
The primary objective is to provide the mathematical and physical fundamentals necessary for a systematic analysis of electromagnetic field problems. Topics included: electromagnetic theorems and principles, scattering and radiation integrals, TE and TM in rectangular and circular waveguides, hybrid LSE and LSM modes in partially filled guides, dielectric waveguides, the Green's function. The course will also include projects using advanced EM modeling software tools.
Prerequisites: EEEE-617 and EEEE-629 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-711 Advanced Carrier Injection Devices (3 Credits)
A graduate course in the fundamental principles and operating characteristics of carrier-injection-based semiconductor devices. Advanced treatments of pn junction diodes, metal-semiconductor contacts, and bipolar junction transistors form the basis for subsequent examination of more complex carrier-injection devices, including tunnel devices, transferred-electron devices, thyristors and power devices, light-emitting diodes (LEDs), and photodetectors. Topics include heterojunction physics and heterojunction bipolar transistors (HBT).
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-712 Advanced Field Effect Devices (3 Credits)
An advanced-level course on MOSFETs and submicron MOS devices. Topics include MOS capacitors, gated diodes, long-channel MOSFETs, subthreshold conduction and off-state leakage, short-channel effects, hot-carrier effects, MOS scaling and advanced MOS technologies.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-713 Solid State Physics (3 Credits)
An advanced-level course on solid-state physics, with particular emphasis on the electronic properties of semiconductor materials. Topics include crystal structure, wave propagation in crystalline solids, lattice vibrations, elements of quantum mechanics, elements of statistical mechanics, free-electron theory of metals, Boltzmann transport equation, quantum-mechanical theory of carriers in crystals, energy band theory, equilibrium carrier statistics, excess carriers in semiconductors, carrier transport.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-715 Photonic Integrated Circuits (3 Credits)
This course focuses on photonic integrated circuits (PICs) - an emerging technology where photonic chips (consisting of waveguides, lasers, detectors, modulators and more) are manufactured using integrated circuit technology and closely integrated with microelectronics. The circuits are finding applications in high performance communication, computing and sensing systems. The technology is rapidly growing in complexity and demand, and as the advantages of using photons are realized and the manufacturing hurdles are overcome, photonic circuits will become ubiquitous in future microsystems. Course topics include, fundamental concepts (waveguides, interference, light-matter interaction), PIC component modeling, schematic and layout driven design, PIC fabrication techniques, and PIC testing to round out the students understanding of integrated photonics.
Prerequisite: EEEE-374 or MCEE-320 or equivalent course or graduate standing in MCSE-PHD or ENGR-PHD or EEEE-MS or CMPE-MS or MCEE-MS.
Contact Hours: Lecture 2
Typically Offered: Fall or Spring

EEEE-716 Lasers (3 Credits)
This course introduces students to the design, operation and applications of lasers (Light Amplification by Stimulated Emission of Radiation). Topics: Ray tracing, Gaussian beams, Optical cavities, Atomic radiation, Laser oscillation and amplification, Mode locking and Q switching, and Applications of lasers.
Prerequisites: EEEE-374 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Biennially

EEEE-717 Nonlinear Optics (3 Credits)
This course introduces nonlinear concepts applied to the field of optics. Students learn how materials respond to high intensity electric fields and how the materials response: enables the generation of other frequencies, can focus light to the point of breakdown or create waves that do not disperse in time or space (solitons), and how atoms can be cooled to absolute zero using a laser. Students will be exposed to many applications of nonlinear concepts and to some current research subjects, especially at the nanoscale. Students will also observe several nonlinear-optical experiments in a state-of-the-art photonics laboratory.
Prerequisites: EEEE-374 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Biennially

EEEE-718 Design and Characterization of Microwave Systems (3 Credits)
There are two primary course objectives. Design of experiments to characterize or measure specific quantities, working with the constraints of measurable quantities using the vector network analyzer, and in conjunction with the development of closed form analytical expressions. Design, construction and characterization of microstrip circuitry and antennas for specified design criteria obtaining analytical models, using software tools and developing measurements techniques. Microwave measurement will involve the use of network analyzers, and spectrum analyzers in conjunction with the probe station. Simulated results will be obtained using some popular commercial EM software for the design of microwave circuits and antennas.
Prerequisites: EEEE-617 and EEEE-629 or equivalent courses. Co-requisite: EEEE-790 or EEEE-792 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-720 Advanced Topics in Digital Systems Design (3 Credits)
In this course the student is introduced to a multitude of advanced topics in digital systems design. It is expected that the student is already familiar with the design of synchronous digital systems. The lecture introduces the operation and design principles of asynchronous digital systems, synchronous and asynchronous, pipelined and wave pipelined digital systems. Alternative digital processing paradigms are then presented: data flow, systolic arrays, networks-on-chip, cellular automata, neural networks, and fuzzy logic. Finally, digital computer arithmetic algorithms and their hardware implementation are covered. The projects reinforce the lectures material by offering a hands-on development and system level simulation experience.
Prerequisites: EEEE-520 or EEEE-620 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-721 Advanced Topics in Computer System Design (3 Credits)
In this course the student is introduced to advanced topics in computer systems design. It is expected that the student is already familiar with the design of a non-pipelined, single core processor. The lectures cover instruction level parallelism, limits of the former, thread level parallelism, multicore processors, optimized hierarchical memory design, storage systems, and large-scale multiprocessors for scientific applications. The projects reinforce the lectures material, by offering a hands-on development and system level simulation experience.
Prerequisites: EEEE-521 or EEEE-621 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-722 Complex Digital Systems Verification (3 Credits)
Due to continually rising system complexity, verification has become the critical inflection point for complex digital system success or failure. In this course students will study various concepts and technologies related to complex digital system verification with an emphasis on functional verification, top down design flows and advanced methodologies. The class projects reinforce the lectures material by offering hands-on development of a verification environment for a complex digital system.
Prerequisite: This course is restricted to students with graduate standing in EEEE-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-726 Mixed-Signal IC Design (3 Credits)
This is the first course in the graduate course sequence in analog integrated circuit design EEEE-726 and EEEE-730. This course covers the following topics: (1)Fundamentals of data conversion (2) Nyquist rate digital-to-analog converters (3) Quantization noise and analysis (4) Nyquist rate analog-to-digital converters (5) Sample and hold circuits (6) Voltage references (7) Static and dynamic testing of digital-to-analog converters (8) Cell based design strategies for integrated circuits (9)Advanced topics in data conversion.
Prerequisites: EEEE-510 or EEEE-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-730 Advanced Analog IC Design (3 Credits)
This is the second course in the graduate course sequence in analog integrated circuit design EEEE-726 and EEEE-730. This course covers the following topics: (1) Fundamentals of Filter Design (2) Filter Approximations (3) Frequency and Impedance Scaling (4) Delay Equalization (5) Sensitivity Analysis (6) Sampled Data Theory (7) CMOS Integrated Filters including Switched Capacitor and gm-C Filters (8)Phase Locked Loops
Prerequisites: EEEE-726 or equivalent course.
Contact Hours: Lecture 4
Typically Offered: Fall

EEEE-731 Integrated Optical Devices & Systems (3 Credits)
This course discusses basic goals, principles and techniques of integrated optical devices and systems, and explains how the various optoelectronic devices of an integrated optical system operate and how they are integrated into a system. Emphasis in this course will be on planar passive optical devices. Topics include optical waveguides, optical couplers, micro-optical resonators, surface plasmons, photonic crystals, modulators, design tools and fabrication techniques, and the applications of optical integrated circuits. Some of the current state-of-the-art devices and systems will be investigated by reference to journal articles.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-733 Robust Control (3 Credits)
This course will provide an introduction to the analysis and design of robust feedback control systems. Topics covered: overview of linear algebra and linear systems, H2 and H(spaces, modeling and paradigms for robust control; internal stability; nominal performance (asymptotic tracking); balanced model reduction; uncertainty and robustness; H2 optimal control; H(control; H(loop shaping; controller reduction; and design for robust stability and performance.
Prerequisites: EEEE-661 or equivalent course.
Contact Hours: Lecture 4
Typically Offered: Spring

EEEE-743 Digital Controls (3 Credits)
This course builds on the fundamentals of continuous feedback control to introduce the student to computer (digital) regulation of systems in closed-loop. Discrete-time modeling of signals and systems is discussed. Analog and digital control schemes are compared using s domain to z-domain conversion, and time-domain response characterization. Closed-loop system design objective specification and evaluation is conducted through numerical simulation. Various discrete-time controller designs are implemented. Topics for the class include: continuous to digital control conversion using finite difference solutions; continuous to digital control conversion using state equation approach; stability of discrete systems; PID control design for digital systems; frequency domain control system design methods for continuous systems (PID, lead, lag, lead-lag compensation design); frequency domain control system design methods for digital systems (PID, lead, lag, lead-lag compensation design) using phase loss methods and bilinear transformation; z-transforms for discrete systems; digital control system design using root locus ; and deadbeat control design. Students will be required to do computer projects using Matlab and program Arduinos. There will be two exams and several homework assignments
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-765 Optimal Control (3 Credits)
The course covers different optimization techniques, as applied to feedback control systems. The main emphasis will be on the design of optimal controllers for digital control systems. The major topics are: Different performance indices, formulation of optimization problem with equality constraints, Lagrange multipliers, Hamiltonian and solution of discrete optimization problem. Discrete Linear Quadratic Regulators (LQR), optimal and suboptimal feedback gains, Riccati equation and its solution, linear quadratic tracking problem. Dynamic Programming - Bellman's principle of optimality - Optimal controllers for discrete and continuous systems - Systems with magnitude constraints on inputs and states.
Prerequisites: EEEE-661 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-766 Multivariable Modeling (3 Credits)
This course introduces students to the major topics, methods, and issues in modeling multiple-input multiple-output (MIMO) linear systems. The course covers methods of creating models and refining them. Modeling topics include model-order determination, canonical forms, numerical issues in high-order models, creating frequency-response models from time-domain measurements, creating state-space models from frequency-response data, model-order reduction, model transformations and information loss, and estimating model accuracy of MIMO models. Use of MIMO models in controller design will be discussed.
Prerequisites: EEEE-707 and EEEE-709 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-768 Adaptive Signal Processing (3 Credits)
An introduction to the fundamental concepts of adaptive systems; open and closed loop adaptive systems; adaptive linear combiner; performance function and minimization; decorrelation of error and input signal. Adaptation algorithms such as steepest descent, LMS and LMS/Newton algorithm. Noise and misadjustments. Applications will include system identification, deconvolution and equalization, adaptive arrays and multipath communication channels.
Prerequisites: EEEE-602 and EEEE-707 and EEEE-709 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-771 Optoelectronics (3 Credits)
To provide an introduction to the operating principles of optoelectronic devices used in various current and future information processing and transmission systems. Emphasis in this course will be on the active optoelectronic devices used in optical fiber communication systems. Topics include optical resonators, quantum states of light, semiconductor optics, fundamental of lasers, light-emitting diodes, laser diodes, semiconductor photon detectors, optical modulators, quantum wells, and optical fiber communication systems.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-779 Digital Image Processing (3 Credits)
The first half of the course contains a detailed study of the mathematical tools required for understanding and implementing specific digital image processing algorithms such as an overview of the human visual system, Cartesian-separable vs. isotropic filters, fast approximation of Gaussian filters, a comprehensive review of 2-D digital spatial filters (LP, HP, sharpening, edge detection), the integral image, 2-D sampling strategies (e.g., Cartesian, Hexagonal, or general grid), fundamentals of image resizing (bilinear, bicubic, Lanczos, etc.), geometric transforms and image warping, and detailed coverage of 2-D discrete Fourier transform. The second half of the course focuses on specific digital image processing algorithms including contrast enhancement, noise reduction, sharpening, deblurring and segmentation. Some specific techniques for contrast enhancement are linear and nonlinear look-up tables, histogram equalization and modification, and contrast-limited adaptive HE (CLAHE). Algorithms for linear and nonlinear noise reduction include selective averaging, the sigma filter, the K-NN filter, bi-lateral filtering, median filtering, and deep networks. Sharpening techniques include nonadaptive and adaptive unsharp masking and relaxation of the boosting parameter. Deblurring techniques include the inverse filter and the Wiener filter. Finally, segmentation algorithms include various edge detection masks, the Otsu algorithm and adaptive thresholding. This course relies heavily on the knowledge of an undergraduate EE course in linear systems such as shift-invariant linear systems, impulse response, continuous and discrete Fourier transforms, the sampling theorem and the convolution operation. Additionally, EEEE678 serves as a good background or can be taken simultaneously.
Prerequisites: EEEE-353 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-780 Digital Video Processing (3 Credits)
In this graduate level course the following topics will be covered: Representation of digital video - introduction and fundamentals; Time-varying image formation models including motion models and geometric image formation; Spatio-temporal sampling including sampling of analog and digital video; two dimensional rectangular and periodic Sampling; sampling of 3-D structures, and reconstruction from samples; Sampling structure conversion including sampling rate change and sampling lattice conversion; Two-dimensional motion estimation including optical flow based methods, block-based methods, Pel-recursive methods, Bayesian methods based on Gibbs Random Fields; Three-dimensional motion estimation and segmentation including methods using point correspondences, optical flow & direct methods, motion segmentation, and stereo and motion tracking.
Prerequisites: EEEE-779 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-781 Image and Video Compression (3 Credits)
This course studies the fundamental technologies used in image and video compression techniques and international standards such as JPEG and MPEG. At the highest level, all visual data compression techniques can be reduced to three fundamental building blocks: transformation or decomposition (examples are discrete cosine transform or DCT, wavelets, differential pulse code modulation or DPCM and motion compensation), quantization (strategies include scalar vs. vector quantization, uniform vs. nonuniform, Lloyd-Max and entropy-constrained quantization) and symbol modeling and encoding (the concept of Markov source and its entropy, context modeling, variable length coding techniques such as Huffman and arithmetic coding and Golomb-Rice coding). This course studies all of these fundamental concepts in great detail in addition to their practical applications in leading image and video coding standards. The study cases include a comprehensive review of the JPEG lossless compression standard (based on pixel prediction and Huffman coding), the JPEG lossy compression standard (based on DCT and Huffman coding), a detailed study of wavelet decomposition and a brief overview of the MPEG family of standards (employing motion compensation in addition to aforementioned techniques). Course concepts rely heavily on knowledge of probability theory. It is strongly recommended that the students have the equivalent knowledge of a senior undergraduate or graduate level probability course such as EEEE602. The course assignments require proficient programming skills (either Matlab or Python).
Prerequisites: EEEE-353 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Summer

EEEE-784 Advanced Robotics (3 Credits)
This course explores advance topics in mobile robots and manipulators. Mobile robot navigation, path planning, room mapping, autonomous navigation are the main mobile robot topics. In addition, dynamic analysis of manipulators, forces and trajectory planning of manipulators, and novel methods for inverse kinematics and control of manipulators will also be explored. The pre-requisite for this course is Principles of Robotics. However, students would have better understanding of the topics if they had Control Systems and Mechatronics courses as well. The course will be a project based course requiring exploration of a novel area in Robotics and writing an IEEE conference level paper.
Prerequisites: EEEE-585 or EEEE-685 or equivalent course.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Spring

EEEE-785 Comprehensive Exam (0 Credits)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall, Spring, Summer

EEEE-787 MEMS Evaluation (3 Credits)
This course focuses on evaluation of MEMS, microsystems and microelectromechanical motion devices utilizing MEMS testing and characterization. Evaluations are performed using performance evaluation matrices, comprehensive performance analysis and functionality. Applications of advanced software and hardware in MEMS evaluation will be covered.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-789 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Prerequisites: This course is restricted to graduate students in the EEEE-MS, EEEE-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

EEEE-790 Thesis (1-6 Credits)
An independent engineering project or research problem to demonstrate professional maturity. A formal written thesis and an oral defense are required. The student must obtain the approval of an appropriate faculty member to guide the thesis before registering for the thesis. A thesis may be used to earn a maximum of 6 credits.
Typically Offered: Fall, Spring, Summer

EEEE-792 Graduate Paper (3 Credits)
This course is used to fulfill the graduate paper requirement under the non-thesis option for the MS degree in electrical engineering. The student must obtain the approval of an appropriate faculty member to supervise the paper before registering for this course.
Typically Offered: Fall, Spring, Summer

EEEE-793 Error Detection and Error Correction (3 Credits)
This course covers linear algebraic block codes, convolutional codes, turbo codes, and low-density parity-check codes. The fundamental structure of linear block code will be developed and applied to performance calculations. The structure of cyclic codes will be developed and applied to encoders and decoders. The major error correction methods, including error trapping, majority logic decoding and the BCH encoder and decoder algorithms will be developed. The Viterbi and sequential decoding algorithms will be studied. Questions of system performance, speed and complexity will be examined.
Contact Hours: Lecture 3
Typically Offered: Fall

EEEE-794 Information Theory (3 Credits)
This course introduces the student to the fundamental concepts and results of information theory. This is a very important course for students who want to specialize in signal processing, image processing, or digital communication. Topics include definition of information, mutual information, average information or entropy, entropy as a measure of average uncertainty, information sources and source coding, Huffman codes, run-length constraints, discrete memoryless channels, channel coding theorem, channel capacity andShannon's theorem, noisy channels, continuous sources and channels, coding in the presence of noise, performance bounds for data transmission, rate distortion theory.
Prerequisites: EEEE-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-795 Graduate Seminar (0 Credits)
The objective of this course is to introduce full time Electrical Engineering BS/MS and incoming graduate students to the graduate programs, campus resources to support research. Presentations from faculty, upper division MS/PhD students, staff, and off campus speakers will expose students to current research being pursued in different areas of electrical engineering and will provide a basis for student selection of research topics. All first year graduate students enrolled full time and BS/MS students starting the MS program are required to successfully complete one semester of this seminar.
Contact Hours: Seminar 3
Typically Offered: Fall

EEEE-797 Wireless Communication (3 Credits)
The course will cover topics in wireless communications, including: wireless propagation channels (propagation mechanisms, statistical description, channel characterization and modeling), modulation and demodulation, slow-flat fading channels, frequency selective channels, diversity methods, OFDM, spread spectrum, CDMA and channel coding. Applications of these systems, including wireless sensor networks would be discussed as well.
Prerequisites: EEEE-602 or equivalent course. Co-requisites: EEEE-593 or EEEE-693 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-798 Software Defined Digital Radio Communications (3 Credits)
Learn the principles and practices of how to engineer and implement software digital radio signal processing systems. Technology advances have brought us into the age of completely programmable full radio systems on a chip. ADC/DAC and high speed low power digital circuitry advances allow engineers to utilize digital signal processing techniques at RF and IF frequencies. By end of course students will understand how to statistically simulate receive and transmit fundamental digital radio modulations utilizing Matlab. As long as it is available by the time of the course and students/RIT can obtain equipment, exercises will be planned to implement some algorithms on a low cost educational digital radio kit (Analog Devices Educational Pluto Radio). Topics covered: OFDM, QAM, I/Q demod/mod, IF frequencies, encryption, channel interleavers, OSI Networking Layers 1 and 2. How to use iterative and non-iterative forward error correction (FEC) schemes. Efficient and proper utilization of RF spectrum, synchronization, radio channel equalization, understanding practical receive and transmit limitations, multipath channel models and an introduction to fixed point signal processing. The course will require much outside of class programming.
Prerequisites: EEEE-602 and EEEE-693 or equivalent course. Co-requisites: EEEE-797 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

EEEE-799 Independent Study (1-3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student must obtain the permission of the appropriate faculty member before registering for the course.
Typically Offered: Fall, Spring, Summer

Engineering - PhD program courses (ENGR)

ENGR-701 Interdisciplinary Research Methods (3 Credits)
This course emphasizes collaboration in modern research environment and consists of five modules. Students will introduced to the concepts of inter-disciplinary and trans-disciplinary research conducted from both a scientific and an engineering perspective. Students will learn how to write a dissertation proposal, statement of work, timeline for their program of study and the elements of an effective literature review. Students will develop skills related to reviewing and annotating technical papers, conducting a literature search and proper citation. Students will demonstrate an understanding of (a) ethics as it relates to the responsible conduct of research, (b) ethical responsibility in the context of the engineering professions, (c) ethics as it relates to authorship and plagiarism, (d) basic criteria for ethical decision making and (e) identify professional standards and code of ethics relevant to their discipline. Students demonstrate an ability to identify and explain the potential benefits of their research discoveries to a range of stakeholders, including policy makers and the general public.
Contact Hours: Lecture 3
Typically Offered: Fall

ENGR-702 Translating Discovery into Practice (3 Credits)
This course provides graduate students with the professional skills needed by PhD graduates within their major research focus area to move the results of their research from the lab into practice. Students will demonstrate a strong contextual understanding for their research efforts. Students will learn professional skills related to Teamwork; Innovation, Entrepreneurship and Commercialization; Research Management; Policy and Societal Context; and Technical Writing.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

ENGR-707 Engineering Analysis (3 Credits)
This course trains students to utilize mathematical techniques from an engineering perspective, and provides essential background for success in graduate level studies. An intensive review of linear and nonlinear ordinary differential equations and Laplace transforms is provided. Laplace transform methods are extended to boundary-value problems and applications to control theory are discussed. Problem solving efficiency is stressed, and to this end, the utility of various available techniques are contrasted. The frequency response of ordinary differential equations is discussed extensively. Applications of linear algebra are examined, including the use of eigenvalue analysis in the solution of linear systems and in multivariate optimization. An introduction to Fourier analysis is also provided.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ENGR-709 Advanced Engineering Mathematics (3 Credits)
Advanced Engineering Mathematics provides the foundations for complex functions, vector calculus and advanced linear algebra and its applications in analyzing and solving a variety of electrical engineering problems especially in the areas of control, circuit analysis, communication, and signal/image processing. Topics include: complex functions, complex integration, special matrices, vector spaces and subspaces, the nullspace, projection and subspaces, matrix factorization, eigenvalues and eigenvectors, matrix diagonalization, singular value decomposition (SVD), functions of matrices, matrix polynomials and Cayley-Hamilton theorem, state-space modeling, optimization techniques, least squares technique, total least squares, and numerical techniques. Electrical engineering applications will be discussed throughout the course.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ENGR-795 Doctoral Seminar (1 Credit)
This seminar course presents topics of contemporary interest to graduate students enrolled in the program. Presentations include off campus speakers, and assistance with progressing on your research. Selected students and faculty may make presentations on current research under way in the department. All doctoral engineering students enrolled full time are required to attend each semester they are on campus. (Graduate standing in a technical discipline)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

ENGR-877 Doctoral Internship (0 Credits)
Internship is designed to enhance the educational experience of PhD students through full-time employment. Students must submit a proposal for the internship, to be approved by an employing supervisor and the department prior to enrolling. Students are required to submit an evaluation report at the conclusion of the internship.
This course is restricted to students in the MCSE-PHD or ENGR-PHD program.
Contact Hours: Internship 3
Typically Offered: Fall, Spring, Summer

ENGR-889 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ENGR-890 Dissertation and Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students must successfully pass the PhD Candidacy examination prior to enrolling in this course
Contact Hours: Research 3
Typically Offered: Fall, Spring, Summer

ENGR-892 Graduate Research (1-6 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students may count a maximum of 9 credits of ENGR-892 towards degree requirements. If the student enrolls cumulatively in more than 9 credits of ENGR-892, the additional credits above 9 will not be counted towards the degree.
Contact Hours: Research 3
Typically Offered: Fall, Spring, Summer

ENGR-899 Independent Study (3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student and instructor must prepare a plan of study and method of evaluation for approval by the program director prior to course registration.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

English (ENGL)

ENGL-610 Transnational Digital Creation Workshop (3 Credits)
The Transnational Digital Creation Workshop is a project-based study abroad experience for students interested in storytelling, digital literature, interactive narrative, digital installation, new media design and technology, human-computer interaction, film, animation, photography, narrative, arts and culture, or global digital cultures. The workshop explores digital writing and transnational collaboration through its methods, its themes, and its practical preparation of students to travel to another country, learning about its official language and culture, as well as prominent digital arts and literary traditions, past and present. The course explores a specific country's cultural and artistic contexts and uses these as the basis for collaborative digital creation projects that students develop with their transnational peers (via videoconferencing, online communication, and through travel to the location to collaborate on-site). The course's transnational research and creation projects provide students with an opportunity to creatively explore themes of global concern, cross-cultural communication, language, and computation-based writing (as the latter is inflected by local and global influences) in one or more ways. This interdisciplinary workshop enables students to put their digital arts, creative writing, literary, and cross-cultural communication skills into practice in new ways, to build their professional portfolio, and to experience working on a cross-cultural team with specific linguistic, cultural, institutional, and site-specific opportunities, challenges, and parameters.
Contact Hours: Seminar 3
Typically Offered: Spring, Summer

ENGL-690 Creative Writing Workshop (3 Credits)
This course is for graduate students who want to explore creative writing. The focus will be on the generation and refinement of creative writing with an awareness of aesthetic principles and narrative techniques. Ongoing work will be discussed regularly with workshop groups, which will help students rethink their work and become better editors. Through reading, writing, discussion, critique, and revision, students will see their own writing in a larger aesthetic and historical context, culminating in a substantial body of work ready for publication. Students will lead a discussion about at least one of the readings; circulate their work to at least two venues; read their own work at least once in a public event; and produce an individual final project that, as applicable, connects with their thesis.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

Environmental Science (ENVS)

ENVS-601 Environmental Science Graduate Studies I (2 Credits)
This course helps graduate students learn how to assess journal articles, government reports, whitepapers, and essays as well as other relevant sources of information. Students will also refine their discussion and presentation skills and gain experience in effective communication to a diverse audience. This course will introduce students to careers in environmental science, to graduate studies in environmental science at RIT, and to the process of defining, conducting, presenting, and defending a thesis proposal.
This course is restricted to students in the ENVS-MS, ENVS-BS/MS program.
Contact Hours: Lecture 2
Typically Offered: Fall

ENVS-602 Environmental Science Graduate Studies II (1 Credit)
A continuation of Grad Studies I, which helps graduate students learn how to assess journal articles, government reports, whitepapers, and essays as well as other relevant sources of information. Students will continue to refine their discussion and presentation skills and gain experience in clarifying their comments and responding to questions from an audience. Student will complete the process of defining, creating, presenting, and defending a thesis proposal.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 1
Typically Offered: Spring

ENVS-615 Aquatic Ecology Seminar (1 Credit)
This graduate seminar course in aquatic ecology will focus on reading and critical evaluation of the peer-reviewed literature, formal and informal communication skills, and discussion of ongoing research in aquatic ecology. This discussion-based course is student lead, and may be retaken for credit.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

ENVS-631 Climate Change: Science Technology & Policy (3 Credits)
This multidisciplinary course will provide students with diverse perspectives on global climate change issues, providing a survey of important aspects of the problem augmented by readings in the primary literature. Topics include atmospheric chemistry, climate modeling, ecological impacts and feedbacks, economics of climate change, international climate policies, and social and environmental justice. The course will include a variety of instructors and guest lecturers, providing an overview of the complex and inter-related nature of global climate change. The course will culminate in a project based on finding solutions to the real-world problem of climate change. Students will be required to take a leadership role in bridging the multiple disciplines presented
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

ENVS-640 Ecological Models in Geographic Information Systems (4 Credits)
This course will introduce students to different types of ecological and environmental models, spatial problem solving analyses, and decision analysis methods used in the fields of ecology, conservation planning, and environmental science. The course will utilize the IDRISI TerrSet software to explore case studies and applications in Land Change, Habitat and Biodiversity, Ecosystem Services, and Climate Change. These will be supplemented by analyses using ArcGIS Pro and InVest software. Students will adapt one or more models for a final project and present their project in a Storymap format.
Prerequisites: BIOL-240 or BIOL-575 or ENVS-531 or equivalent course.
Contact Hours: Lecture/Lab 6
Typically Offered: Spring

ENVS-650 Hydrologic Applications of Geographic Information Systems (4 Credits)
Aerial photography, satellite imagery, Global Positioning Systems (GPS), and Geographic Information Systems (GIS) are extremely useful tools in hydrologic modeling and environmental applications such as rainfall runoff modeling, pollution loading, landscape change analyses, and terrain modeling. This course will: 1) introduce students to spatial analysis theories, techniques and issues associated with hydrologic and environmental applications; 2) provide hands-on training in the use of these spatial tools and models while addressing a real problem; 3) provide experience linking GIS and model results to field assessments and monitoring activities; 4) enable students to solve a variety of spatial and temporal hydrologic and environmental problems; and 5) provide tools useful for addressing environmental problems related to the graduate thesis or project.
Prerequisites: ENVS-250 or equivalent course or graduate standing in the ENVS-MS program.
Contact Hours: Lecture/Lab 6
Typically Offered: Spring

ENVS-670 Advanced Concepts of Environmental Chemistry (3 Credits)
This course will build on previous chemistry courses to expand knowledge of biogeochemical cycles, environmental toxicology and applied methods of environmental analysis. The course will be conducted in a workshop format at the graduate level.
Prerequisites: CHMO-231 and CHMO-235 or CHMO-331 and CHMO-335 or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ENVS-689 Graduate Special Topics (1-4 Credits)
This is a graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall, Spring, Summer

ENVS-780 Environmental Science Project (1-6 Credits)
This course will result in an Environmental Science project accomplished by the MS student for an appropriate topic as arranged between the candidate and the project advisor. Credit 1-6
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

ENVS-789 Graduate Special Topics (1-4 Credits)
This is a graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall, Spring, Summer

ENVS-790 Environmental Science Thesis (1-4 Credits)
The thesis option will be available to environmental science graduate students only with prior written approval of program faculty. Students will submit a proposal to a faculty member who agrees to serve as the student's thesis committee chair. The proposal will describe the basic research question to be investigated and the experimental protocols to be employed. Proposals will be reviewed by the program faculty who will give permission to register for thesis credit. This course may be taken several times over the course of a student's graduate program, for variable credits. A written thesis and oral defense are required at the completion of the thesis research.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ENVS-791 Continuation of Thesis (0 Credits)
Continuation of Thesis

ENVS-795 Environmental Science Graduate Research (1-4 Credits)
This course is a graduate level, faculty-directed, student project or research involving laboratory or field work, computer modeling, or theoretical calculations that could be considered of an original nature. The level of study is appropriate for students in Environmental Science graduate program.
Typically Offered: Fall, Spring, Summer

ENVS-798 Advanced Environmental Science Independent Study (1-4 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for student in the Environmental Science graduate program.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Environmental Sustainability Health & Safety Mgt (ESHS)

ESHS-601 Fire Protection (3 Credits)
Introduces fundamental concepts in protection of industrial workers and property from fire and explosion. Fire chemistry, control of ignition sources in industry, and properties of combustible materials are discussed. Fire detection and extinguishment are covered along with building construction for fire prevention, life safety, fire codes, and related topics. This course is co-listed with ESHS-501; students may receive credit for ESHS-501 or ESHS-601, not both.
Students cannot take and receive credit for this course if they have taken ESHS-501.
Contact Hours: Lecture 3
Typically Offered: Fall

ESHS-611 Occupational Health (3 Credits)
This course will provide students with an overview of the fundamentals of industrial hygiene. Emphasis will be on the toxicological effects of various industrial substances, on the body, monitoring and personal sampling for these substances and personal protection against such substances. This course maybe co-listed with ESHS-511; students may receive credit for ESHS-511 or ESHS-611, not both.
This class is restricted to degree-seeking graduate students or those with permission from instructor. If you have earned credit for ESHS-511 or you are currently enrolled in ESHS-511 you will not be permitted to enroll in ESHS-611.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ESHS-613 Solid and Hazardous Waste Management (3 Credits)
An examination of strategies and technologies to move an organization toward environmental sustainability, including resource use reduction, material substitution, process and product modification, and waste minimization; and for handling and managing wastes including treatment, storage, transport, and disposal storing solid and hazardous waste. Associated environmental impacts, regulatory concerns, technical feasibility, and costs are considered. (Students who have completed ESHS-310 Solid and Hazardous Waste Management may not receive credit for this course.)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

ESHS-614 Industrial Wastewater Management (3 Credits)
This course investigates characteristics and sources of industrial wastewaters, related environmental impacts, regulatory implications, and technical considerations of current treatment and disposal methodologies. Students learn to identify appropriate methods, technologies, and sequences for source reduction, treatment and pretreatment, direct discharge, and management of treatment residuals. (Students who have completed ESHS-330 Industrial Wastewater may not receive credit for this course.)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

ESHS-615 Air Emissions Management (3 Credits)
This course will present an overview of industrial air pollution management: its sources, methods of reduction, control, and management. Students will become familiar with the history of air pollution, the chemistry and effects of pollutants, regulations and standards, and control technologies as well as developing analytical and quantitative skills necessary in air emissions management decision-making. By the end of the course, students will be able develop a comprehensive facility air emissions management plan. This course maybe co-listed with ESHS-525; students may receive credit for ESHS-525 or ESHS-615, not both.
This class is restricted to degree-seeking graduate students or those with permission from instructor. Students cannot take and receive credit for this course if they have taken ESHS-525.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ESHS-620 Occupational Safety (3 Credits)
This course is an overview of the occupational safety management tools and techniques utilized in today's industry. Topics examined include OSHA requirements, record keeping, guarding, electrical safety, material handling, welding, fire prevention, excavation, medical surveillance, worker's compensation, inspection techniques, auditing, committees, incentives, and voluntary programs.
This course is restricted to students in the EHSM-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

ESHS-626 Exposure Assessment and Analysis (3 Credits)
The course focuses on industrial hygiene applications and hands on participation. Particular attention will be given to sampling strategies from similar exposure grouping, actual sampling experiences with a wide range of industrial hygiene instruments, and sampling analysis using statistical protocols. Field experience with instrumentation, as well as professional written and oral communication of results is emphasized. There are several out of classroom learning experiences required (team-based).
Contact Hours: Lecture/Lab 4
Typically Offered: Fall, Spring

ESHS-630 Mechanical and Electrical Controls and Standards (3 Credits)
Discussion of machine safety with emphasis on hazard analysis, risk estimation, safeguarding techniques, and electrical safety. Particular attention will be paid to applicable OSHA, ANSI, NFPA, and EN standards as they relate to wood, metal, films, and automation. Elements of the course will change regularly to reflect emerging issues in industry.
This course is co-listed with ESHS-530; students may receive credit for ESHS-530 or ESHS-630, not both.
This class is restricted to degree-seeking graduate students or those with permission from instructor. Students cannot take and receive credit for this course if they have taken ESHS-530.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ESHS-665 Sustainable Product Stewardship (3 Credits)
This course examines the principles of sustainable product stewardship, including the ethical, legal, and economic issues that product manufacturers face as well as the relationship between products and sustainability. Students will learn and apply some environmental sustainability, health and safety analysis techniques used to identify and manage product environmental sustainability aspects as well as health and safety hazards. Students will use case studies to examine the concept of product stewardship management through product life cycle thinking and extended producer responsibility. (Students who have completed ESHS-565 Product Stewardship may not receive credit for this course.)
Contact Hours: Lecture 3
Typically Offered: Summer

ESHS-680 Environmental, Health and Safety Management (3 Credits)
This is the initial course in the curriculum core of RIT's MS degree program in Environmental, Health and Safety (EHS) Management. It defines and profiles EHS management within the organization; explores EHS management history, motivations, and strategies; introduces a systems approach for managing an organization's EHS aspects, risks and opportunities consistent with international EHS standards; and investigates the elements and implications of developing an organization's EHS vision and policy statement. The course's unique delivery style includes online learning with capstone activities and presentations. Students may not take and receive credit for this course if they have already taken ESHS-580.
This course is restricted to ESHS-BS or ESHSEHSM-BSMS students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ESHS-699 ESHS Co-op (0 Credits)
Students will have the opportunity to gain appropriate work experience and applied knowledge of the profession working in one or more EHS areas. The graduate committee determines whether enrollment for one or more co-op semesters will be required. Department permission is required.

ESHS-722 EHS Law (3 Credits)
An overview of environmental, health and safety related law with an emphasis on legislative law. Topics include a review of the historical and modern sources for EHS law, the emergence of administrative law, and the responsibilities of the separate branches of government. Major EHS related legislation and their impact on EHS management systems will be covered.
This course is restricted to students in the EHSM-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

ESHS-725 EHS Accounting and Finance (3 Credits)
This course focuses on the environmental, health, and safety (EHS) costs of business decisions. Methods will be taught to identify and quantify EHS related costs and benefits that can lead an organization towards a more sustainable future.
This course is restricted to FCMG-MS, EHSM-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

ESHS-740 EHS Management System Design (3 Credits)
This course examines the design and development of environmental, health and safety management systems in order to implement an organization's policies and offers strategies for measurement of results in order to assess performance and ensure continual improvement. Significant team project work as well as individual work is required.
Prerequisites: ESHS-720 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ESHS-750 EHS & FM Project Management (3 Credits)
This course has been designed to give the student an overview of the fundamental concepts of modern project management. Areas of focus include the project life cycle (PLC), the project management body of knowledge (PMBOK), program evaluation review technique (PERT), critical path method (CPM), and various budgeting and resource allocation techniques. Discussion of project management organizations, negotiation and conflict resolution, and project termination will be included, along with an introduction to Project Management Institute (PMI) and Microsoft Project for Windows.
This course is restricted to FCMG-MS, EHSM-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

ESHS-755 Corporate Social Responsibility (3 Credits)
This course will introduce social responsibility concepts and approaches presented in key documents like the ISO 26000 Social Responsibility Standard, and will explore strategies for assisting an organization to identify and implement socially responsible initiatives appropriate to the nature and scope of its activities, products, and services.
This course is restricted to students in the EHSM-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

ESHS-760 Integrating EHS Management (3 Credits)
This course examines strategies for integrating EHS systems and processes. Using case studies, the course explores interrelationships between EHS and total quality management, business value, reporting, and approaches for sustainable business development. Students will be prepared to select appropriate quality tools to improve EHS processes; identify opportunities, strategies, and tools for integrating EHS into business management; and identify best practices in EHS/business integration.
Prerequisites: ESHS-720 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ESHS-770 Risk Assessment, Management & Communication (3 Credits)
This course focuses on risk management systems, including implementation of risk management and risk reduction strategies. The course includes case studies and application of risk analysis, technological risk, cost benefit analysis and decision-making under uncertainty in a corporate environment. Risk communication strategies are examined as an integral step in the risk management process.
Prerequisites: ESHS-611 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ESHS-780 EHS Internal Auditing (3 Credits)
This course provides an overview of the fundamentals of EHS internal auditing, including EHS internal audit program design and management principles, management system performance evaluation and corrective action techniques, and system improvements. Exercises provide opportunities to apply knowledge.
Prerequisites: ESHS-720 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ESHS-788 Thesis Planning (3 Credits)
Students will rigorously develop their thesis research ideas, conduct literature reviews, identify and plan methodologies, prepare schedules, and gain a clear understanding of the expectations of the faculty and the discipline. Each student will be required to prepare a committee approved thesis research proposal and may begin work on their thesis.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ESHS-790 Thesis (3 Credits)
The graduate thesis is a formal research document that empirically relates theory with practice. A formal written thesis and oral defense are required.
Prerequisites: GRCS-701 and ESHS-788 or equivalent courses.
Contact Hours: Thesis 5
Typically Offered: Fall, Spring

ESHS-792 Continuation of Thesis (0 Credits)
Continuation of Thesis
Enrollment in this course requires permission from the department offering the course.

ESHS-795 Comprehensive Exam (0 Credits)
A comprehensive exam is one of the non-thesis methodologies for completion of the MS degree. This course will provide a forum for independent review of the main concepts of the program core subject areas. The student will take an examination at the conclusion of the course and must receive a passing grade to be successful. Students will have one additional opportunity to pass this examination if their initial attempt is unsuccessful. Department approval is required.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Spring

ESHS-797 Graduate Project (3 Credits)
This course provides an opportunity for students to demonstrate their capabilities developed through their course of study to design, develop, and/or evaluate an EHS management related project culminating in a written report or manuscript and presentation.
Prerequisite: GRCS-701 or equivalent course.
Contact Hours: Project 3
Typically Offered: Fall, Spring

ESHS-798 Continuation of Graduate Project (0 Credits)
Continuation of Graduate Project
Enrollment in this course requires permission from the department offering the course.

Exercise Science (EXSC)

EXSC-640 Clinical Therapeutic Exercise (3 Credits)
Exercise elicits responses and adaptations from the body. In those living with chronic disease, exercise induced metabolic changes improve physiological function, enhancing health and functional capacity, while also reducing the risk of exacerbation or complications. Several chronic conditions will be explored with a culminating focus on the cardiovascular system. Come learn why the cardiovascular system benefits the most while presenting the greatest risk.
This class is restricted to DIET-MS or HLTHWB-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

EXSC-650 Exercise Physiology (4 Credits)
Exercise Physiology is the scientific basis for the field of Exercise Science. This course provides students with an opportunity to deepen their understanding of the body's responses and adaptations to exercise. Neuromuscular physiology is reviewed along with energy systems and mechanisms of fatigue. The cardiorespiratory system is examined with a focus on control and regulation during activity and there is a look at the physiological components of exercise training. Environmental factors that impact sport activities as well as training techniques which optimize performance will be reviewed. The differences in performance and adaptation that exist between children, adolescents, and adults as well as between males and females will be compared and contrasted. Exercise's influence on long term health and fitness will conclude the course. Laboratory experiences will allow students to integrate and apply the concepts of exercise physiology through investigative experiments.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

EXSC-689 Topics in Exercise Science (3 Credits)
Topics in Exercise Science engages graduate students to explore topics in exercise science that are either novel findings, of current concern, hold media interest, or require a unique presentation platform. Course content and delivery methods will vary for each course offering, but will include development of professional presentation skills, interpretation of evidence-based resources, and translation to future health and fitness practice.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

EXSC-690 Exercise Science Research (3 Credits)
This course is designed to give students an immersive and hands-on research experience. Students will use knowledge from prerequisite coursework to hypothesize, design, and conduct a research investigation that focuses on some facet of exercise physiology and science. Areas of skill development include hypothesis generation, logistical and ethical considerations of methodology construction, institutional review board submission, safe data collection, and data analysis and interpretation. This class will benefit those who desire an immersive hands-on exposure to conducting scientific research, and who wish to prepare for a career as a healthcare professional or graduate level scientist.
Prerequisites: EXSC-550 and (NUTR-560 or WSHN-560) or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

Film & Animation (SOFA)

SOFA-601 Graduate Production (3 Credits)
A fundamental course in 16mm non-synchronous film and basic digital video production. Filmmaking is presented as a means of interpretation and expression. This course will combine technical information, camera technique and editing with a theoretical and practical approach to motion picture continuity. Production is divided into two learning experiences: 16mm (non-sync) HD format and digital video format. Students will be responsible for purchasing their own film and processing.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-602 Production Processes (6 Credits)
This course is an introduction to various aspects of professional film/video narrative production. Course content focuses on collaborative production techniques with various student levels to reinforce team building needed to produce a film. At the completion of this course, students create short projects while learning basic shooting and crewing procedures, studio protocol, equipment handling and maintenance, and basic sync editing.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 2, Studio 10
Typically Offered: Fall

SOFA-603 2D Animation I: Fundamentals (3 Credits)
This course will introduce graduate students to the concepts and mechanics of movement for animation, focusing on, but not limited to, character based movement. Animation principles and theories on movement and acting will be introduced and applied using hand-drawn methods, which will serve as the foundation for their application in any desired medium. Various styles of animation timing will be examined and students will have the opportunity to develop their own sense of timing and movement. Multi-week exercises will be recorded using standard animation software, and will be reviewed, discussed and open to group critique.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Studio 6
Typically Offered: Fall

SOFA-604 2D Animation II: Mechanics (3 Credits)
This course will build on information gained from foundation animation courses. Multi-week assignments will allow students to fully grasp the production process involved in hand-drawn animation and develop an understanding of different parameters commonly found in animated films, including but not limited to character interaction, emotion and animal movement. Students will have the opportunity to explore various approaches to timing, movement, acting and characterization. Character design and solid drawing skills are highly recommended.
Prerequisites: SOFA-603 or equivalent course.
Contact Hours: Laboratory 3, Lecture 1
Typically Offered: Spring

SOFA-605 Basic Sound Recording (3 Credits)
This course will provide specialized knowledge and work in sound to prepare the student to be able to distinguish and evaluate proper sound techniques for film and animation productions. The course lays the foundation for professional work in the sound industry. Each student will record an audio and prepare a mixed soundtrack to professional quality standards.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-606 Graduate Directing (3 Credits)
An introduction to the arts of directing and acting with an emphasis on script analysis, performance, and blocking. Students direct and act in scenes from professional productions. Scenes are rehearsed outside of class, and then staged and critiqued in class.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-607 Advanced Directing (3 Credits)
Students will deepen their skills in analyzing scripts and directing actors while adding the breakdown of scenes into shots and the choreography of the camera with actors. Students will stage scenes from professional productions in class, and then shoot and edit them outside of class with a focus on creative rather than technical accomplishment.
Prerequisites: SOFA-606 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-608 Dramatic Structure (3 Credits)
This course explores the theories of dramatic structure from Aristotle to the present and applies these theories to current and classic dramatic works. The class also explores dramatic script structure as it is used in dramatic works on stage and screen.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall

SOFA-609 3D Animation III (3 Credits)
Over the semester, students will produce a series of short three-dimensional computer animations using pre-rigged characters. In this course, students will examine facial expressions and learn how to create emotion. Students will be presented with techniques to examine character and animal movement and apply them to the rigs. Students will be exposed to realistic and exaggerated movements.
Prerequisite: SOFA-695 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring

SOFA-610 Graduate Seminar (2 Credits)
A forum to establish among a diverse student group a common vocabulary for discussing film language and structure, collaborative relationships, and a sense of community, while exploring issues related to scene analysis, production practice and planning, story boarding, story telling, visual music, School of Film and Animation policies and professional business realities.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 2
Typically Offered: Fall

SOFA-611 History and Aesthetics of Animation (3 Credits)
This course will explore the beginnings, the evolution, and the creative and practical history of the animated film. This will include prehistory of animation, early film and animation history development, major trends, artists, animation studios, theoretical distinctions, and international identities in animation. Issues of animation aesthetics will also be revealed through discussions, readings and reviews of exemplary films: emphasizing the unique characteristics of the animated art form and how those characteristics are used as a means of interpretation and expression. Both orthodox and unorthodox animation will be highlighted. Films will be screened at every lecture.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 4
Typically Offered: Spring

SOFA-613 Graduate Screenwriting (3 Credits)
This course focuses on the forms and techniques of writing for visual media, particularly the short film. Throughout the course, students develop resources for finding stories and concepts that can be turned into films. Students are responsible for writing a short script of their own choosing and for completing several brief written exercises in areas such as personal storytelling, character development, dialogue, and plot. Scripts written in this class can be used as the basis for films produced in other classes.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-614 Business and Careers in Film (3 Credits)
An introduction to all aspects of the business side of professional film/video narrative and commercial production. Students develop a business plan to create their own production company while learning alternative careers in film, basic financial and legal protocol, and mental preparation needed to enter the film business market.
Prerequisites: SOFA-621 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

SOFA-615 3D Animation Fundamentals (3 Credits)
This course will provide a fundamental understanding of computer-generated three-dimensional imagery and world-building. Using top industry-standard software Autodesk Maya, students will explore the technology and processes of professional world-creation and animation. Students will experience the creation of completed digital animations and display skills in 3D modeling, animation, lighting and rendering.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-616 Virtual Production I (3 Credits)
Virtual Production I introduces the theory and practice in the evolving field of virtual cinematic and television production. Students are exposed to the techniques and workflows associated with virtual production and previsualization using current and future hardware and software, computer graphics, immersive technology, real-time rendering, game engines, and practical filmmaking. Technologies addressed include AR (augmented reality) and VR (virtual reality) for scouting, environment and asset creation, motion capture for previsualization and real-time production, virtual cinematography, lighting design, real-time visual effects (VFX), and set extension. Students will use project management techniques and work in teams to research and develop an array of pipeline and technology needs for the successful creation of creative narratives. By the completion of the course, students develop a working knowledge of engineering and design thinking and an immersion in the methods of teamwork in the disciplines which enable modern virtual production.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-617 Stop Motion Puppet Fundamentals (3 Credits)
This introductory course will give graduate students a basic and solid understanding of stop-motion animation. The class will cover aspects of stop-motion in its various forms but will mainly concentrate on stop-motion puppet / character animation. There will be demonstrations on model fabrication, animation techniques and camera / grip techniques. Topics, such as latex and silicon mold-making and intensive postproduction techniques will be introduced.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-618 Business and Careers in Animation (3 Credits)
This class will be geared toward the small animation business owner, the studio employee, and the individual freelance animator. The course will discuss the setting up of a small business and all of its operations. The elements of discussion will teach students how to approach animation work in the industry from a small business perspective and from an individual approach. The class will discuss the creation of sample reels, websites, self-promotion, contracts, negotiation, pitching, fund-raising, research and interview techniques all related to the individual animator. Crowdfunding and grant writing will be discussed. There will be guest interviews from animation professionals. Discussions of ethics and individual responsibilities will be covered.
Prerequisites: SOFA-622 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-619 2D Effects Animation (3 Credits)
This course will examine and record the natural world to help craft both naturalistic and supernatural 2D effects animation. Building on knowledge gained from foundation animation courses, the course content will cover physics, dynamics, and variation represented in elements such as water, fire, wind, and more. Analysis and adaptation of physics, filmic context, and visual aesthetics will be explored to develop proficiency in both conceptual and practical uses of 2D effects animation.
Prerequisites: SOFA-603 or equivalent course.
Contact Hours: Laboratory 6
Typically Offered: Fall or Spring

SOFA-620 3D Modeling Mastery (3 Credits)
In this advanced three-dimensional modeling course, students will refine their knowledge and skills by creating objects and characters in 3D space. Students will build and create on their previous modeling knowledge and will be introduced to digital sculpting. Modeling concepts such as edge-loop placement for proper animation deformation will be emphasized.
Prerequisites: SOFA-615 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-621 Spring Film (3 Credits)
In this course students will complete their first full semester production. Students must decide on a concept, develop a treatment, write a script or research a non-fiction subject. Student will produce a film complete with mixed track and finished titles and credits.
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-622 30 Second Film (3 Credits)
An introduction into the world of producing television commercials or other 30 second films. Major emphasis will be placed on learning to generate and intensify a personal statement through creative projects. Work is critiqued weekly by the instructor and class. Students execute the production of a completed 30 second film.
Prerequisites: SOFA-603 or SOFA-615 or SOFA-617 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-623 Stop Motion Master Class (3 Credits)
This course will introduce SOFA students to advanced techniques of photographic single frame production. This course will concentrate on professional animation techniques used in studios. Fabrication techniques will also be introduced, including: sculpting, mold building, and basic prop making. Camera and lighting are explored along with rig removal and other post-production processes specific to stop-motion. The class will be divided into teams that will execute a final project complete with post and sound work.
Prerequisites: SOFA-617 or equivalent course and graduate student standing in FILMAN-MFA.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-624 Tradigital Animation (3 Credits)
The computer has become an integral part of modern animation production. This course will introduce students to the application of computer technology to animation to aid them in incorporating it into their personal skill sets. The focus will be on adapting traditional techniques to the digital production environment. The student will work with professional level animation software using both raster and vector graphics to produce several short exercises adapted from traditional techniques that will develop the skills needed to efficiently and effectively use two-dimensional digital tools in their own work.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-625 Animated Acting Principles (3 Credits)
This course will give students an opportunity to explore a visual language of acting and posing that will help their storytelling abilities. Acting, timing and pacing are critical elements to any successful character animated film. Identifying and building a library of expressions, poses, and movement for emotional and visual expression is the goal for each student. Students will study reference material from silent and animated films. Students will also create their own reference material through acting and filming. The visual references will be scrutinized on a frame-by-frame basis for a deeper understanding of this visual language. Students will produce animated studies related to the acting principles.
Prerequisites: SOFA-630 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-626 Writing the Short (3 Credits)
This course will explore the short screenplay as its own genre and as a stepping-stone to writing longer forms. Students will improve their ability to develop goals and obstacles and, thereby, create a complete narrative journey. Students will write approximately a 15 minute film or animation scripts. Film scripts will be used in production courses.
Prerequisite: SOFA-613 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-627 Pre-Production for Animators (3 Credits)
Using pre-production steps, students will produce short film ideas. The course will cover concept creation, treatments, scripts, storyboards, design, budgets and experimental film structures. Students will make weekly presentations and work will be critiqued.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-628 Animation Writing and Visual Storytelling (3 Credits)
This course will provide an in-depth examination of structural elements of both the written and visual aspects of the animated film and the pre-production process. Particular attention will be given to: the application of materials, short film format, and layout of movements, visual composition, and storyboarding. Along with visualization and writing exercises, students will conceive a story idea, develop it in to formatted animation storyboards and create an animatic.
Prerequisite: SOFA-627 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-629 Experimental Animation (3 Credits)
This course explores the concept of animation as a fine art practice. Course content will cover various techniques and concepts within experimental animation. Lectures will be enriched through film screenings and in-depth class discussions and demonstrations. Students will explore adventurous techniques and mediums such as, but not limited to, direct-on-film processes, stop motion paint, phenakistoscopes, stratacuts, charcoal/chalk board palimpsests, maximum loop cycles, paper cut-out animation, and sound. At the completion of the course, students will have a thorough understanding of the scope of experimental animation techniques.
Prerequisites: SOFA-603 or SOFA-615 or SOFA-617 or equivalent course.
Contact Hours: Laboratory 3, Lecture 1
Typically Offered: Fall or Spring

SOFA-630 Animation Film Language (2 Credits)
This course will introduce the historical and contemporary discourse on the theory, aesthetics and characteristics of the animated film. Lectures, readings, writing assignments, classroom discussions, and film viewings will emphasize animation's diverse history, theories, philosophical and practical aspects. Concepts of animation production and related classification and terminology will be presented.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 2, Seminar 1
Typically Offered: Fall

SOFA-634 Virtual Production II (3 Credits)
Virtual Production II addresses advanced topics in the evolving field of virtual cinematic and television production and serves as a practical film workshop. Students will develop mastery of the techniques and workflows associated with virtual production and previsualization using current and future hardware and software, computer graphics, immersive technology, real-time rendering, game engines, and practical filmmaking. Students will use project management techniques and work in teams to produce short fiction projects using virtual production technologies. Students specializing in a cinematic craft or cinematic engineering will contribute their role-specific skills to the projects. Intensive pre-production protocol and documentation are followed. VFX, editing, and sound design will be completed through post-production workflows as well. Students will complete projects for screening at the end of the semester.
Prerequisites: SOFA-616 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-635 Acting for Film (3 Credits)
A course in basic acting technique with an emphasis on the requirements of film production. Students are introduced to various approaches to acting through exercises and by performing in scenes from professional productions. Scenes are rehearsed outside of class, and then staged and critiqued during class time.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

SOFA-637 Radical Cinema Workshop (4 Credits)
Students will produce at least one completed artistic work that uses the moving image. This course demands the use of alternative expressions in concept, style, or technology, and students are encouraged to take risks, break "rules" and explore their own unique creative potential. Students may work in a variety of media, depending on their proficiencies and their vision of the project. Students will complete projects for screening at the end of the semester.
Prerequisites: SOFA-621 or SOFA-622 or equivalent course.
Contact Hours: Lecture 4
Typically Offered: Fall

SOFA-638 Complete 3D Character Creation (3 Credits)
This course will explore the process of character creation, specifically character rigging for digital animation. Students will learn to build a working rig by applying their research into body mechanics, character deformation, and dynamic restructuring. Students will combine their understanding of aesthetic character creation with the study of 3D technology. Students will be exposed to automation through code-building and expressions. This course has an additional research component.
Prerequisite: SOFA-695 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-639 Advanced Camera (3 Credits)
This hands-on course provides a comprehensive understanding of the camera department on a film set. Students will build core competencies as camera assistants by studying various motion picture camera equipment. Beginning with the Arri SR3 film camera and progressing to modern digital production workflows, students will gain hands-on experience with the essential processes and tools for the camera department. Camera checkout, film loading, set etiquette, lenses, focus pulling, as well as the business of freelancing will be covered. Upon completing this course, students will be prepared to offer professional technical support on projects within the SOFA program and develop marketable skills for freelance production work.
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

SOFA-640 Node Based Material Creation (3 Credits)
This course will introduce students to the creation of materials and textures using graphs of individual procedural nodes. Student will use industry standard non-destructive software such as Substance Designer. This non-destructive workflow allows artists to iterate on their material designs, without destroying previous versions of the materials, thus providing a great deal of flexibility in the material creation process. Students will learn how to import their texture files into 3D software such as Maya, and a game engine such as the Unreal Engine. The textures will then be incorporated into materials that can be applied to assets for 3D animated films or games.
Prerequisites: SOFA-615 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring or Summer

SOFA-641 Advanced Sound Recording (3 Credits)
This course continues the work from Basic Sound Recording to include audio synchronized or locked to picture and the use of Foley and ADR production techniques. Students will develop workflow approaches for complex multi-track mixing and signal manipulation. Each student will prepare a mixed track to professional quality standards and manages sound and video files between various hardware and software platforms.
Prerequisite: SOFA-605 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-642 History and Aesthetics: Animation Stories (3 Credits)
This course will provide an in-depth study of an animation artist, animated genre, or other specific topic that has had a major impact on the animated film art form. Films will be viewed and discussed in the context of the specific time and places in which they were made. Emphasis will also be place on determining the unique characteristics of the animation medium and how those characteristics are used as a means of interpretation and expression.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 4
Typically Offered: Spring

SOFA-643 Targeting an Audience: Developing Content for TV (3 Credits)
This course will introduce students to the methods and strategies used by studios and TV networks to develop content that appeals to specific audiences. The student will gain insight into both the business and creative aspects of developing television content. Each student will choose a TV network to study and through a series of assignments will develop a profile of the audience their network attracts. This information is used by the student to create an appropriate 90-second film using the style and subject matter that fits the chosen network and its viewers. This course offers an unique feature through webcam interviews with Hollywood development executives, writers, and producers. Finished films will receive personalized feedback from a panel of entertainment professionals.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-644 Cinematic Compositing (3 Credits)
Students will learn digital compositing using rotoscoping, image tracking, alpha channels and transparency. Composites may be accomplished through green screen shooting, transfer modes, masks, and/or traveling mattes. Students will shoot their own footage to combine with their effects to create the final image. Node based compositing will be addressed as well.
Prerequisite: (SOFA-602 or SOFA-624) or equivalent courses.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-652 Alternative Frame by Frame (3 Credits)
This course will give all students a chance to explore three different approaches to stop-motion animation. The class will study and experiment with pixilation, time-lapse and relief animation with a “down-shooter.” These techniques will expand the student’s knowledge of traditional and experimental animation and present an alternative means of expression. The class will study existing work with these techniques, analyze and discuss them with the instructor and then produce several examples of their own after instruction for each approach. There will be a final project in the technique of the student’s choice.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-655 Film Practice: (3 Credits)
In this course students and faculty collaboratively produce a film project determined prior to the start of class. Students attend class and work on the production in specific job functions. This course can be taken twice with different topics. Topic is determined by the instructor.
Prerequisites: SOFA-621 or equivalent course.
Contact Hours: Studio 4
Typically Offered: Fall or Spring

SOFA-657 Digital Color Correction (3 Credits)
This course offers hands-on projects to develop the skills needed to understand and communicate the process of digital color correction and grading. Course content will cover technical workflow planning and calibration from simple primary color correction to advanced secondary and color separation methods. At the completion of this course, students will be able to use tone and color to augment theatrical storytelling and add a dimension of professional finish to their films.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-660 Documentary Film History (3 Credits)
This course will examine the development of documentary film from 1920 to the present. Key activities will explore: documentary filmmaking, including the Grierson social documentary, the Flaherty romantic tradition, cinema verite, propaganda films, first person narratives, and experimental documentary. Through film viewings, class discussions, and assigned readings, the student will critically examine how documentary film is constructed in relationship to the film’s content and meaning.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture/Lab 5
Typically Offered: Spring

SOFA-661 New Documentary Issues (3 Credits)
This course will examine the current trends in documentary film during the last decade. Students will view 1-2 documentary films each week. Students will examine each film critically; analyzing the film’s theme, structure, style, relationship to reality, and effectiveness. In addition, students will examine how current filmmakers interpret and build upon the basic ideas and discourse that have defined documentary filmmaking since its beginnings. Graduate students will be required to do additional research on various topics and write extended papers.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture/Lab 4
Typically Offered: Fall

SOFA-662 Film History (3 Credits)
This course examines selected, varying film topics in a wider socio-historical context. Seminar themes change each year and may include topics such as post-war German film, films of the Holocaust, Japanese film, Surrealist and Magic Realist film, Soviet film, Native Americans on film, etc. Students are expected to participate actively in the course discussions.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall, Spring

SOFA-663 Writing the Feature (3 Credits)
This is course is an exploration of the feature film form. Students propose ideas for a feature length film and in consultation with the instructor and other students, write a detailed step outline and a substantial portion of the first draft.
Prerequisite: SOFA-626 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-664 Writing the Series (3 Credits)
This course is an introduction to all forms of series writing for television and the Internet. Students will choose to write either a one-hour pilot for a dramatic series, or a half-hour pilot and an additional episode for a single-camera comedy series. All students will develop and write a series “bible,” a thorough description of all the characters and the world in which the series takes place as well as how the series may develop with future plotlines.
Prerequisite: SOFA-626 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-665 Creative Research Workshop (3-6 Credits)
A research and/or production opportunity for advanced students with extensive prior experience in the field of animation or live action filmmaking to work on a special project independently or collaboratively under the supervision of a faculty adviser. Enrollment in this course is by application only and with permission of a faculty adviser.
This course is restricted to students in the FILMAN-MFA program.
Typically Offered: Fall, Spring

SOFA-670 30 Second Commercial Production (3 Credits)
An introduction to the world of producing television commercials. Students learn the workflow between advertising agencies, their clients and production companies. They also execute the production of a television commercial from conception to editorial.
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-671 Advanced Production Immersion (3 Credits)
This workshop provides students with the opportunity to learn more about a particular area of production such as editing, cinematography, lighting and sound. This course will be taught with an industry professional. This course can be taken multiple times but individual topics must be different.
Prerequisite: SOFA-602 or SOFA-628 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

SOFA-672 Mixing and Sound Design (3 Credits)
This course will continues the work completed Advanced Sound Recording by mixing multi-track sessions with video to post-produce several different projects to professional standards. Students will learn how to listen and develop a trained ear while understanding proper equalization and use of effects and digital signal routing. Sessions can include documentaries, dialog and musical productions. Students will also create templates and develop editing/mixing techniques to balance creativity and time constraints of a typical project.
Prerequisite: SOFA-641 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SOFA-675 3D Lighting and Texturing (3 Credits)
This course will offer an intensive look at lighting for three-dimensional animation pipelines. The focus of the course will be: surfacing, set-dressing, production design, and economical rendering techniques. Students will learn to observe, plan, replicate real-world environments, and apply to artistic interpretations of style and design. The course will also provide a balance between artistic needs and technical limitations in order to prepare a scene for post-production practices. This course has an additional research component.
Prerequisites: SOFA-615 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-676 After Effects for Animators (3 Credits)
This is an intermediate animation course that will focus on After Effects and how it is integrated into an animation workflow. The course will cover different aspects of the software including keyframe animation, motion graphics, visual effects development, puppet-building and character animation, world-building, and post-production effects and cleanup. Students will learn and engage with design and style development in animation production.
Prerequisites: SOFA-603 or SOFA-615 or SOFA-617 or equivalent course.
Contact Hours: Lecture/Lab 5
Typically Offered: Spring

SOFA-678 Cinematography and Lighting I (3 Credits)
This advanced level course will enable students to develop an appreciation for the multi-dimensional nature of the craft of cinematography and provide them with theoretical, technical and practical knowledge. Students will explore visual aesthetics and engage in conceptual and critical thinking. They will also learn about industry standards, best practices, and workflows and channel their learning into class projects.
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Lecture 4
Typically Offered: Fall or Spring

SOFA-681 Particle Effects and Dynamics (3 Credits)
This course is an introduction to the creation of three-dimensional generated visual effects designed to enhance film and animation productions. This includes everything from generated particle simulation to dynamic simulations of fluid, rigid bodies, and cloth. Students will work across multiple applications and learn to successfully integrate various elements into cohesive scenes.
Prerequisites: SOFA-615 or equivalent course.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall or Spring

SOFA-682 Underwater Cinematography (3 Credits)
This course is designed to prepare students to professionally complete cinematography assignments in an underwater environment. To accomplish this, the student will complete basic scuba diving training and achieve scuba diving certification. The student will become familiar with underwater video camera housings and accessories and basic underwater shooting techniques. A facility fee covers all equipment, off campus facility use, texts and insurance. **Fee: There is a lab fee required for this course**
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

SOFA-683 Advanced Editing (3 Credits)
This course will focus on the professional workflow of editing digital film and video files to study the technical craft as well as the aesthetic choices that editors make. Students will practice the editing of all genres including short fiction, documentary, and experimental projects. Exploration of advanced software will facilitate editing short projects and tutorials. Areas of study include media management, color correction, visual and time-based effects, sound processing and track building, multi-camera usage, titling/graphics, and digital cinema proxy workflows.
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall or Spring

SOFA-684 Animation Gesture (3 Credits)
This course focuses on the mechanics of motion as applied to animated characters, both human and non-human. Working directly from a live model, costumed and nude, and employing visualization techniques, students will apply figure-drawing skills along with gesture drawing, focusing on the correct representation of weight, energy and force in sequential poses. Specific attention is paid to improving drawing skills in order to create stronger storytelling poses for animated properties. A variety of drawn animation examples will be screened in class.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Studio 6
Typically Offered: Spring

SOFA-688 DVD Authoring (3 Credits)
Students will develop a specific DVD that is based on a film they have completed. Class discussion will be geared towards presentation and interactivity. The student will use a variety of tools: menu development, subtitles, audio streams, encoding principles, hybrid DVD creation, web linking (DVD@ccess), and basic scripting.
Prerequisites: SOFA-601 or SOFA-622 or equivalent course and graduate student standing in FILMAN-MFA.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-689 Cinematography and Lighting II (3 Credits)
This course will focus on enhancing aesthetic skills through advanced cinematography topics. Students will build on what they learned in Cinematography and Lighting I and continue their cinematography practice using the best available tools in the department. The ultimate goal of this course is to enable students to explore their own personal cinematography aesthetic and style.
Prerequisite: SOFA-678 or equivalent course.
Contact Hours: Lecture/Lab 4
Typically Offered: Fall or Spring

SOFA-690 Los Angeles: Behind the Scenes (3 Credits)
An exploration of the interconnected careers of the entertainment industry and the city of Los Angeles for a behind-the-scenes look at either film or animation. Students travel during the winter break. During the course students will discuss the industry, city, and their travel. This course has a mandatory travel component and requires an additional travel fee. Permission to enroll is required.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture 1
Typically Offered: Spring

SOFA-691 Film Sound Theory: Music (4 Credits)
This course is one of three in the study of film sound theory. Through readings, focused group discussion, and the viewing of/listening to select films, the course promotes critical analysis of the varied and profound uses of music in sound design. Addressed is the history of music from the silent era to the modern score. The concepts studied include the modal changes in point-of-audition, and positioning across diegeses. Newer topics including audio-visualization and ventriloquism theory are also addressed.
This course is restricted to students in the FILMAN-MFA program.
Contact Hours: Lecture/Lab 6
Typically Offered: Fall, Spring, Summer

SOFA-692 Film Sound Theory: Effects (4 Credits)
This course is one of three in the study of film sound theory. Through readings, focused group discussion, viewing of and listening to select films, the course promotes critical analysis of the varied and profound uses of effects in sound design. Addressed is the history of effects from the early sound era to the modern design. The concepts studied include the modal changes in point-of-audition, and positioning across diegeses. Other topics include complementarity and the acousmatic.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3, Seminar 3
Typically Offered: Fall or Spring or Summer

SOFA-693 Film Sound Theory: Voice (4 Credits)
Through readings, focused group discussion, and the viewing/listening of select films, the course promotes critical analysis of the varied and profound uses of voice in sound design. The history of voice from the silent era to the modern sound design will be addressed. The concepts studied include the modal changes in point-of-audition, and positioning across diegeses. Other topics like vococentric mixing and separation; and dialogue theory, are also addressed. Each student gives a presentation on a chosen concept within film voice theory.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall, Spring, Summer

SOFA-695 Advanced 3D Animation (3 Credits)
This course will explore advanced character animation utilizing performance, emotion, and speech. Course content will include facial expressions and scenes with multiple characters interacting. Professional animation software will be used. By the end of the course, students will be able to create advanced biped character animation with dialogue and emotion.
Prerequisites: SOFA-615 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

SOFA-698 Film And Video Graduate Internship (1-6 Credits)
Provides the student with on-the-job experience in the field of film/video/animation. The student seeks and acquires a school approved internship position in a business or industry. The working environment provides the forum for learning more about the student's chosen career. A final interview with the internship coordinator assists the student in evaluating the experience. The coordinator should be the faculty member most familiar with the student's internship field.
Prerequisites: This class is restricted to students in FILMAN-MFA with at least 3.0 cumulative GPA and department permission to enroll.
Typically Offered: Fall, Spring, Summer

SOFA-699 Film and Animation Co-op (0 Credits)
Cooperative Education will provide Film and Animation students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in FILMAN-MFA with department permission.
Typically Offered: Fall, Spring, Summer

SOFA-717 Animation Workshop (4 Credits)
This course is the student's second experience producing a complete animated film individually or in collaboration with a classmate. In this workshop-style course, students will design and implement all phases of an animated film production and produce a short film with sound. Students will rely only on techniques learned in previous classes. The final film must be screened for the school community at the end of the course.
Prerequisites: SOFA-622 or equivalent course.
Contact Hours: Lecture 4
Typically Offered: Fall

SOFA-721 Fall Film (3 Credits)
This course allows 2nd year graduate student in production or screenwriting an opportunity to complete their second major production in the program. They must decide on a concept, develop a treatment, write a script or research a non-fiction subject and produce the film complete with mixed track and finished titles and credits.
Prerequisites: SOFA-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

SOFA-733 Hybrid Forms: Theory and Practice (3 Credits)
This graduate seminar explores storytelling across a multitude of hybrid forms. It examines an array of fictional and non-fictional strategies as fluid and organic form-content relationships that constitute the shared language between Cinema and New Forms. The creation of a hybrid character in this class is complemented by experimentation in the ways in which we experience characters and stories in contemporary times. Students develop a final semester project, two position papers and an artist statement. The course encourages the use of new media technologies including archival material, prosumer cameras and software.
Contact Hours: Lecture 4
Typically Offered: Spring

SOFA-748 Concept and Character Design (3 Credits)
This course will introduce students to the basics of design as applied to characters and environments for animated productions. Line, color, texture, shape, form and story will be referenced when developing characters and environments. Projects will utilize drawing, digital painting, and live action. In this course, a variety of exercises will explore tone, mood, deep and shallow space, and natural and imagined spaces. Students will develop their own personal process of visual development through a variety of exercises, working toward a final finished project.
Prerequisites: SOFA-603 or equivalent course.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

SOFA-780 Thesis Preparation Seminar (1 Credit)
The focus of this course is to develop a written proposal for an MFA Film Thesis. The thesis will provide the backbone of a candidate's final film-making production leading to the completion of MFA creative work and the supporting written document. Students must identify a thesis chair and form a committee. The course will prepare students to present and defend their thesis before a faculty committee seeking approval of the proposal.
Prerequisite: SOFA-717 or SOFA-721 or equivalent course.
Contact Hours: Seminar 2
Typically Offered: Spring

SOFA-790 Research and Thesis I (4 Credits)
This is the first of two courses designed to advance a student towards completion of their thesis. Students will work independently on their approved plan of work for their thesis while meeting on a regular basis with their committee chair. They are required to meet at least twice with their full committee during the semester.
Prerequisites: SOFA-780 or equivalent course.
Typically Offered: Fall

SOFA-799 Film and Animation Graduate Independent Study (1-4 Credits)
Film and Animation Graduate Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser, should propose a course of study or project with clearly defined deliverables. Students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll. Student must have a minimum of a 3.0 GPA to apply.
Prerequisites: This class is restricted to students in FILMAN-MFA with at least 3.0 cumulative GPA and instructor permission to enroll.
Typically Offered: Fall, Spring, Summer

SOFA-887 Film and Animation Part-Time Co-op (0 Credits)
Cooperative Education will provide Film and Animation students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in FILMAN-MFA with department permission.
Typically Offered: Fall, Spring, Summer

SOFA-890 Research and Thesis II (4 Credits)
This is the second of two courses designed to advance a student towards completion of their thesis. Students will work independently on their approved plan of work for their thesis while meeting on a regular basis with their committee chair. They are required to meet at least twice with their full committee during the semester as well as present a final screening of their thesis.
Prerequisite: SOFA-790 or equivalent course.
Contact Hours: Thesis 4
Typically Offered: Spring

SOFA-892 Continuation of Thesis Film and Animation (0 Credits)
Continuation of thesis course provides MFA students' additional semester(s) to complete their thesis research and supporting documents. Taking COT before a Thesis film is screened needs to have the approval of the Graduate Director.
Prerequisite: SOFA-890 or equivalent course.
Typically Offered: Fall, Spring, Summer

Finance (FINC)

FINC-605 Financing New Ventures (3 Credits)
A focus on financial issues affecting an entrepreneur. The course emphasizes, identifies, and follows the wealth creation cycle. The wealth creation cycle begins with an idea for a good, product or service, progresses to an initial company startup, passes through successive stages of growth, considers alternative approaches to resource financing, and ends with harvesting the wealth created through an initial public offering, merger or sale. Identification and valuation of business opportunities, how and from whom entrepreneurs raise funds, how financial contracts are structured to both manage risk and align incentives, and alternative approaches by which entrepreneurs identify exit strategies are reviewed.
Contact Hours: Lecture 3
Typically Offered: Spring

FINC-610 Financial Risk Management and Analysis (3 Credits)
Students learn about various financial risk measurement and management issues. The focus of this course is on analyzing financial and other risks using widely used methods and discussing various ways of managing the risks.
This course is restricted to FINC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

FINC-671 Survey of Finance (3 Credits)
This course introduces students to the field of finance and prepares them to undertake a study of advanced topics in other courses. Students learn about financial markets, regulation, and the fundamentals of corporate finance in areas such as investment and financing decisions. A brief overview of financial reporting allowing students to understand firm performance is also provided.
Prerequisites: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

FINC-721 Financial Analysis for Managers (3 Credits)
An examination of basic financial theories, techniques, and practices. Topics include: time value of money, valuation, capital asset pricing, risk and diversification, cost of capital, capital budgeting techniques and spreadsheet analysis. This course provides students with grounding in the basic financial theories, techniques and practices so they understand the role of finance in a corporation and so they are well prepared to study more advanced financial topics.
Prerequisite or Co-requisite: ACCT-603 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-722 Financial Management II (3 Credits)
This advanced course in corporate finance focuses on financing policies, financial planning/control, and other advanced corporate topics. Specific topics include the financing process, alternative financing instruments, restructuring, cost of capital, corporate applications involving options, working capital management and the use of financial budgets/forecasts.
Prerequisites: FINC-721 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-725 Securities and Investment Analysis (3 Credits)
A survey of topics in investment analysis, including the study of financial markets, features of various financial assets and security pricing. Focus is on individual security analysis (as distinct from portfolio analysis). Asset pricing theory is used in valuing securities. Practical issues in equity valuation are discussed including risk evaluation, macroeconomic/industry/competitive analysis, and the use of corporate SEC filings.
Prerequisites: FINC-721 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-732 Portfolio Management (3 Credits)
This course extends the knowledge of risk and return in a portfolio context to portfolio management. Topics include portfolio optimization, diversification strategies, hedging strategies and performance evaluation. A variety of investment tools (e.g., fixed income securities) and investment contexts (e.g., pensions) will be studied.
Prerequisites: FINC-725 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-740 Options and Futures (3 Credits)
This course focuses on financial derivative securities. Their role in financial management is becoming increasingly important, especially in portfolio management. This course covers valuation of various options and futures as well as their use in risk management. Specific topics include options and futures pricing models, options strategies, and contemporary topics such as index arbitraging.
Prerequisites: FINC-721 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-742 Financial Modeling and Analysis (3 Credits)
Students apply computer technology to solve finance-related problems using a variety of analytical methods. Analytical methods include spreadsheet modeling, mathematical optimization, regression, decision tree analysis, and Monte Carlo Simulation. Typical topics covered are financial forecasting, pro-forma financial statements, equity valuation, cash budget forecasts, and portfolio analysis. This is a hands-on course that focuses on collecting, managing and analyzing financial data.
Prerequisites: FINC- 722 and FINC-725 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-758 Seminar in Finance (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to finance. Specific topics will vary depending upon student and faculty interests and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics will normally vary from semester to semester. (instructor-determined)
Contact Hours: Lecture 3

FINC-760 International Finance (3 Credits)
This course has a specific focus on international business problems that are financial in nature. Topics include an examination of the international environment the firm operates in, international investment, exchange rates and the management of risks arising from shifting exchange rates, and the problems of short and long-term asset and liability management.
Pre or Corequisites: FINC-721 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

FINC-761 Stock Market Algorithmic Trading (3 Credits)
The course is a “hands-on” lab-based class designed to help students develop algorithmic trading strategies to invest in the stock market that can be implemented by retail and professional traders. What sets this course apart from many others is a strong emphasis on practical application with the purpose of building marketable skills for careers in finance. Concepts are not only taught, they are brought to life by learning how to design algorithmic trading models through the use of a computerized trading platform, that allows back-testing of data on thousands of different stocks. The software platform includes an automated wizard for building advanced technical trading models without programming knowledge; but also has an embedded programming language, similar to C-sharp, for those students that have those skills and elect to use them. (Knowledge of programming is not required; and there are no pre or co-requisites; but a lap-top is strongly recommended.).
Contact Hours: Lecture 3
Typically Offered: Spring

FINC-772 Equity Analysis (3 Credits)
Students learn about various equity markets, trading, and valuation. The focus of this course is on valuing equities using widely used methods and in forming and analyzing equity portfolios. Students also learn portfolio optimization methods.
Prerequisites: FINC-671 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

FINC-773 Debt Analysis (3 Credits)
Students learn about various debt markets, trading, and valuation. The focus of this course is on valuing debt instruments using widely used methods and in forming and analyzing debt portfolios.
Co-requisites: FINC-671 & FINC-721 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

FINC-774 Advanced Derivatives (3 Credits)
Students learn about derivatives contracts, their pricing, and uses. The course will cover advanced financial engineering topics such as the engineering of fixed-income contracts, volatility positions, credit default swaps, and structured products.
Co-requisites: FINC-671 & MATH-736 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

FINC-780 Financial Analytics (3 Credits)
This course provides a survey of financial analytics applications in contexts such as investment analysis, portfolio construction, risk management, and security valuation. Students are introduced to financial models used in these applications and their implementation using popular languages such as R, Matlab, and Python, and packages such as Quantlib. A variety of data sources are used: financial websites such as www.finance.yahoo.com, government sites such as www.sec.gov, finance research databases such as WRDS, and especially Bloomberg terminals. Students will complete projects using real-world data and make effective use of visualization methods in reporting results. There are no pre or co-requisites; however, instructor permission is required – student aptitude for quantitative work will be assessed; waived for students enrolled in quantitative programs such as the MS-Computational Finance which have pre-requisites in the areas of calculus, linear algebra, and programming.
Contact Hours: Lecture 3
Typically Offered: Fall

FINC-790 Field Exam Preparatory (1 Credit)
All MS-Finance students take a field exam at the end of their program. This course provides basic help to students taking this exam. (all required finance courses in the MS-finance program)
This course is restricted to FINC-MS Major students.
Contact Hours: Comprehensive Exam 1
Typically Offered: Fall, Spring, Summer

FINC-791 Computational Finance Exam Preparatory (0 Credits)
Computational finance students take a field exam at the end of their program. This course provides basic help to students taking this exam. (all required finance courses in the computational finance program)
Typically Offered: Fall, Spring, Summer

FINC-795 Computational Finance Experience (3 Credits)
Students apply their mathematical, data analytic, and integrative finance skills in a complex project involving real or simulated data. Under the supervision of an advisor, students work in teams to perform a stipulated task/project and write a comprehensive report at the end of the experience. Subject to approval by the program director, an individual student internship/co-op followed by an in-depth report may obtain equivalent credit.
This course is restricted to CMPFINC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Summer

FINC-799 Independent Study Finance (3 Credits)
The student will work independently under the supervision of a faculty adviser. (Instructor approval)
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

FINC-810 Research Seminar: Technology in Accounting & Finance (3 Credits)
This Ph.D. research seminar focuses on the two roles of technology in accounting and finance research in particular, and business research generally. First, the world of technology which includes information technology and analytics, has influenced research methods with techniques such as sentiment analysis and machine learning. Second, technology has transformed the practice of accounting and finance, through innovations such as the blockchain and has led to distinct areas of research such as fintech. This seminar will cover both aspects and has the objective of (a) allowing access to cutting edge research techniques and (b) developing research questions in tech related areas.
Contact Hours: Seminar 3
Typically Offered: Fall

FINC-820 Research Topics & Methods in Corporate Finance (3 Credits)
This Ph.D. research seminar scans relevant literatures in accounting and finance, develops ability to articulate research topics, and plan and execute various components of a research project. This course will introduce students to current research topics and methodologies in corporate finance with the aim of equipping students with the knowledge and analytical tools to carry out research project. This course covers various corporate finance topics, such as agency problems, corporate governance, executive compensation, financing, investing, merger and acquisition (M&As), taxes, and capital structure, etc. This course also provides students with a toolbox of analytical methods and hands-on experience of handling data that are commonly used in corporate finance field. The overall purpose is to develop a student's capability both in articulating ideas and in executing empirical projects in Corporate Finance field.
Contact Hours: Seminar 3
Typically Offered: Fall

FINC-830 Research Topics & Methods in Investment & Asset Pricing (3 Credits)
Investment and Asset pricing theories are foundations of modern financial economics. This course focuses on the no arbitrage pricing under a general equilibrium framework. Specific topics include decisions under uncertainty, modern portfolio theories, option pricing, behavioral finance, and models with asymmetric information. Students develop a solid understanding of the Investment and Asset pricing literature and research methodologies and search for potential research topics in the area of asset pricing.
Contact Hours: Seminar 3
Typically Offered: Fall

FINC-845 Valuation and Capital Budgeting (2 Credits)
The course introduces financial concepts of risk, return and valuation. The main application studied in this course, Capital Budgeting, arises in the corporate setting where managers allocate scarce resources to projects. Basic issues of capital budgeting covered include cash flow estimation and valuation techniques. Advanced issues include sensitivity analysis and the consideration of real options.
Prerequisites: ACCT-802 or equivalent course. Corequisites: DECS-810 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

FINC-846 Financial Planning and Analysis (2 Credits)
This is the second-part of a two-course corporate finance sequence for EMBA students. The overall theme is one of strategic control of corporate assets and liabilities. The five topics covered in this course are: (a) long-term financial planning, corporate financing and cost of capital (b) short-term financial planning and the analysis of short-term assets and liabilities (c) risk management and the corporate use of derivatives (d) the analysis of international activities (e) corporate control activities. Three topics are explored in depth: short-term financial management, capital structure and dividend policy, and risk and hedging. Short-term financial management includes the topics of credit analysis, financial forecasting and planning, working capital management and cash flow management.
Prerequisites: FINC-845 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

FINC-850 International Finance (2 Credits)
This course examines how the international environment affects the practice of corporate finance by using a combination of theory and cases. Topics include an examination of the international environment the firm operates in, international investment, exchange rates and the management of risks arising from shifting exchange rates, and the problems of short and long-term asset and liability management.
Prerequisites: FINC-846 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall

FINC-858 Seminar: Special Topics in Finance (3 Credits)
This research seminar focuses on timely, special topics not covered in other seminars. Topics rotate based on faculty expertise (such as Financial Institutions and Markets, Behavioral Research in Accounting) and student needs as determined by the department.
Contact Hours: Seminar 3
Typically Offered: Biennially

Fine Art Studio (FNAS)

FNAS-890 Research & Thesis (1-10 Credits)
After creating a body of artwork derived from the student's thesis proposal, the student must exhibit this work in a gallery. In the exhibition space, during this show, the student will meet with the thesis committee to examine the success of the artwork in relation to the proposal. The student will be expected to orally present and defend the ideas explored through the artwork. The student will conclude the thesis process by explaining the work and putting it into both a personal and artistic context in a written and published document.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring

Fine Arts (FNRT)

FNRT-776 Visual Culture (3 Credits)
FNRT 776 is a graduate-level counterpart to FNRT-476. As such, students enrolled under the 776 number will be required to read the otherwise recommended reading; meet with the professor outside of class for an additional weekly discussion; and produce a final project that connects with their thesis work. Following current debate in the Journal of Visual Culture and calls for upcoming conferences on Visual Culture, graduate students will approach images as sites of gesture and as agents of intellectual productivity. Visual Culture studies recognize the predominance of visual forms of media, communication, and information in the contemporary world, investigating both “high” cultural forms such as fine art, design, and architecture and popular "low" cultural forms associated with mass media and communications. Visual Culture studies represents a turn in the discourse of the visual, which had focused on content-based, critical readings of images, and has since broadened its approach to additionally question the ways in which our consumption and production of images and image based technologies are structured. Analyzing images from a social-historical perspective, visual culture asks: what are the effects of images? Can the visual be properly investigated with traditional methodologies, which have been based on language, not imagery? How do images visualize social difference? How are images viewed by varied audiences? How are images embedded in a wider culture and how do they circulate?
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

FNRT-777 Imag(in)ing Rochester (3 Credits)
FNRT-777 is a graduate-level counterpart to FNRT-477. Students enrolled under the 777 number will be required to read the City and Culture Reader in addition to regular course readings; meet with the professor outside of class for an additional weekly discussion; and produce a final project that connects with their thesis work. Examining the ways in which culture, ethnicity, languages, traditions, governance, policies and histories interact in the production of the visual experience, graduate level students will approach the campus of RIT and the city of Rochester and their various urban spatial forms as image experiences, subject to interpretative strategies and the influence of other discourses. We will wander the well-traveled and the unbeaten paths, participating in and interrogating a wide range of our campus’ and city’s treasures and embarrassments, secrets and norms. In addition to these field trips, we will be reading from literature and cultural studies, as well as viewing films, advertisements and websites, and possibly attending theatrical and music performances or sporting events.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

FNRT-783 Traumatic Images (3 Credits)
FNRT-783 is a graduate-level counterpart to FNRT-483. Students enrolled under the 783 number will be required to read extensively in trauma theory, especially Cathy Caruth, Ruth Leys, Lisa Saltzman, and Eric Rosenberg. This theoretical discourse will contextualize course readings and material. Students will also meet with the professor outside of class for an additional weekly discussion; and produce a final project that connects with their thesis work. Traumatic Images investigates visual culture and its imagistic response to life’s crises. Problems of identity and identification will be explored and confronted through works of photography, painting, mixed media, new media and film of the 19th, 20th, and 21st Centuries. Beginning with the late 19th Century vogue for images of hysterical women, crippled black-sheep family members and dead loved ones (as corpses and as ghosts), we then move on to consider the last century’s fascination with pain and suffering, disease and violence, struggle and survival and then the 21st century’s emphasis on terrorism. Specifically, we will focus on the gendering of images and imaging as disturbing pictures work to defy the formal and theoretical distinction between private and public, personal and collective experience and manage the often conflicting responsibilities to self, family, religion, race, nation and society.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

FNRT-784 Art of Dying (3 Credits)
FNRT-784 is a graduate-level counterpart to FNRT 484. Under the 784 number, graduate students will explore various disciplinary critiques of mourning practices and attitudes toward death. This interdisplinary discourse will contextualize concepts of pathorgraphy and autopathorgraphy. Students will also meet with the professor outside of class for an additional weekly discussion; and produce a final project that connects with their thesis work. This course explores the experience of dying—a profoundly human and universal experience—as it is represented by artists who are themselves facing immanent death. The unique and deeply personal process of each dying artist is crucially informed by social, cultural, and historical as well as artistic contexts. The course will focus primarily on visual artists and writers living with and dying of disease—such as AIDS, cancer, and cystic fibrosis—as well as mortality and age. Topics such as aesthetics, artistic media, representation, grief, bereavement, illness, care-giving, aging, and the dying process will be considered within the context of issues of race, class, ethnicity, sexuality, gender, and community values. Some of the artists covered will be Jo Spence, Hannah Wilke, Elias Canetti, Bob Flanagan, Herve Guibert, Tom Joslin, Laurie Lynd, Audre Lorde, Charlotte Salomon, Keith Haring, Frida Kahlo, Bas Jan Ader, Ted Rosenthal, Felix Gonzalez Torres, Keith Haring, Eric Steel, Derek Jarman, Eric Michaels, and David Wojnarowicz. We will also explore some of the critical theory of Roland Barthes, Michel Foucault, Elaine Scarry, Susan Sontag, and Ross Chambers.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

FNRT-799 Independent Study - Graduate (1-12 Credits)
Independent Study - Graduate

Furniture Design (CWFD)

CWFD-601 Furniture Design Graduate Studio (6 Credits)
Furniture Design Graduate Studio covers the advanced aesthetics and techniques of woodworking and culminating in the master's thesis. This program is structured on the basis of the individual student's needs, interests and background preparation as they may be determined through faculty counseling. There will be a strengthening of woodworking techniques, design fundamentals and encouragement of personal expression. The student will be encouraged to evaluate new techniques, materials and concepts. This repeatable course leads to the master's thesis, proposed by the student and approved by the faculty. Lab fee is required.
This course is restricted to students in the WOOD-MFA program.
Contact Hours: Studio 12
Typically Offered: Fall, Spring

CWFD-606 Design and Fabrication I (3 Credits)
This course will cover fundamental woodworking techniques associated with furniture design and construction. Through ideation and conceptual development, students will investigate the functional and aesthetic considerations of table design. Topics covered will include wood as a material and its basic properties, design development through drawing and modelmaking, the safe use and care of hand tools such as chisels and saws, and stationary power tools. Students will be introduced to wood joinery best suited for table construction including halved and bridle joints, and simple mortise and tenon construction. **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
Contact Hours: Studio 6
Typically Offered: Fall

CWFD-607 Design Methods and Practice I (3 Credits)
This course will provide students with fundamental techniques necessary to design and fabricate refined hand carved vessels and other wooden objects. Participants in this course will gain an understanding of the inherent properties of wood, identifying assets and limitations of the material as they design and build. Students will develop skills to formalize individual design ideas for presentation, planning and construction. Topics will include lumber selection, the safe and proper use of machinery and portable power tools, the care and use of gouges, spokeshaves and other sharp-edged hand tools, as well as sanding and wood finishing. Demonstrations, presentations, discussions, critiques, as well as individual meetings with students, will support the focus on craftsmanship, technical knowledge and design development. **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
Contact Hours: Studio 6
Typically Offered: Fall

CWFD-611 Design and Fabrication II (3 Credits)
This course will cover intermediate woodworking techniques associated with furniture design and construction. With a focus on aesthetics, structure, and functionality, students will design and construct furniture for seating such as a stools and benches. Topics covered will include intermediate joinery techniques, lathe turning, hand and power shaping, and the safe use of the multi-router, router table and rotary carving tools. Demonstrations, presentations, discussions, critiques, as well as individual meetings with students, will support the focus on craftsmanship, technical knowledge and design development. **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
Contact Hours: Studio 6
Typically Offered: Spring

CWFD-612 Design Methods and Practice II (3 Credits)
This course will cover the fundamental techniques associated with the design and construction of wooden boxes. Students will design and build a series of functional containers giving careful consideration to the inherent properties of the material. Course topics will include lumber selection and processing, joinery layout and corner joint construction, as well as the safe use of hand and power tools. Lid and hinging options, as well as intermediate hand finishing techniques will also be introduced. Demonstrations, presentations, discussions, critiques, as well as individual meetings with students, will support the focus on craftsmanship, technical knowledge and design development. **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
Contact Hours: Studio 6
Typically Offered: Spring

CWFD-630 Furniture Design Elective III (3 Credits)
This is a class designed for non-majors, covering a fundamental introduction to techniques and aesthetics of woodworking. Topics covered include the use of select hand tools and woodworking power tools, wood as a material, its basic properties and fundamental processes of wood fabrication. The course includes a prescribed project based on five in-class contact hours. **Fee: There is a lab fee required for this course**
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall, Spring

CWFD-698 Furniture Design Internship (1-6 Credits)
The Furniture Design Internship will provide students with the option to work in the furniture design or furniture manufacturing field. Students may apply for internships to businesses based on the availability of positions and business job needs. Students must obtain permission of an instructor and complete the Internship Permission Form to enroll. Registration with co-op and placement office also required.
Prerequisites: This class is restricted to students in WOOD-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CWFD-699 Furniture Design Co-op (0 Credits)
Cooperative Education will provide Furniture Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in WOOD-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CWFD-790 Furniture Design Thesis Initiation (6 Credits)
Initiation is the first of a two-semester sequential class covering creation of the master's thesis exhibition. Students will develop a topic of investigation for the master's thesis, select a graduate thesis committee, and begin the planning, research, and development of a body of creative work. There will be a strengthening of woodworking techniques, design fundamentals and encouragement of personal expression. Student will be encouraged to evaluate new techniques, materials and concepts. **Fee: There is a lab fee required for this course**
Prerequisites: CWFD-702 or equivalent course and student standing in the WOOD-MFA program.
Contact Hours: Studio 12
Typically Offered: Fall

CWFD-799 Furniture Design Independent Study (1-6 Credits)
Furniture Design Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser will propose a course of study. Furniture Design students must obtain permission of an instructor and complete the Independent Study Form to enroll.**NOTE: Student must have a minimum 3.0 GPA **
Prerequisites: This class is restricted to students in WOOD-MFA with instructor permission.
Typically Offered: Fall, Spring

CWFD-887 Furniture Design Part-Time Co-op (0 Credits)
Cooperative Education will provide Furniture Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in WOOD-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CWFD-890 Furniture Design Thesis Resolution (9 Credits)
Furniture Design Thesis Resolution is final course covering the completion of the Masters Thesis exhibition. Working from an approved topic of investigation for the Master's Thesis, students work independently and create a body of work supported by a written thesis paper. In consultation with a selected graduate thesis committee, students plan, research, and develop a body of creative work for exhibition and review. There will be a strengthening of woodworking techniques, design fundamentals and encouragement of personal expression. **Fee: There is a lab fee required for this course** Enrollment in this course requires permission from the department offering the course.
Contact Hours: Studio 12
Typically Offered: Spring

GCCIS College Level Courses (GCIS)

GCIS-610 Vertically Integrated Projects (VIP) for Computing - Graduate (1-3 Credits)
The Vertically Integrated Projects (VIP) engage undergraduate students in long-term, large-scale, multidisciplinary project teams that are led by faculty. VIP courses are project-based, team-based courses directly supporting faculty research and scholarship. VIPs under this course number have a particular focus on computation and applications of computing.
Typically Offered: Fall, Spring

General Engineering (EGEN)

EGEN-610 Vertically Integrated Projects in Engineering (1-3 Credits)
The Vertically Integrated Projects (VIP) engage students in long-term, large-scale, multidisciplinary project teams that are led by faculty. VIP courses are project-based, team-based courses directly supporting faculty research and scholarship. VIPs under this course number have a particular focus on engineering topics, with team membership coming from across RIT's colleges. Each VIP team has large-scale and multi-faceted objectives in research, design, entrepreneurship, and/or community outreach & service. A VIP faculty advises students on each VIP team, with each student participating from one to three years. VIP teams generally are comprised of undergraduate students as well as students at the Masters and PhD levels. New VIP students learn from and replace those who graduate by engaging in peer-to-peer learning and mentorship which sustains each VIP team beyond any one student. The teams are: Multidisciplinary - drawing students from different disciplines on campus; Vertically-integrated - maintaining a mix of undergraduate through PhD students each semester; Long-term - each student may participate in a project for up to three years. Students taking the 600-level course will: have technical foundations within their discipline, pursue needed knowledge/skills independently as-needed, make meaningful contributions, assume technical/leadership responsibilities, and serve as mentors for junior members. Students will be required to make significant contributions to the project, maintain detailed notebooks describing their contribution to the project, attend and participate in team meetings, learn about topics specific to each VIP via tutorials and readings from appropriate literature, and participate in reporting and presentations. Graduate students will focus on research skills, such as: reviewing literature and presenting to the team, developing research project plans, and participating in external paper submissions.
This course is restricted to students with Graduate standing in KGCOE.
Typically Offered: Fall, Spring

Glass (CGLS)

CGLS-601 Glass Graduate Studio: Concepts (3 Credits)
This course is designed to deepen the individual's understanding and connection to concepts in contemporary glass and art. Course content will include a chosen thematic focus relevant to issues in the contemporary art conversation that will influence student development and the course's conversation through various assignments and group activities. Readings, group discussion, written responses, and material research will culminate in self-directed projects based on a proposed topic of student investigation. Students will explore research themes through conversation, presentation, and workshops. Additionally, this course will host visiting artists who will contribute through lectures, studio visits and activities pertinent to their practices. This course may be retaken for credit. **Fee: There is a materials fee required for this course and an additional course fee applied via student account.**
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

CGLS-602 Glass Graduate Studio: Practice (3 Credits)
This course is designed to challenge the individual student's interests, background and capabilities to support a reinvigorated approach to their thinking and making in relation to glass. Course content will include exploration of technique and experimentation through student designed and implemented skill exchanges. Glass studios will be investigated in four-week blocks. Each block will tackle a different studio/technique/material question and will be supported by studio visits, discussions, and punctuated by critique. This course will be retaken for credit and leads to the master's thesis, proposed by the student and approved by the faculty. **Fee: There is a materials fee required for this course and an additional course fee applied via student account.**
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

CGLS-605 Hot Phenomena Glass Practice (3 Credits)
This hot glass course will allow students to discover and/or rediscover fundamental solid and blown techniques through a fresh lens of instruction and ideas. The cold shop will be an additional studio where students will learn to use the equipment to further their projects. Contemporary themes surrounding material experimentation, problem-solving and making a mess will be the springboards for prompted assignments. **Fee: A course fee applied via student account.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Spring

CGLS-606 Molten Glass Practice (3 Credits)
This course will introduce students to basic glass working processes in the hot glass studio. Solid and blown techniques are introduced as ways to activate ideas through molten glass. Students will learn introductory processes of finishing and further manipulating annealed glass in the cold shop. Students will build technical understanding and material comprehension in the application of these skills through assigned projects motivated by current themes in contemporary art. **Fee: A course fee applied via student account.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall

CGLS-611 Mold and Kiln Glass Practice (3 Credits)
This course will introduce students to basic mold making and glass working processes in the kiln studio. Fusing, slumping, and casting techniques will be covered as ways to activate ideas through kiln-formed glass. Basic processes of finishing glass in the cold shop will also be introduced. Students will build technical understanding and material comprehension in the application of these skills within self-directed projects motivated by prompted themes found within contemporary art. **Fee: A course fee applied via student account.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall

CGLS-630 Glass Processes (3 Credits)
This course is designed for non-majors and covers fundamental techniques and aesthetics of working with glass. Topics will include glass forming, hot and cold-working techniques, basic properties of glass, fundamental understanding of historical and contemporary practices and applications. There is required out-of-class lab time in the glass studio for a minimum of 3 hours per week. ** Fee: There is a course fee applied via student account**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

CGLS-698 Glass Graduate Internship (1-6 Credits)
Glass graduate internship is a course that offers students the chance to take advantage of professional opportunities as they arise during their graduate studies. This course is structured on the basis of the individual student's needs, interests and background preparation as they may be determined through faculty counseling. This course leads to the master's thesis, proposed by the student and approved by the faculty.
Prerequisites: This class is restricted to students in GLASS-MFA who have at least a 3.0 GPA and instructor permission to enroll.
Typically Offered: Fall, Spring, Summer

CGLS-699 Glass Co-op (0 Credits)
Cooperative Education will provide Glass students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in GLASS-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CGLS-799 Glass Grad Independent Study (1-6 Credits)
Glass Graduate Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser, will propose a course of study. Students will produce projects specific to their proposal. **NOTE: Student must have a minimum 3.0 GPA **
Prerequisites: This class is restricted to students in MFA programs with instructor permission to enroll.
Typically Offered: Fall, Spring

CGLS-887 Glass Part-Time Co-op (0 Credits)
Cooperative Education will provide Glass students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission
Prerequisites: This class is restricted to students in GLASS-MFA with department permission.
Typically Offered: Fall, Spring, Summer

Health Care Interpretation (HCIA)

HCIA-610 Interpreting Research Setting (3 Credits)
This online course will prepare graduate interpreters for working in research settings. Students will learn about the lived experience of Deaf scientists and how to effectively work with them by utilizing a variety of tools and strategies. Students will also become familiar with procedures and protocols for interpreting in research settings including lab-based work, meeting with collaborators, and professional conferences. Additionally, students will have the opportunity to build upon their American Sign Language (ASL) and English skills, specifically working on how to translate and interpret complex research related terminology and jargon. Also, students will investigate a topic related to their interest specifically in context of research and science that extends beyond the course materials covered in class and will summarize their findings in both academic ASL and English. This course involves online video lectures in both English and ASL, video observations and case studies, and online group discussions. Grading in the course will be based on students' participation online and performance on their assignments. Students can receive credit for INTP-510 or HCIA-610, not for both.
This course is restricted to HLTHINT-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Summer

HCIA-705 Professional Seminar (3 Credits)
This course is the first course taken in the MS in Health Care Interpreting degree program. This week long on-campus residency professional seminar will build a foundation of the practical skills and knowledge undergirding the master's degree program. It is intended to provide the learner with an overview of the course management system, webinar software, and sign language health care skills development used throughout the program. This course addresses the theoretical constructs and the approach to the practice of interpreting based on the demand-control schema and reflective practice and the federal regulations and policies impacting communication access and the work of interpreters. The latest research regarding health care disparities in the deaf population will be presented and health care interpreting skill development activities will commence.
This course is restricted to HLTHINT-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Summer

HCIA-715 Human Body Systems/Diseases I (3 Credits)
This first course in a two-course sequence will help interpreters build a strong foundation in human body systems and diseases. Within each body system topics for discussion include: anatomy and physiology (structure and function), common conditions/diseases, common medications and treatments, specialized terms, health care provider specialties, medical tests, and procedures and equipment. This class is conducted in ASL.
Prerequisites: HCIA-705 or equivalent course and student standing in HLTHINT-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIA-719 Theories of Translation and Interpretation (3 Credits)
This course will begin with an examination of the scope of practice of spoken language interpreters in health care settings and this will then be compared to the models of professional deportment in sign language interpreting. From there, we will review the major paradigms in the field of translation and interpretation, that of formal or functional (dynamic) equivalence, and how the scope of practice expectations impact the interpretation process. Finally, students will explore the concept of "sense" or meaning and how to convey that in a medical setting.
This course is restricted to HLTHINT-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Summer

HCIA-720 Health Care Practical Interpreting I (3 Credits)
This interpreting course exposes interpreters to interpreting in mental health, cardiology, OBGYN, and orthopedic outpatient and inpatient settings. This course will expose interpreters to medical professionals, common medical service protocols, typical diagnostic and treatment dialogues or clinical "scripts" of common conditions, diagnoses, and initial presenting complaints. Exposure to this new content knowledge happens via observations of medical student practice dialogues with simulated patients and other problem-based learning activities. In addition to this new knowledge and the unique observation opportunity, participants will be further reinforcing and integrating the Human Body Systems course content in their analyses of medical interpreted cases. English to ASL/ASL to English skill development activities will be employed.
Prerequisites: HCIA-705 or equivalent course and student standing in HLTHINT-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

HCIA-730 Human Body Systems/Diseases II (3 Credits)
This second course in a two-course sequence in Human Body Systems/Diseases will continue to help interpreters build a strong foundation in human body systems and diseases by addressing the remaining body systems not covered in the first course. Within each body system, topics for discussion include: anatomy and physiology (structure and function), common conditions/diseases, common medications and treatments, specialized terms, health care provider specialties, medical tests, and procedures and equipment.
Prerequisites: HCIA-715 or equivalent course and student standing in HLTHINT-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIA-740 Health Care Practical Interpreting II (3 Credits)
This course is a continuation of HICA 720 Health Care Practical Interpreting I. The course content will address interpreting for surgery, end of life care, pediatrics, and cancer inpatient and outpatient settings. It will also advance students' ability to facilitate group supervision based on DC-S constructs. Using reflective practice techniques already employed and demonstrated in the program's courses, students will be expected to emulate similar techniques with their colleagues. Case presentation and case analysis of actual interpreting assignments will form the basis for the course material and activities. Students will be expected to identify and articulate the unique contextual factors of the case (the demands of the job), the decisions made by the interpreting in the case, and discuss all ethical attributes of these demand-control pairings. Students will also be expected to use DC-S constructs to restructure the dialogue that emerges from case analysis discussions. Students will be further reinforcing and integrating the Human Body Systems course content in their analyses of medical interpreted cases. English to ASL/ASL to English skill development activities will be employed.
Prerequisites: HCIA-720 or equivalent course and student standing in HLTHINT-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

HCIA-750 Health Care Interpreting Within a Diverse Deaf Community (3 Credits)
This course is for health care interpreting students to learn how to work with the diverse Deaf community. The course begins with a discussion of current perspectives in Deaf Studies including the Deaf Gain paradigm and Social Justice Theory relevant to medical interpreting. Current research on deaf individuals' health knowledge, health literacy, and health outcomes are presented. Class discussions will focus on working with deaf individuals fluent in foreign sign languages, minority Deaf populations, deaf individuals with special needs, deaf-blind individuals, deaf interpreters, deaf students, and deaf professionals. Students will develop skills interpreting for some of these deaf individuals.
Prerequisites: HCIA-730 and HCIA-740 or equivalent course and student standing in HLTHINT-MS.
Contact Hours: Lecture 3
Typically Offered: Summer

HCIA-760 Research Methods in Interpreting (3 Credits)
This is an introductory graduate-level survey course on research design/methods and analysis. The course provides a broad overview of the process and practices of social and linguistic research in translation/interpreting in health care settings. Content includes principles and techniques of research design, data collection, and analysis, including the nature of evidence, types of research, defining research questions, data collection and analysis, issues concerning human subjects from vulnerable groups, and research ethics. This course instructs the learner how to conduct research in real-world contexts of health-care settings, drawing on translation/interpreting theories. The analysis component of the course teaches how to interpret data found in research (including statistics) as well as how to use data analysis software.
This course is restricted to HLTHINT-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HCIA-770 Capstone Prof Proj/Rsrch Paper (3 Credits)
The purpose of this course is to provide students the opportunity to conduct research, develop a plan and evaluation components, or submit a project as a demonstration of final proficiency in the program. The faculty teaching the class will guide the topic selected by the student and it will require the student to coalesce and incorporate into the final project or paper a culmination of their entire course work in the program to date (e.g., if a student is employed in a health care setting a project related to enhancing the provision of Language Access Services could be conducted).
Prerequisites: HCIA-719 and HCIA-730 and HCIA-740 and HCIA-760 or equivalent course and student standing in HLTHINT-MS.
Contact Hours: Laboratory 3
Typically Offered: Spring, Summer

HCIA-789 Special Topics: Health Care Interpretation (1-3 Credits)
The description will be specified in each Special Topic Documentation Form.
This course is restricted to HLTHINT-MS Major students.
Typically Offered: Fall, Spring

HCIA-799 Independent Study: Health Care Interpretation (1-3 Credits)
The description will be specified on each Independent Study Contract.
This course is restricted to HLTHINT-MS Major students.
Typically Offered: Fall, Spring, Summer

Health Systems Management (HLTH)

HLTH-700 Research Methods (3 Credits)
This is an introductory graduate-level survey course on research design/methods and analysis. The course provides a broad overview of the process and practices of social research in service-related contexts. Content includes principles and techniques of research design, sampling, data collection, and analysis including the nature of evidence, types of research, defining research questions, sampling techniques, data collection, data analysis, issues concerning human subjects and research ethics, and challenges associated with conducting research in real-world contexts. The analysis component of the course provides an understanding of statistical methodology used to collect and interpret data found in research as well as how to read and interpret data collection instruments.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HLTH-702 Graduate Writing Strategies (3 Credits)
Taught in conjunction with Research Methods students will become articulate in a variety of business and research communication methodologies. These methods will include writing a research proposal, a white paper, critique professional journal articles and prepare a grant proposal. A search of the literature for a defined research proposal will include an annotated bibliography to support the references used in the research proposal.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HLTH-706 Leading Health Systems I (3 Credits)
This course provides a detailed examination of the core principles of management as well as characteristics and disciplines that are required by persons holding management and leadership roles in health care delivery organizations. The course will also provide key tools to aid in managing people, resolving conflicts, and creating and maintaining effective relationships.
Contact Hours: Lecture 3
Typically Offered: Fall

HLTH-707 Health Care Finance & Reform (3 Credits)
The health care industry is undergoing significant change as a result of reform. The Affordable Care Act directly affects the financing and delivery of heath care. This course reviews the key elements of health care finance required of managers and leaders. Changes mandated by the Federal government will be explored in the areas of finance, care delivery and health insurance.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-710 Health Care Economics and Policy (3 Credits)
This course provides an examination of the roles and responsibilities of policy makers on the health care system and the resulting economic impact of their policies. Students will compare and contrast the regulatory functions of varying levels of government, the political process and economic impacts as they relate to health care systems as well as examine control issues, economic functions and regulatory trends in the United States. In addition, an assessment will be made of national health systems and national health policies of other countries as they compare to the United States.
Contact Hours: Lecture 3
Typically Offered: Fall

HLTH-712 Health Care Delivery (3 Credits)
The health care industry is diverse and complex. This course is designed to provide a context for understanding the various elements of the US health care delivery system. The system is studied by reviewing the systems' history and roots, current and future state. Students will study the unique personal service orientation of health care and the sub-systems that support care delivery. The course will cover: services and modes of care delivery; roles, responsibilities and relationships of providers, payers, patients, support personnel and policymakers; reimbursement and insurance systems; health care outcomes; health care reform and government policies. Students will view the health care delivery system from a critical perspective and develop solutions to the access, quality, and cost issues.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HLTH-715 Reinventing Health Care (3 Credits)
This course discusses reinventing health care in our country. Specifically the course will review the current status of American health care including research into population demographics and health and the concept of wellness and prevention. Following this a review of international health care models will occur to consider best practice as alternative care models for consideration for the US. Third the students will develop, for their area of interest and expertise a strategy for incremental or radical innovation in how we provide health care to our constituents.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HLTH-717 Bioethics (3 Credits)
This course will provide students with an ethical framework consisting of knowledge of the principle theories and moral philosophers and their methods to approach decision making. Ethics will be further explored giving consideration of cultural norms and how this influences societal ethical decision making; a review of the ethics of the professions of health care; information about gaining access to the organizations ethical principles and an understanding of personal ethics. Using these as a foundation personal and professional ethics will be explored, developed and a decision making rationale developed through a sequence of exercises requiring ethical decision making related to finance, human resources, clinical issues and personal morality.
Contact Hours: Lecture 3
Typically Offered: Spring, Summer

HLTH-718 Evidence-Based Management in Health Care (3 Credits)
The purpose of this course is to introduce students to evidence-based management practice in health care. The primary focus is to ensure that managers ask the right questions, use the best evidence available and make better decisions in carrying out their mission. Students will participate in the process of retrieval, appraisal, and synthesis of evidence in collaboration with other members of the health care team to improve processes and patient outcomes in diverse populations. Students complete an individual, final assignment demonstrating the ability to collect, document, and translate research (evidence) on the practice of health care management .
Contact Hours: Lecture 3
Typically Offered: Summer

HLTH-723 Human Resources in Health Care (3 Credits)
This course focuses on the changing competitive health care environment that has made human capital an organization's key asset, with HR largely responsible for cultivating it. Specifically, students will learn the impact that human capital has on the HR division and function of health care organizations. The focus will be on how the "New HR" has become more strategic and fundamental to a health care organization's success and the need to meet the demands of highly skilled, educated and credentialed health care professionals.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-725 Health Care Strategic Marketing & Communications (3 Credits)
This course is designed to build innovative, customer-centered, thinking within the future leaders of the health care industry. This is accomplished with an introduction to the role of strategic decision making through the core principles of marketing (the 4'Ps). Students will also experience basic data base management, conducting an internal and external environmental analysis, primary and secondary data gathering and interpretation and the creation of a marketing plan to meet an unsatisfied market need or build volume for a health care product or service. Finally, the role of corporate communication will be interwoven throughout the course as it supports marketing success.
Contact Hours: Lecture 3
Typically Offered: Summer

HLTH-730 Health Care Financial Management I: Principles & Practice (3 Credits)
This course provides a basic understanding of health services financial management. We begin with elementary accounting concepts and then focus on financial statement preparation and analysis. Special topics areas include discounted cash flow, risk, capital investments evaluation, debt/equity financing, and financial decision making models such as break-even analysis, cash flow forecasting and the like.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-731 Health Care Financial Management II: Concepts/ Applications (3 Credits)
This course builds on the foundational learning from Health Care Financial Management I: Principles & Practice. Course emphasis will be on for-profit entities within the health care sector. The course goes into greater depth on discounted cash flow analysis, risk, financial performance evaluation, capital investments, capital budgeting, debt, and equity financing. A key objective of this class is to develop the student's ability to engage in long-term financial modeling. Students will complete a comprehensive financial forecast as their final graded assessment for this field of study.
Prerequisites: HLTH-730 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Summer

HLTH-732 Health Insurance and Reimbursement (3 Credits)
This course provides an in-depth review of the characteristics of successful health insurance plans with emphasis on cost containment and premium control techniques. Emphasis will be placed on learning various cost containment and quality improvement tools of an effective delivery system and how to apply those tolls to different delivery structures. The relationship between shared risk and behavior change is explored as well as basic concepts of health insurance underwriting and the essentials of a successful provider payer partnership.
Contact Hours: Lecture 3
Typically Offered: Summer

HLTH-733 Health Systems Quality & Organizational Learning (3 Credits)
This course will incorporate an examination of contemporary organizational systems thinking focusing on concepts relevant to health service organizations and their communities; emphasizing organizational quality, leadership, environment, strategy, structure, and processes. The course provides students with the evaluation of key factors affecting an organization's system as well as their community, through quality and analytical thinking; allowing the student to apply theories that suggest an effective organizational response to such influences and change.
Contact Hours: Lecture 3
Typically Offered: Fall

HLTH-735 Management of Risk in Health Care (3 Credits)
This course identifies the risk inherent within health care institutions, organizations, agencies and for individual providers. The management of risk is explored as part of a strategic response of an organization or individual within health care. Specifically the risk inherent within health care organizations; in communications and sharing of data; in the embracing of new technologies and drug treatment therapies; and the expectations of corporate compliance will be discussed. The role of quality assurance will be reviewed as a strategy to control risk. This is a required course in the Health Systems Administration program and assignments/ applications are focused on healthcare issues.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-736 Health Care Operations: Building High Reliability Systems (3 Credits)
The challenges and complexities of the current health care environment require a skilled operations leader that will engage high performing teams, develop highly reliable processes, effectively manage expenses, and succeed in achieving desired outcomes in an increasingly competitive market. The increased focus on population health, payment reform pressure, the emergence of risk and value-based payment models will challenge traditional healthcare organizations and require leadership focused on change management and performance improvement. The purpose of this course is to provide students with the opportunity to analyze the health care organization using both qualitative and quantitative principles of operations management. It provides an integrated system and a set of contemporary operations improvement tools that can be used to make significant gains in any organization. This course is designed to provide the student with an overview of the field, and the ability to use some of the most commonly deployed operations tools and processes.
Contact Hours: Lecture 3
Typically Offered: Fall

HLTH-737 Lean Sigma in Health Care (3 Credits)
This course teaches the principles Lean-Sigma and the application of its process improvement methodologies (and tools) in a health care environment. The curriculum examines the current challenges encountered in the healthcare industry and how the application of Lean-Sigma techniques can improve overall performance. A specific focus of the course is to learn the methodology used to obtain desired results of streamlining operations and enhancing administrative effectiveness in the clinical, administrative and service segments of health care.
Contact Hours: Lecture 3
Typically Offered: Summer

HLTH-740 Health Care Leadership (3 Credits)
Highly trained clinical and administrative professionals drive the nature of work in health care. The purpose of this course is to provide students the opportunity to study leadership theory as it is applied in health care organizations. Leadership theories and applications geared toward professionals working in health service organizations will be emphasized. Students will learn to apply leadership theories via case studies and issue analysis of their active work environments.
Contact Hours: Lecture 3
Typically Offered: Fall

HLTH-746 Leading Health Systems II (3 Credits)
This course focuses on student development as high function managers and leaders within the health care industry. It builds on the first Leading Health Care Systems I (HLTH 706) course and provides an in-depth examination of advanced management and leadership knowledge, skills and values required of contemporary leaders within health care systems.
Prerequisites: HLTH-706 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-750 Ethics in Human Subjects Research (3 Credits)
A comprehensive course in clinical research ethics. The course will present the history of ethical issues in research involving human subjects and the resulting development of regulatory requirements globally. Critical processes such as informed consent and institutional review boards will be reviewed extensively. Current issues such as conflict of interest and research involving genetic material will also be discussed and understanding the role of good science as good ethics will be included.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-760 Health Informatics and Decision Support (3 Credits)
This course is intended to explore current challenges in the health care system and how the ability to understand and apply health informatics, health data, and associated health care information technology (IT) tools can improve the quality and cost of health care services. Students will learn about regulations, standards, and rules that impact health IT and health informatics. The course will include a review of current and future health care technology tools and associated data collection, storage, and exchange practices; and utilize applied case studies allowing students to demonstrate their ability to use health informatics systems and data analytics to improve patient and provider outcomes. The role of technology will also be explored as it relates to strategy, adoption levels, care settings, and patient engagement. Students will also learn how to properly evaluate and implement systems to solve real-world health care problems. Emerging technologies that have the potential to improve care and operations will also be explored.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-780 Internship (3 Credits)
This course provides the student with the opportunity to apply their graduate coursework to the world of work. Students will be placed or seek out internship opportunities in a work scenario similar to their ultimate career choice in the field. A mentor for the student must be identified in the place of the internship. The role of the mentor will be to work with students to develop a plan for the internship, facilitate the internship experience, and verify the student's accomplishment of specified outcomes as a result of the internship. Once the mentor approves of the plan of work and student accomplishments at the conclusion of the internship they will send this final report to the student's program advisor.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Internship 3
Typically Offered: Fall, Spring, Summer

HLTH-789 Selected Topics (3 Credits)
Selected topics is an innovative course not reflected in the accepted curriculum. Once the outline is submitted titles will appear in the course listing for the semester. The course may be taken more than once as topics change.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

HLTH-794 Integrative Problem Solving (3 Credits)
Students will demonstrate synthesis and integration of the theories and foundation principles of their discipline. This will be achieved through application of core knowledge in a series of progressive problem.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

HLTH-796 Health Care Strategy: Analysis & Formulation (3 Credits)
Having an effective organizational strategy is an essential component of all successful entities. Yet, practicing managers often engage in strategy formulation with very different conceptions of strategy and the strategic process. This course reviews the historical development of modern strategic theory and practice, with a focus on the works of Porter, Minztberg, and Barney. More importantly, the course will address and utilize various analytical frameworks which infuse the strategic process with intellectual rigor while retaining the essence of strategy that is innovative and creative.
Contact Hours: Lecture 3
Typically Offered: Summer

HLTH-797 Capstone (3 Credits)
This course serves as a culminating experience in which students are expected to apply knowledge gained from their graduate experience to the real field of health care administration. The fundamental goal is to facilitate the research and development of a critical and creative recommendation to a problem or opportunity. Students will work under the guidance of a practicing health care administrator and the course faculty to develop a well researched, effectively written paper. This final course serves as a turning point for the student—from education to professional practice.
This course requires permission of the Instructor to enroll.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

HLTH-798 Health Systems Analysis & Innovation (3 Credits)
This is the final and capstone course in the MS HSM program that requires students to participate in a first-hand analysis of a health system within the United States. The objective of the analysis is to critically examine and assess the structure, function and achievements of care delivery. The students will be assigned to small teams and work on a real-world problem with a healthcare organization, and present their findings and recommendations to the healthcare client organization at the end of the semester. The students will also receive training in Design Thinking and Innovation principles, which they will apply in their research and presentation. As this is the capstone course for the MS HSM program, the students will have the opportunity to apply their learnings from the other HSM courses.
Contact Hours: Lecture 3
Typically Offered: Spring

HLTH-799 Independent Study (1-4 Credits)
Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty advisor, will propose a course of study. Independent Study students must obtain permission of an instructor and complete the CHST Graduate Independent Study Form to enroll.
Contact Hours: Independent Study 1
Typically Offered: Fall, Spring, Summer

Hospitality & Tourism (HSPT)

HSPT-730 Hospitality and Tourism Customer Experience and Engagement (3 Credits)
Creating memorable experience is a crucial differentiator for hospitality and tourism enterprises. Guided by the concepts of "hospitality" and "being hospitable", this course introduces theories and methods that can be utilized during the service encounter to trigger optimal customer experiences through physical, social, and cultural interactions. This course addresses the co-creation of the experiences and value not only from hospitality and tourism service providers but also from the engagement of customers. The course puts an emphasis on the design of the customer journey, including theming, storytelling, and sensory, as well as unfolding customer experience in the phygital (physical and online) platform.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

HSPT-735 Hospitality and Tourism Customer Experience and Engagement (3 Credits)
This course introduces theories and methods for creating memorable customer experiences in the hospitality, tourism, and service industries. It integrates qualitative and quantitative, data-driven, and scientific techniques to deeply understand customer needs, design personalized services, and enhance service quality. Emphasizing technology, students gain analytical skills to customize customer experiences using loyalty program and other forms of data. The course also covers the co-creation of value with customer engagement, focusing on data-driven customer journey design in both physical and online platforms. Finally, students will be exposed to various service quality tools and metrics as well as principles of capacity management.
Contact Hours: Lecture 3
Typically Offered: Spring

HSPT-740 Economic Performance Analysis for Hospitality & Tourism (3 Credits)
Applications of economic analysis to hospitality and tourism including estimation and prediction of demand and supply, valuation, determination of regional economic impacts, and use of economic analysis in management, marketing, and policy decisions.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HSPT-745 Advanced Lodging Operations and Revenue Management (3 Credits)
This course surpasses traditional lodging operations and management, equipping students with the skills to manage contemporary lodging operations through technological innovation, and data-centric strategies. In addition to providing an overview of ownership models, the hotel guest cycle, market segmentation, and organizational structures, this course emphasizes the use of qualitative approaches and the utilization of big data and analytics. These tools empower students to craft strategic solutions that optimize hotel operations, maximize revenue generation, and ultimately enhance customer satisfaction to unprecedented levels.
Contact Hours: Lecture 3
Typically Offered: Fall

HSPT-750 Strategic Processes and Assessment of Hospitality and Tourism Industries (3 Credits)
This class will apply customer relationship management methods to hospitality and tourism industries in order to develop new service experiences and maintain the economic viability of others. A review of the quality models and strategies available for maintaining hospitality and tourism competitiveness will be covered. The use of the six sigma quality improvement process will be applied to hospitality industries.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

HSPT-755 Strategic Food and Beverage Business Management (3 Credits)
This course will equip students with quantitative methods for menu engineering, market analysis, supply chain analysis, cost control, financial analysis, inventory management, and human resource management in the food and beverage sector. Additionally, they will explore various operating structures, such as multi-unit operations, independent establishments, franchising, and hotel restaurant operations, while delving into topics like merchandising, market identification, and the application of restaurant technologies to maximize productivity, efficiency, and profitability.
Contact Hours: Lecture 3
Typically Offered: Fall

HSPT-760 Hospitality Asset Management (3 Credits)
This course provides a quantitatively rigorous overview of hospitality asset management. Furthermore, it builds on the theoretical foundation of portfolio optimization and capital asset pricing theory, which are applied directly to hospitality assets and their management. Students will learn how to solve for an optimal financing solution (e.g., refinancing, selling, leasing) given a hospitality asset's cash flow issues with budget constraints. At the end of the course, students will be able to: (1) Understand complex cash flow information and quantitatively identify asset management issues; (2) Use discounted cash flow model and computations to recommend an improved financing and management decision; (3) Draft a technical report and recommendations based on statistical analysis; (4) Apply the obtained quantitative acumen to hospitality-like durable assets and extend the analysis in other asset classes; (5) Perform textual analysis using factor models and generative AI to extract key information of distressed hospitality asset and debt conditions.
Contact Hours: Lecture 3
Typically Offered: Spring

HSPT-761 Planning & Development for Hospitality and Tourism Industries (3 Credits)
This course analyzes tourism as a system of interrelationships between markets (demand) and destinations (supply), and between governments and private businesses. This analysis provides a framework for the in-depth study of policy initiatives at the local, regional, and international levels. Additionally this course will address tourism and hospitality planning as it defines the frames of reference used in making choices concerning the development of tourism facilities and use of space. Scenario planning will be used to create new service systems for hospitality and tourism industries.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

HSPT-763 Resort Amentity and Attraction Development (3 Credits)
This course gives the student an understanding of how resort amenities and visitor attractions are developed and managed in destinations. Focus is on the planning, development, operation, design, and special needs of recreational amenities such as golf, tennis, skiing, spas, and marinas. Additional emphasis is placed on managing both historical, cultural, and natural resource based tourist attractions.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

HSPT-767 Convention and Event Management (3 Credits)
This class provides the student an opportunity to explore the function of a convention from the point of view of the convention center manager. Consideration is given to various methods used to sell a location to an event planner and the servicing of large groups. Students also examine the various ways to evaluate floor and meeting space as to profitability and quality related to the goals and objectives of the client. Various forms of business are ranked and the ability of one convention to enhance a second are considered in the decision making process. Finally codes, regulations, and licensing considerations are explored.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HSPT-780 Hospitality Analytics (3 Credits)
This course introduces students to the application of statistical tools and software in the analysis and management of hospitality operations. The hospitality and related service industries are among the most data-intensive industries and this course prepares students to identify, collect, visualize, analyze and ultimately interpret data in support of organizational decision-making. At the end of this course, students will be able to apply data analytic methods in improving industry revenues, optimizing and managing marketing programs, and in human capital management.
Contact Hours: Lecture 3
Typically Offered: Fall

HSPT-789 Graduate Special Topic (1-4 Credits)
Graduate Special Topic
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 4
Typically Offered: Fall, Spring, Summer

HSPT-790 Research Thesis (6 Credits)
A thesis is based on experimental evidence obtained by the candidate in an appropriate topic demonstrating the extension of theory into practice. A written proposal which is defended and authorized by the faculty adviser/committee followed by a formal written thesis and oral presentation of findings are required. Typically the candidate will have completed research methods, data analysis, and graduate writing strategies prior to enrolling in this course and will start the thesis process as soon as they have completed these courses to allow them to finish the thesis when they have finished their coursework. The candidate must obtain the approval of their graduate adviser who will guide the thesis before registering for this course.
Contact Hours: Thesis 6
Typically Offered: Fall, Spring, Summer

HSPT-791 Continuation of Project (0 Credits)
Continuation of Project

HSPT-795 Comprehensive Examination (0 Credits)
A written comprehensive exam is one of the non-thesis methodologies for completion of the MS degree. Students will demonstrate a fundamental knowledge of the theories and foundation principles. This course will include a review of the main concepts of each of the core subjects and at the conclusion of the course the student will take a written examination and must receive a passing grade of at least 80 percent to be successful. Students will have one additional opportunity to pass this examination if their initial attempt results in a failing grade. (This course will be taken with not less than 16 hours of course work remaining to complete the program, completion of core courses, and the student should be currently enrolled in the program. Possess a GPA of 3.0 or higher; no outstanding incomplete grades, nor can the student be on academic/disciplinary probation)
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Summer

HSPT-797 Capstone Project in Hospitality and Tourism (3 Credits)
This course is practical, project-based approach to a more traditional master's thesis. Students in the course will design and develop a project which reflects a viable option for an existing or putative organization. After a review of essential project management and planning skills as well as financial skills, the student designs and develops the project with continual review and feedback from the supervising faculty.
Contact Hours: Project 3
Typically Offered: Spring, Summer

HSPT-798 Continuation of Thesis (0 Credits)
Continuation of Thesis

HSPT-799 Independent Study (1-6 Credits)
An opportunity for the advanced student to undertake independent investigation in a special area under the guidance of a faculty member. A written proposal is to be forwarded to the sponsoring faculty member and approved by the director of the program prior to registering for this course. The independent study must seek to answer questions outside the scope of regular course work.

Human Computer Interaction (HCIN)

HCIN-600 Research Methods (3 Credits)
This course provides students with an introduction to the practical application of various research methods that can be used in human computer interaction. The course provides an overview of the research process and the literature review, and provides experience with qualitative, survey, and experimental research methods. Students will study existing research and design and conduct studies. Students will need to have taken a statistics course before registering for this class. Prerequisites: DECS-782 or STAT-145 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HCIN-610 Foundations of Human-Computer Interaction (3 Credits)
Human-computer interaction (HCI) is a field of study concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. This course surveys the scope of issues and foundations of the HCI field: cognitive psychology, human factors, interaction styles, user analysis, task analysis, interaction design methods and techniques, and evaluation. This course will focus on the users and their tasks.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HCIN-620 Information and Interaction Design (3 Credits)
Designing meaningful relationships among people and the products they use is both an art and a science. This course will focus on the unique design practice of: representing and organizing information in such a way as to facilitate perception and understanding (information architecture); and, specifying the appropriate mechanisms for accessing and manipulating task information (interaction design). This course will also explore the various design patterns (design solutions to particular problems) that are appropriate for the HCI professional. Students will need prior knowledge of an interface prototyping tool.
Prerequisite: ISCH-620 or GCIS-123 or equivalent course. Co-requisite: HCIN-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HCIN-630 Usability Testing (3 Credits)
This project-based course will focus on the formal evaluation of products. Topics include usability test goal setting, recruitment of appropriate users, design of test tasks, design of the test environment, test plan development and implementation, analysis and interpretation of the results, and documentation and presentation of results and recommendations.
Prerequisites: HCIN-600 and HCIN-610 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring, Summer

HCIN-636 Interactive Programming (3 Credits)
This course teaches students how to program interactive components to create user interfaces and information visualization systems. Students will work with data, information, animation, and digital media to create interactive applications. Students will be introduced to visual layout and design concepts. Programming is required. Students will need to have taken one year of programming in a high-level language to be successful in this course.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

HCIN-660 Fundamentals of Instructional Technology (3 Credits)
Instructional Technology encompasses the basic processes for developing and delivering instruction. Instructional Systems Design (ISD) is a well-established methodology for describing knowledge and skills and developing instructional systems to effectively conveying knowledge. This course enables the student to be able to plan, organize, and systematically develop instructional materials. The course uses an ISD model to analyze, design, deliver, and evaluate instruction.
Contact Hours: Lecture 3
Typically Offered: Fall

HCIN-661 Interactive Courseware (3 Credits)
Computer software that teaches is referred to as courseware. This course is a continuation of HCIN-660 that transitions from general instructional design into the actual application of these principles in a computer-based environment. Although the basic principles of instructional design hold true in all media environments, using these teaching and learning principles is somewhat different when developing instruction that will be delivered by computer. This course teaches procedures that have already been successful in the design and development of courseware. Successful students should have one year of object-oriented programming.
Prerequisites: HCIN-660 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIN-662 Research in Accessibility (3 Credits)
Students will dive into cutting edge research in the field of computer accessibility and assistive technology; they will read, present, and discuss research literature from major conferences and journals in the field. Students will learn about recent developments and ongoing research efforts in accessibility, and they will learn how to synthesize the results from research publications. Students will learn how to identify high quality research and how to critique this work to identify areas for improvement or future research directions. Students will learn the elements of a high-quality research publication, and they will explore and gain expertise in a particular topic in the field of accessibility in depth.
Prerequisites: HCIN-600 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Biennially

HCIN-663 Access and Assistive Technology (3 Credits)
Students will gain hands-on experience and knowledge about a wide variety of accessibility and assistive technology available for people with disabilities. Students will understand the design principles underlying this technology and how the features and capabilities of assistive technology can be tailored to a particular individual's needs and capabilities. Students will learn about how new technologies and research in accessibility can be made available for users, and they will learn how to design websites and software that work effectively with a user's own technology. Specific technologies discussed in the course may include, e.g.: alternative input devices, communication devices, and screen readers and magnifiers for people with visual impairments.
Prerequisites: HCIN-630 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Biennially

HCIN-700 Current Topics in HCI (3 Credits)
Human-Computer Interaction (HCI) is an evolving field. This course is designed to study the current themes and advanced issues of HCI. Topics will vary depending upon current research and developments in the field.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIN-705 Topics in HCI for Biomedical Informatics (3 Credits)
This course will provide a theoretical and case-based study of several areas of HCI, all considered within the application domain of biomedical informatics. Course topics include a scientific approach to UI design (usability engineering), domain-specific user analysis and user profiles, social and cultural influences, general and domain-specific design issues, information visualization, data integration, mobile devices, security, privacy, and ethics.
Prerequisites: HCIN-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIN-715 Agent-Based and Cognitive Modeling (3 Credits)
This course is intended as an introduction to the emerging areas of agent-based modeling and cognitive modeling. Both modeling approaches are at the intersection of research (theory development and confirmation) and computational simulation. This course will be an introduction to these topics, focusing on the research aspects of agent-based modeling and the development and testing of cognitive models. The role of visualization in modeling development and analysis is presented. Students will analyze the social science literature for current models and theories and will develop computational models incorporating these theories.
Prerequisites: HCIN-600 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

HCIN-720 Prototyping Wearable and Internet of Things Devices (3 Credits)
Wearable computers and Internet of Things devices involve both hardware and software. In order to design user experiences for these systems, professionals must understand how they are built. Students will learn how to rapidly prototype and evaluate wearable and IoT devices combining hardware and software. Experience in programming is helpful but not a prerequisite.
Contact Hours: Lecture 3
Typically Offered: Fall

HCIN-722 Human-Computer Interaction with Mobile, Wearable, and Ubiquitous Devices (3 Credits)
Mobile phones are now a major computing platform, and wearable and Internet of Things devices are emerging as major technologies. Each device offers different interaction opportunities and challenges. Students will learn about the research in interaction with these devices and how to design effective interactions for mobile, wearable, and ubiquitous devices.
Prerequisites: HCIN-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIN-730 User-Centered Design Methods (3 Credits)
This course will focus on the major user centered design methodologies used in the development of applications and environments. Topics include: evolution of software design methods, emergence of user-centered design, and key concepts, attributes and process of the major design methodologies. Software design projects will be required.
Prerequisites: HCIN-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIN-735 Collaboration, Technology, and the Human Experience (3 Credits)
Students will examine the role of technology and group collaboration in organizations. An overview of relevant theory, current and emergent technologies, and trends in collaborative science will provide the context for strategic implementation and development of collaborative environments. Group projects using collaborative technologies will be required.
Prerequisites: HCIN-600 and HCIN-610 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

HCIN-794 MS Human Computer Interaction Capstone Proposal (3 Credits)
In this course, students will design a proposal for a capstone project to apply the theories and methodologies to a problem in the HCI domain. Students working through the guidance of the instructor, will investigate a problem space, perform a literature review, develop the problem statement, write a proposal for how they intend to design and implement a solution, and communicate the proposal to potential capstone committee members.
Prerequisites: HCIN-600 and HCIN-610 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HCIN-795 MS HCI Project (3 Credits)
In this course, students will apply the theories and methodologies to the investigation of a problem in the HCI domain. Students who have already prepared a proposal for their capstone project,will design and implement a solution to a problem, and communicate the results.
Prerequisites: HCIN-794 or equivalent course.
Contact Hours: Project 4
Typically Offered: Fall, Spring, Summer

HCIN-796 MS HCI Thesis (1-6 Credits)
Students electing a research capstone experience will work closely with an adviser on a current research project or one self-developed and guided by the adviser. Permission of the capstone committee and the graduate program director is required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

HCIN-797 MS HCI Directed Final Project (3 Credits)
This course provides students with the skills to develop a plan and execute a project in the field of human-computer interaction. Emphasis is placed on the student applying skills and knowledge gained previously throughout their HCI master's degree program. Students will select a topic from a set of recommendations provided by the instructor, formulate a detailed plan for the execution of this project, provide deliverables for key milestones throughout the semester, and present their work in a professionally appropriate manner, e.g. via a written report, video, or other forms that are suitable for dissemination in a professional user-experience portfolio. The goal of this course is for students to gain experience how to employ methodologies and skills from the field of human-computer interaction appropriately as part of an extended final project that serves as a culminating experience for their master's degree program. This course is only an option for students who are registered as online students.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Project 3
Typically Offered: Fall, Spring

HCIN-909 Proposal Development (0 Credits)
This course is part of a capstone experience for graduate students who are just beginning the thesis topic development process. Students must submit an accepted proposal as a prerequisite for formal thesis work. Requires permission of the program director for enrollment.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Human Resource Development (HRDE)

HRDE-710 Foundations in Human Resource Development (3 Credits)
This course introduces students to the concepts that are the foundation of HRD and how these concepts are applied in a real-world environment. Human resource development is a distinct and unique area of practice that focuses on aligning employee learning and development with the strategic direction of an organization. This course provides an orientation to the profession and explores historical perspectives, theoretical foundations, and the practice of HRD.
This course is restricted to student in the HRDE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HRDE-711 Program Evaluation and Design (3 Credits)
This course teaches the systematic application of social research procedures to evaluate the conceptualization, design, implementation, and utility of human resource development programs.
This course is restricted to student in the HRDE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HRDE-712 Performance Analysis and Development (3 Credits)
This course provides individuals with a framework needed to successfully analyze performance and design learning interventions that drive performance improvements in an organization. Students will examine performance measurement, adult learning principles, and learning styles as well as best practices in organizational learning, employee development, and alternative delivery strategies. Additionally, students will identify how to link learning initiatives with strategy and gain commitment to those initiatives from senior leaders.
This course is restricted to student in the HRDE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HRDE-715 Human Performance Design and Development (3 Credits)
A systematic approach to improve organizational productivity and competence of the internal workforce. It is a process of selection, analysis, design, development, implementation, and evaluation of programs to allow the most cost effective influence on human behavior and accomplishment to solve organizational problems.
This course is restricted to student in the HRDE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

HRDE-720 Theories of Organizational Development (3 Credits)
As organizations undergo continual change, HR leaders play a pivotal role enabling their organizations to anticipate, plan, and profit from change. This course introduces the student to theories and practices of organization development and change leadership. Such leadership requires competencies of identifying and framing challenges, consulting with clients, researching solutions, creating, implementing, and evaluating action plans. Through study, practice, and application, students will gain knowledge and skills to foster change, innovation, and the adaptability of an organization.
Contact Hours: Lecture 3
Typically Offered: Spring

HRDE-721 Organizational Learning and Knowledge Management (3 Credits)
This is an introductory graduate-level survey course for organizational learning and knowledge management. The course will provide a broad overview of the concepts, practices, and challenges associated with learning in organizational contexts. Principles, techniques, and structures used to create, capture, store, value, distribute, and leverage knowledge to enhance organizational performance in continuously changing environments will be examined. Topics covered include types and nature of knowledge, levels of organizational learning, communities of practice, social and technological systems for capturing, storing, and distributing knowledge, valuation of knowledge assets, innovation and creativity, barriers to organizational learning, and knowledge as a source of competitive advantage.
Prerequisites: HRDE-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

HRDE-722 Talent Development (3 Credits)
This course provides skills to develop, retain, and engage the best available talent required for current and future success. Students examine benchmark practices from all industry types to derive effective strategies for their own organizations, develop a human capital strategy development, and complete an integrated set of projects to implement selected components of the strategy.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

HRDE-726 Technology and the Future of Work (3 Credits)
The rapid pace of progress in technology and the change in demographics of the workforce are anticipated to affect what work will look like in the future, in addition to the structure and nature of work itself. Some of these changes might be incremental and others more radical and disruptive affecting the conduct of business. The pace, nature, and magnitude of these changes demand that businesses, organizations, educators, policy makers, leaders, managers, and individual employees reimagine models of employment including the organization and functioning of the workforce. This course is intended to provide students with a global perspective of the future of work and employment, and insights into the implications on their designated professions and careers. Among others, this course will address the following questions: What are the skills and competencies required of the workforce for this new future of work? What skills, competencies, and job roles may become redundant? How should corporations preempt and prepare to deal with these changes? What will be the role of leaders and managers in reimagining and developing the workforce of the future?
Contact Hours: Seminar 3
Typically Offered: Fall

HRDE-731 Team Process and Facilitation Skills (3 Credits)
The ability to build a functioning team and then facilitate the group process ranks among the most critical competencies for HRD practitioners today. HRD practitioners are required to develop work teams and facilitate a variety of events from meetings and new employee orientations to training sessions. This course provides the HRD practitioner with the skills required to effectively develop teams, and plan for and facilitate a variety of events. Individuals in other disciplines will benefit from this course as well.
Prerequisites: HRDE-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

HRDE-732 Learning Transfer (3 Credits)
Learning transfer is the ability of an organization to promote the individuals transfer of learning back to their job. This course examines the research conducted in this area and how it is applied in practice. As an HRD practitioner it is imperative that the impact of training, the transfer of knowledge, is built in to the design of every program. By focusing on learning transfer, the goal of any program is to ensure that employees in the workplace are applying the newly acquired knowledge in the fulfillment of their job. This course examines the theoretical foundations of knowledge transfer, how to measure and evaluate this transfer, and strategies for increasing the probability this transfer will occur.
Prerequisites: HRDE-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

HRDE-735 Leading Human Resources (3 Credits)
The goal of this course is to develop knowledge of Human Resource Development and Management practices for the purpose of analyzing, communicating, evaluating, and leading the development of strategic human resource initiatives that react to emerging organizational concerns. This course is a foundation course for those seeking a leadership opportunity in Human Resources in which students will demonstrate their ability to analyze and lead the alignment of strategic organizational goals into HR functions.
Contact Hours: Lecture 3
Typically Offered: Spring

HRDE-740 Strategic HRD for Global Organizations (3 Credits)
Global human resource development is a method for developing employees in global organizations. In this course, students will be exposed to the fundamentals of developing HRD programs within a multicultural framework. The need to be aware of cultural differences and how to best address them is critical for the global company. This course will explore globalization and HRD, design and development of global HRD programs, delivery and assessment of global HRD programs, and consulting across cultures.
Prerequisites: HRDE-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

HRDE-741 Global Human Resource Development Leadership (3 Credits)
This course provides students with a theoretical foundation of global leadership. The frameworks presented in this course will help to guide students through a critical perspective of how they view leadership and how HRD can take part in developing leaders. Additionally, the global context of leadership will provide knowledge of the foundational concepts of leadership and how it impacts multinational organizations. Course focuses on human resource development applications and problem solving and not on human resource management.
Prerequisites: HRDE-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

HRDE-742 Leading Change (3 Credits)
Major change initiatives within organizations fail because of lack of understanding of the process of change and the lack of deliberate and focused attention to the change process. This course teaches students the change process and the alterations required in structures, processes, and activities to effectively implement change initiatives within organizations. The components of this course include applied approaches and tools to help analyze barriers for change, leverage power and influence, and provide frameworks to plan and implement change.
Contact Hours: Lecture 3
Typically Offered: Summer

HRDE-743 Training for Global Organizations (3 Credits)
This course is designed to develop a student’s understanding of cross-cultural communication and adaptation and how to design and deliver formal training. The course provides an introduction to different theoretical perspectives on cross-cultural communication and adaptation and the application of these perspectives to the design of training. Issues examined include culture theory, cross-cultural competence, and techniques and design of cross-cultural training.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

HRDE-745 Information Systems in HRD (3 Credits)
The workforce of the future is changing. It is creating challenges for organizations to continue to grow and develop their human capital. The role of the HRD professional is to act strategically, utilizing information system tools to ensure the workforce has the skills to meet the challenges of tomorrow. This course will provide a comprehensive overview of information systems used in HR to develop, assess, and provide data analysis of the workforce to meet the present and evolving needs of the organization.
Contact Hours: Lecture 3
Typically Offered: Fall

HRDE-765 Diversity in Global Workplace (3 Credits)
As strategic partners in global workforce development, human resource development professionals guide organizations to build and maintain a diverse workforce. Diversity and inclusion exploit the natural synergies of a multicultural workforce. This course will examine dimensions of diversity beyond race, ethnicity, and gender and create opportunities to develop an understanding about how these dimensions intersect and play out in the workplace. The purpose of this course is to provide HRD professionals the knowledge required to manage these dynamics in an organizational setting and lead initiatives that will create and maintain an inclusive workplace. Project work will allow for the in-depth ability to assess the current state of diversity within a defined organization, conduct research and benchmarking to build a diverse workforce, and develop a diversity strategic plan with an on-going evaluation component to assess the success of diversity initiatives.
Contact Hours: Lecture 3
Typically Offered: Spring

HRDE-780 Internship (1-3 Credits)
This course provides the student with the opportunity to apply their graduate course work to the world of work. Students will participate in internship opportunities in a work scenario similar to their ultimate career choice in the field. A mentor for the student must be identified in the place of the internship. The role of the mentor will be to work with students to develop a plan for the internship, facilitate the internship experience, and verify the student’s accomplishment of specified outcomes as a result of the internship. Once the mentor approves of the plan of work and student accomplishments at the conclusion of the internship they will send this final report to the student's program adviser. This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

HRDE-785 Strategic HRD (3 Credits)
Students will apply strategies to solve industry HRD problems as defined by the instructor. This will require the use of strategic HRD practices to influence and support the larger organizational strategy as it relates to their human capital. Incorporated in the course is a review of HRD strategies including an exploration of the boundaries of the practice of HRD; identification of organizational accountability structures and functions; application of strategic HRD concepts taken from core subjects; and identification of strategic HRD tools and interventions. Ultimately students will develop a plan to resolve a strategic HRD issue. This course is restricted to student in the HRDE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

HRDE-789 Special Topics (3 Credits)
Special topics is an innovative course not reflected in the accepted curriculum. Once the outline is submitted titles will appear in the course listing for the semester. The course may be taken more than once as topics change.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

HRDE-794 Integrative Problem Solving (3 Credits)
Students will demonstrate synthesis and integration of the theories and foundation principles of their discipline. This will be achieved through application of core knowledge in a series of progressive problem situations culminating in a comprehensive examination. Completion of all HRDE core and required courses required. Students must receive a passing grade of at least 80 percent in the course to be allowed to take the comprehensive exam.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

HRDE-795 Comprehensive Examination (0 Credits)
A written comprehensive exam is one of the non-thesis methodologies for completion of the MS degree. Students will demonstrate a fundamental knowledge of the theories and foundation principles. This course will include a review of the main concepts of each of the core subjects. Completion of all HRDE core and required courses required. Students must receive a passing grade of at least 80 percent to be successful. Students will have one additional opportunity to pass this examination if their initial attempt results in a failing grade.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Summer

HRDE-797 Graduate Capstone Project (3 Credits)
The purpose of this course is to provide students the opportunity to conduct research, develop a plan and evaluation components, and submit the project as a demonstration of final proficiency in the program. The topic selected by the student will be guided by the faculty teaching the class and it will require the student to coalesce and incorporate into the final project a culmination of all their course work in the program to date.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

HRDE-798 Research Thesis (1-6 Credits)
A thesis is based on experimental evidence obtained by the candidate in an appropriate topic demonstrating the extension of theory into practice. A written proposal which is defended and authorized by the faculty adviser/committee followed by a formal written thesis and oral presentation of findings are required. Typically the candidate will have completed research methods, data analysis and graduate writing strategies prior to enrolling in this course and will start the thesis process as soon as they have completed these courses to allow them to finish the thesis when they have finished their coursework. The candidate must obtain the approval of their graduate adviser who will guide the thesis before registering for this course.
Contact Hours: Thesis 3
Typically Offered: Fall, Spring, Summer

HRDE-799 Independent Study (1-3 Credits)
This course provides for independent study or research activity in subject matter areas not included in any existing course in the degree program, but having specialized value to students. Proposals approved by a supervising faculty member and the program chairperson are required prior to registration. This course may be taken more than once.
Typically Offered: Fall, Spring, Summer

Illustration (ILLS)

ILLS-601 Illustration (3 Credits)
This course offers an immersive, advanced illustration experience focused on pushing conceptual boundaries and refining professional practices across traditional, mixed, and digital media. Students will focus on creating work for illustration markets including advertising, editorial, corporate, and book publishing, among others. Emphasis will be placed on developing a cohesive body of work demonstrating a consistent, distinct style and artistic perspective. Students will gain experience in creative production, develop technical problem-solving techniques, advance technical and creative skills, and present their work in both individual and group critiques. Students may take this course multiple times.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall, Spring

ILLS-659 Illustrative Design (3 Credits)
Illustrative Design is an introduction to the principles and methods used to incorporate illustration with typography and layout. Students will conceptualize, organize and execute illustrations within a design context. Illustrative Design I will emphasize the use of graphic elements such as symbols, charts, and type to be incorporated into illustrations. Layout terminology and illustration production methods will be included. Projects will expose students to various examples of real-world assignments that will demand the use of traditional illustration methods as well as computer-based production media. Assignments will stress solutions that are typically managed by art directors and designers. The course will emphasize the language of visualization and the relationship and coordination of concept, illustration and word.
This course is restricted to CAD Graduate students.
Contact Hours: Studio 6
Typically Offered: Fall

ILLS-662 Journalistic Illus Grad (3 Credits)
This course will familiarize students with the requirements of researching and visually reporting a specific happening or event. Assignments will be longer in duration and will consist of several major works, many drawings, sketches, notes, and photo references. This journalistic approach to illustration demands that students attend an event and selectively record important aspects that will best communicate the atmosphere and action of the scene. Extensive research, both informational and visual is expected. A personal, editorial viewpoint is desired. This course will familiarize students with methods and issues involving creating a series of images for the single purpose of representing a story or illustrated sequence. Emphasis will be placed on choosing important content and planning effective image sequences. Students will learn to share their observations to clarify and embellish what might be commonplace for the non-visual observer.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture/Lab 5
Typically Offered: Spring

ILLS-663 Zoological and Botanical Illustration (3 Credits)
This course utilizes subjects found in nature as resources for fine and applied art applications. Working from live and preserved subjects, students will accurately depict plant and animal images which may be used in print and electronic media.
This course is restricted to students in the FNAS-MFA, IDDE-MFA, GRDE-MFA, CMGD-MFA, VISCOM-MFA and ILLM-MFA programs.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

ILLS-668 Pop-Up Books (3 Credits)
This course will deal with constructing, illustrating, and developing stories for pop-up and mechanical books. Students will study planning, preparation, engineering and illustration for production of pop-ups. The course will be divided into a preliminary section of learning basic mechanisms of pop-up books and a second section, which allows students to apply knowledge learned in the first section to the illustration and production of their own book.
This course is restricted to CAD Graduate students.
Contact Hours: Studio 6
Typically Offered: Spring

ILLS-669 Advertising Illustration Graduate (3 Credits)
This course will deal with creating illustrations used to advertise products, services and events. Assigned projects will give students a better understanding of the wide range of assignments that advertising illustrators produce for advertising agencies and corporate accounts. Students will experience the fast-paced working conditions inherent in the advertising industry.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall

ILLS-679 Digital Editorial Graduate (3 Credits)
Digital Editorial will introduce students to editorial illustration. Importance will be placed on interpretation of editorial subject matter for illustration series, and preparation of digital imagery for print reproduction. Students will apply approaches to creative illustration while creatively interpreting editorial text and visual narratives. Students may use vector and raster-based software applications and a variety of input and output devices. Stylistic issues, conceptual strategies, production restrictions, and color systems will also be covered.
This course is restricted to CAD Graduate students.
Contact Hours: Studio 5
Typically Offered: Spring

ILLS-799 Illustration Graduate Independent Study (1-6 Credits)
Illustration Graduate Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser will propose a course of study. Students must obtain permission of an instructor and complete the Independent Study Form to enroll.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring

Imaging Science (IMGS)

IMGS-606 Graduate Seminar I (1 Credit)
This course is focused on familiarizing students with research activities in the Carlson Center, research practices in the university, research environment and policies and procedures impacting graduate students. The course is coupled with the research seminar sponsored by the Center for Imaging Science (usually weekly presentations). Students are expected to attend and participate in the seminar as part of the course. The course also addresses issues and practices associated with technical presentation and technical writing. Credits earned in this course apply to research requirements.
This class is restricted to graduate students in the IMGS-MS or IMGS-PHD programs.
Contact Hours: Seminar 1
Typically Offered: Fall

IMGS-607 Graduate Seminar II (1 Credit)
This course is a continuation of the topics addressed in the preceding course Imaging Science Graduate Seminar I. The course is coupled with the research seminar sponsored by the Center for Imaging Science (usually weekly presentations). Students are expected to attend and participate in the seminar as part of the course. The course addresses issues and practices associated with technical presentations. Credits earned in this course apply to research requirements.
Prerequisites: IMGS-606 or equivalent course.
Contact Hours: Seminar 1
Typically Offered: Spring

IMGS-609 Graduate Laboratory (2 Credits)
This course provides foundational skills in computer programming required in the field of Imaging Science. This course is focused on mastery of fundamental of Python and C++ computer programming skills and their application to problems in Imaging Science.
This class is restricted to graduate students in the IMGS-MS or IMGS-PHD programs.
Contact Hours: Laboratory 4
Typically Offered: Fall

IMGS-610 Graduate Laboratory II (1 Credit)
This course is the second semester course of a two-semester sequence providing foundational skills in computer programming required in the field of Imaging Science. This course is focused on mastery of more advanced skills in Python and c++ computer programming and their application to problems in Imaging Science.
Contact Hours: Laboratory 1
Typically Offered: Spring

IMGS-613 Noise and System Modeling (2 Credits)
This course develops models of noise and random processes within the context of imaging systems. The focus will be on stationary random processes in the spatial and spatial frequency domain. The concept of image noise is introduced in both the analog and digital domain. Random processes are studied in both the spatial and spatial frequency domain stressing the autocorrelation function and the power density spectrum. The application of random processes to the understanding of signal noise in imaging systems in both the continuous and the digital domains is presented. Tools for modeling signal and noise transfer are emphasized. At the completion of the course the student should have the ability to model signal and noise transfer within a multistage imaging system.
Prerequisites: IMGS-617 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

IMGS-616 Fourier Methods for Imaging (3 Credits)
This course develops the mathematical methods required to describe continuous and discrete linear systems, with special emphasis on tasks required in the analysis or synthesis of imaging systems. The classification of systems as linear/nonlinear and shift variant/invariant, development and use of the convolution integral, Fourier methods as applied to the analysis of linear systems. The physical meaning and interpretation of transform methods are emphasized.
This class is restricted to graduate students in the IMGS-MS or IMGS-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-617 Image Processing and Discrete Fourier Methods (2 Credits)
This course considers sampled and quantized images and temporal image sequences, along with methods for performing useful image processing. These processing methods are classified based on the number of input picture elements (“pixels”) that determine the value of each output pixel: single pixels, local neighborhoods, or global operations. The discrete Fourier transform is introduced. Application to image segmentation and compression are considered.
Contact Hours: Lecture 2
Typically Offered: Fall

IMGS-619 Radiometry (2 Credits)
This course is focused on the fundamentals of radiation propagation as it relates to making quantitative measurements with imaging systems. The course includes an introduction to common radiometric terms, detector figures of merit, and noise concepts.
This course is restricted to Graduate students.
Contact Hours: Lecture 2
Typically Offered: Fall

IMGS-620 The Human Visual System (2 Credits)
This course describes the underlying structure of the human visual system, the performance of those structures and the system as a whole, and introduces psychophysical techniques used to measure them. The visual system’s optical neural systems responsible for collecting and detecting spatial, temporal, and spectral signals from the environment are described. The sources and extent of limitations in the subsystems are described and discussed in terms of the "enabling limitations" that allow practical imaging systems.
This course is restricted to Graduate students.
Contact Hours: Lecture 2
Typically Offered: Fall

IMGS-621 Computer Vision (2 Credits)
This course will cover a wide range of current topics in modern image processing and computer vision. Topics will include introductory concepts in supervised and unsupervised machine learning, linear and nonlinear filtering, image enhancement, supervised and unsupervised image segmentation, object classification, object detection, feature matching, image registration, and the geometry of cameras. Assignments will involve advanced computational implementations of selected topics from the current literature in a high-level language such as Python, MATLAB, or Julia and will be summarized by the students in written technical papers.
Prerequisites: This class is restricted to graduate students in the IMGS-MS, IMGS-PHD or AI-MS programs.
Contact Hours: Lecture 2
Typically Offered: Spring

IMGS-622 Vision Sciences Seminar (1 Credit)
This seminar course provides a forum in which students, faculty, and researchers with an interest in the Vision Sciences (visual neuroscience, perception psychology, computational vision, computer graphics) can interact through reading, presentation, and discussion of classic texts and contemporary research papers in the field. Students will read and summarize weekly readings in writing and will periodically prepare presentations and lead discussions.
This class is restricted to graduate students in the IMGS-MS or IMGS-PHD programs.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

IMGS-624 Interactive Virtual Env (3 Credits)
This course provides experience in the development of real-time interactive three-dimensional environments, and in the use of peripherals, including virtual reality helmets, motion tracking, and eye tracking in virtual reality. Students will develop expertise with a contemporary Game Engine, along with an understanding of the computations that facilitate 3D rendering for interactive environments. Projects will cover topics such as lighting and appearance modelling, mathematics for vertex manipulation, 3D to 2D projection, ray tracing, the integration of peripherals via software development kits, and the spatial and temporal calibration of an eye tracker embedded within a head-worn display. Students will complete homework tutorials on game/application development in a contemporary computer gaming engine. This course involves a substantial programming component, and prior programming experience is required.
This class is restricted to graduate students in the IMGS-MS or IMGS-PHD programs.
Contact Hours: Laboratory 4, Lecture 1
Typically Offered: Fall

IMGS-628 Design and Fabrication of Solid State Cameras (3 Credits)
The purpose of this course is to provide the student with hands-on experience in building a CCD camera. The course provides the basics of CCD operation including an overview, CCD clocking, analog output circuitry, cooling, and evaluation criteria.
This course is restricted to students with graduate standing in the College of Science or the Kate Gleason College of Engineering or Graduate Computing and Information Sciences.
Contact Hours: Laboratory 6, Lecture 1
Typically Offered: Fall

IMGS-632 Advanced Environmental Applications of Remote Sensing (3 Credits)
This course will focus on a broader selection of analytical techniques with an application-centric presentation. These techniques include narrow-band indices, filtering in the spatial and frequency domains, principal component analysis, textural analysis, hybrid and object-oriented classifiers, change detection methods, and structural analysis. All of these techniques are applied to assessment of natural resources. Sensing modalities include imaging spectroscopy (hyperspectral), multispectral, and light detection and ranging (lidar) sensors. Applications such as vegetation stress assessment, foliar biochemistry, advanced image classification for land use purposes, detecting change between image scenes, and assessing topography and structure in forestry and grassland ecosystems (volume, biomass, biodiversity) and built environments will be examined. Real-world remote sensing and field data from international, US, and local sources are used throughout this course. Students will be expected to perform a more comprehensive final project and homework assignments, including literature review and discussion and interpretation of results.
Prerequisites: IMGS-431 and PHYS-112 or equivalent courses.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

IMGS-633 Optics for Imaging (2 Credits)
This course describes Fourier transform of continuous functions, followed by its application to describe optical imaging systems in the wave model, including the concepts of point spread function, optical transfer function, and image resolution. Analysis of optical imaging systems using the ray model for systems composed of one thick lens and two thin lenses are considered.
Prerequisites: IMGS-617 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

IMGS-635 Optical System Design and Analysis (3 Credits)
The primary objectives of this course are to teach critical optics and system concepts, and skills to specify, design, simulate, and evaluate optical components and systems. A modern optical design program and various types of optical systems will be used to illustrate how to solve real-world optical engineering problems. The course is not a traditional lens design course, which usually focuses on designing and optimizing individual lens elements. Instead the course will emphasize analyzing systems, which are often made with off-the-shelf optical components.
Prerequisites: IMGS-321 or IMGS-633 or (EEEE-505 & EEEE-705) or (IMGS-322 or PHYS-365) or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Spring

IMGS-639 Principles of Solid State Imaging Arrays (3 Credits)
This course covers the basics of solid state physics, electrical engineering, linear systems and imaging needed to understand modern focal plane array design and use. The course emphasizes knowledge of the working of CMOS and infrared arrays.
This course is restricted to students with graduate standing in the College of Science or the Kate Gleason College of Engineering or Graduate Computing and Information Sciences.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-640 Remote Sensing Systems and Image Analysis (3 Credits)
This course introduces the students to the governing equations for radiance reaching aerial or satellite based imaging systems. It then covers the temporal, geometric, spectral, and noise properties of these imaging systems with an emphasis on their use as quantitative scientific instruments. This is followed by a treatment of methods to invert the remotely sensed image data to measurements of the Earth's surface (e.g. reflectance and temperature) through various means of inverting the governing radiometric equation. The emphasis is on practical implementation of multidimensional image analysis and examining the processes governing spatial, spectral and radiometric image fidelity.
Prerequisite: IMGS-251 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-642 Testing of Focal Plane Arrays (3 Credits)
This course is an introduction to the techniques used for the testing of solid state imaging detectors such as CCDs, CMOS and Infrared Arrays. Focal plane array users in industry, government and university need to ensure that key operating parameters for such devices either fall within an operating range or that the limitation to the performance is understood. This is a hands-on course where the students will measure the performance parameters of a particular camera in detail.
This course is restricted to students with graduate standing in the College of Science or the Kate Gleason College of Engineering or Graduate Computing and Information Sciences.
Contact Hours: Laboratory 6, Lecture 1
Typically Offered: Spring

IMGS-643 Mathematical Methods of Imaging Science 1 (1 Credit)
This course will provide the foundational mathematics needed in Imaging Science. This course is the first semester in a two-semester sequence covering fundamental mathematical tools and methods with specific examples drawn from Imaging Science. Students will have the opportunity to put concepts into practice through practical implementation in computer programming assignments.
This course is restricted to Graduate students.
Contact Hours: Lecture 1
Typically Offered: Fall

IMGS-644 Mathematical Methods of Imaging Science 2 (1 Credit)
This course is restricted to Graduate students.
Contact Hours: Lecture 1
Typically Offered: Spring

IMGS-682 Image Processing and Computer Vision (3 Credits)
This course will cover a wide range of current topics in modern image processing and computer vision. Topics will include introductory concepts in supervised and unsupervised machine learning, linear and nonlinear filtering, image enhancement, supervised and unsupervised image segmentation, object classification, object detection, feature matching, image registration, and the geometry of cameras. Assignments will involve advanced computational implementations of selected topics from the current literature in a high-level language such as Python, MATLAB, or Julia and will be summarized by the students in written technical papers. The course requires computer programming, linear algebra, and calculus.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-684 Deep Learning for Vision (3 Credits)
This course will review neural networks and related theory in machine learning that is needed to understand how deep learning algorithms work. The course will include the latest algorithms that use deep learning to solve problems in computer vision and machine perception, and students will read recent papers on these systems. Students will implement and evaluate one or more of these systems and apply them to problems that match their interests. Students are expected to have taken multiple computer programming courses and to be comfortable with linear algebra and calculus. No prior background in machine learning or pattern recognition is required.
This course is restricted to students with graduate standing in the College of Science or the Kate Gleason College of Engineering or Graduate Computing and Information Sciences.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-689 Graduate Special Topics (1-4 Credits)
This course is a faculty-developed exploration of appropriate graduate-level imaging topics that are not part existing courses. The level of study is appropriate for upper-class undergraduates or graduate level students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

IMGS-699 Imaging Science Graduate Co-op (0 Credits)
This course is a cooperative education experience for graduate imaging science students.
Typically Offered: Fall, Spring, Summer

IMGS-711 Computational Methods for Imaging Science (3 Credits)
This course addresses computational topics that are important in a variety of applications in imaging science. Examples of topics that may be included are: vector space operations, including matrix factorizations and solutions of systems of equations (used in hyperspectral target detection and image compression, among many other applications); linear and nonlinear optimization (used for the design of detectors, camera calibration, bundle adjustment, etc.); iterative methods and dynamic systems (Kalman filtering, tracking, optical flow, etc.); random number generation and use (Monte Carlo methods, system performance evaluation, etc.); and energy minimization techniques applied to image processing (used for image enhancement, segmentation, etc.)
Prerequisites: IMGS-616 or IMGS-682 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-712 Multi-view Imaging (3 Credits)
Images are 2D projections gathered from scenes by perspective projection. By making use of multiple images it is possible to construct 3D models of the scene geometry and of objects in the scene. The ability to derive representations of 3D scenes from 2D observations is a fundamental requirement for applications in robotics, intelligence, medicine and computer graphics. This course develops the mathematical and computational approaches to modeling of 3D scenes from multiple 2D views. After completion of this course students are prepared to use the techniques in independent research.
Prerequisites: IMGS-616 or IMGS-682 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-715 Computational Photography (3 Credits)
Computational photography is an emerging field that aims to overcome the limitations of conventional digital imaging and display devices by using computational techniques and novel programmable sensors and optical devices. In this course, we will study start-of-the-art techniques for capturing, modeling, and displaying complex appearance phenomena. We will cover topics such as computational sensor with assorted pixel designs, mobile camera control, light field capture and rendering, computational flash photography, computational illumination for appearance modeling and 3D reconstruction, light transport analysis, and light sensitive display and printing techniques. We will integrate the latest smart imaging devices into the course for homework and term projects.
This course is restricted to students with graduate standing in the College of Science or the Kate Gleason College of Engineering.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-719 Radiative Transfer I (3 Credits)
This course is the first course in a two-semester course sequence that covers the theory of radiative transfer in disordered media. The course begins with a brief review of basic electromagnetism and models for scattering and absorption by single particles and progresses to the theory of radiative transfer in semi-infinite media. Various approximations that allow closed-form solutions are presented, and related phenomenology, such as the shadow-hiding opposition effect and coherent backscatter opposition effects, are described in terms of these models.
Prerequisites: IMGS-619 and ASTP-615 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-720 Radiative Transfer II (3 Credits)
This course covers advanced topics related to the theory of radiative transfer in disordered media. The course begins with a review of topics presented in the first semester course, including the radiative transfer solutions due to Hapke's solution for a semi-infinite medium and the opposition effect. Students will complete a project focused on one or more advanced topics related to radiative transfer in disordered media, such as effects of surface roughness, scattering in layered media, oriented scattering layers, more advanced treatments of multiple scattering or polarization, or radiative transfer in the water column.
Prerequisites: IMGS-719 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-722 Remote Sensing: Systems, Sensors, and Radiometric Image Analysis (3 Credits)
This course introduces the governing equations for radiance reaching an aerial or satellite based imaging systems. The course also covers the properties of these imaging systems with an emphasis on their use as quantitative scientific instruments. It also includes a treatment of methods to invert the remotely sensed image data to measurements of the Earth's surface (e.g. reflectance and temperature) through various means of inverting the governing radiometric equation. The emphasis is on multidimensional image analysis (e.g., multispectral, polarimetric, and multidate) and includes issues such as image registration to support image analysis. Based on the previous treatment, the parameters and processes governing spatial, spectral, and radiometric image fidelity are studied with an emphasis on how each step in the image chain impacts the final image or image product.
Prerequisites: IMGS-619 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-723 Remote Sensing: Spectral Image Analysis (3 Credits)
This course is focused on analysis of high-dimensional remotely sensed data sets. It begins with a review of the properties of matter that control the spectral nature of reflected and emitted energy. It then introduces mathematical ways to characterize spectral data and methods to perform initial analysis of spectral data to characterize and preprocess the data. These include noise characterization and mitigation, radiometric calibration, atmospheric compensation, dimensionality characterization, and reduction. Much of the course focuses on spectral image analysis algorithms employing conceptual approaches to characterizing the data. These analytical tools are aimed at segmentation, subpixel or pixel unmixing approaches and target detection including treatment of signal processing theory and application. There is also a significant emphasis on incorporation of physics-based algorithms into spectral image analysis. The course concludes with an end-to-end treatment of image fidelity incorporating atmospheres, sensors, and image processing effects.
Prerequisites: IMGS-619 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-724 Introduction to Electron Microscopy (3 Credits)
The course will introduce the basic concepts and practice of electron microscopy, including transmission electron microscopy (TEM), scanning electron microscopy (SEM) and x-ray microanalysis. During the second half of the course students will do an 8-10 hour hands-on project in SEM or TEM or both, including a project paper and a poster presentation. Laboratory demonstrations will be held in the NanoImaging Lab to reinforce the lecture material.
This course is restricted to students with graduate standing in the College of Science or the Kate Gleason College of Engineering.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-730 Magnetic Resonance Imaging (3 Credits)
This course is designed to teach the principles of the imaging technique called magnetic resonance imaging (MRI). The course covers spin physics, Fourier transforms, basic imaging principles, Fourier imaging, imaging hardware, imaging techniques, image processing, image artifacts, safety, and advanced imaging techniques.
This class is restricted to graduate students in the IMGS-MS or IMGS-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-731 Ultrasound Imaging (3 Credits)
This course is an overview of the physics and signal processing principles of ultrasound as applied to the different medical imaging modalities such as B-mode, M-mode, Doppler, and 3D imaging. Tissue characterization methods are introduced.
Prerequisites: IMGS-616 and IMGS-682 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-732 Synthetic Aperture Radar Image Formation Processing (3 Credits)
This course covers the history and fundamental principles of synthetic aperture radar image formation processing (SAR-IFP). Topics included a review of linear systems theory, an introduction to radar systems, synthetic aperture radar (SAR) concepts, exposure to commonly used spotlight and stripmap image formation algorithms, and autofocus. The course concludes with a discussion on linear frequency modulated continuous wave (LFM-CW) SAR systems that are often fielded on very small, low-cost, low power platforms. Spotlight mode image formation algorithms covered in this course include the Polar Formatting Algorithm (PFA) and the Backprojection Algorithm. Stripmap mode image formation algorithms addressed include the Range-Doppler Algorithm and the Omega-K Algorithm. Along the way, a variety of remote sensing and linear systems theory will be employed to provide specific insight into the following system performance metrics: image size, area rate, resolution, impulse response, noise equivalent backscatter coefficient, residual quadratic phase error, depth of focus, and geometric distortion.
Prerequisites: IMGS-261 or IMGS-616 or IMGS-617 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-733 Medical Imaging Systems (3 Credits)
This course is an introduction to the physics, instrumentation, and signal processing methods used in different imaging modalities such as X-ray CT, MRI, PET/SPECT and ultrasound.
Prerequisites: IMGS-616 and IMGS-682 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-737 Physical Optics (3 Credits)
This course covers the wave properties of light, its interaction with matter, and the application of these principles to imaging systems. Topics include polarization of light, birefringence, interference and interferometers, spatial and temporal coherence, and scalar diffraction theory.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

IMGS-740 Imaging Science MS Systems Project Paper (3 Credits)
The analysis and solution of imaging science systems problems for students enrolled in the MS Project capstone paper option.
Contact Hours: Research 3
Typically Offered: Fall, Spring, Summer

IMGS-754 Pattern Recognition (3 Credits)
This course develops a fundamental understanding of adaptive pattern recognition and a basic working knowledge of techniques for use in a broad range of applications. Inherent in adaptive pattern recognition is the ability of the system to learn by supervised or unsupervised training, or by competition within a changing environment. The effectiveness of the system depends upon its structure, adaptive properties, and specifics of the application. Particular structures developed and analyzed include Bayes decision theory, parametric and non-parametric techniques, multilayer perceptrons, and unsupervised clustering methods. The goal is to gain both a fundamental and working knowledge of each kind of technique and the ability to select the most appropriate one when faced with a real application design.
Prerequisites: IMGS-613 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-756 Advanced Digital Image Processing (3 Credits)
This course investigates algorithms and techniques for a variety of imaging applications. The techniques build on the background from IMGS-682. The course is taught using a lecture and group project format, in which the lectures focus on advanced techniques and provide applications of their use in selected applications. The group projects enable students to work on substantial designs that require the understanding of the task domain, exploration of solution methods by analysis and prototyping, and implementation of a selected approach. Each team presents a preliminary plan, an approach with feasibility analysis, and a final demonstration.
Prerequisites: IMGS-682 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

IMGS-765 Performance Modeling and Characterization of Remote Sensing Systems (3 Credits)
This course introduces the techniques utilized for system performance predictions of new imaging platforms during their design phase. Emphasis will be placed on systems engineering concepts and their impact on final product quality through first principles modeling. In addition, the student will learn techniques to characterize system performance during actual operation to monitor compliance to performance specifications and monitor system health. Although the focus of the course will be on electro-optical collection systems, some modality specific concepts will be introduced for LIDAR, broadband infrared, polarimetric, and hyperspectral systems.
Prerequisites: (IMGS-616 or IMGS-617) and IMGS-619 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-766 Geometrical Optics and Lens Design (3 Credits)
This course leads to a thorough understanding of the geometrical properties of optical imaging systems and detailed procedures for designing any major lens system. Automatic lens design, merit functions, and optimization are applied to real design problems. The course will utilize a modern optical design program and examples carried out on a number of types of lenses to illustrate how the process of design is carried out.
Prerequisites: IMGS-633 or equivalent course.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

IMGS-789 Graduate Special Topics (1-3 Credits)
This is a graduate-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall, Spring, Summer

IMGS-790 Research & Thesis (1-6 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

IMGS-791 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring, Summer

IMGS-799 Imaging Science Independent Study (1-4 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for student in their graduate studies.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

IMGS-830 Advanced Topics in Remote Sensing (3 Credits)
This course is an in-depth examination of emerging techniques and technologies in the field of remote sensing at an advanced level. Examples of topics, which will differ each semester, are typically formed around a specific remote sensing modality such as lidar, polarimetry, radar, and hyperspectral remote sensing.
Prerequisites: IMGS-723 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

IMGS-890 Research & Thesis (1-6 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

IMGS-891 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring, Summer

Industrial & Systems Engineering (ISEE)

ISEE-601 Systems Modeling and Optimization (3 Credits)
An introductory course in operations research focusing on modeling and optimization techniques used in solving problems encountered in industrial and service systems. Topics include deterministic and stochastic modeling methodologies (e.g., linear and integer programming, Markov chains, and queuing models) in addition to decision analysis and optimization tools. These techniques will be applied to application areas such as production systems, supply chains, logistics, scheduling, healthcare, and service systems. Note: Students required to take ISEE-301 for credit may not take ISEE-601 for credit.
This course is restricted to students in ISEE-MS, ENGMGT-MS, MIE-PHD, AI-MS, or BIME-BS with a BIMEISEE-U subplan or CHME-BS students with a CHMEISEE-U subplan..
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-610 Systems Simulation (3 Credits)
Simulation and queueing theory are used to design and evaluate the performance of dynamic and stochastic systems. Queueing methods are utilized to study waiting line systems. Digital simulation is applied to the design and analysis of complex systems in a variety of contexts using powerful simulation tools. The course will emphasize simulation modeling and statistical analysis techniques essential for conducting simulation projects.
Prerequisites: ISEE-200 and ISEE-301 and (ISEE-325 or STAT-252) or degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-626 Lean System Design (3 Credits)
In today's competitive business environment, organizations strive to deliver high-quality products and services efficiently while continuously improving their processes. This course explores the principles and methodologies of lean manufacturing and service systems design, providing students with the knowledge and skills to improve operational systems across various industries. Topics covered include value stream mapping, just-in-time production, pull systems, continuous improvement, standardization, and visual management. The course also explores strategies for aligning operational systems with customer needs and market demands, fostering a culture of continuous improvement, to drive change and innovation.
This course is restricted to students in ISEE-MS, ENGMGT-MS, MIE-PHD, BIME-BS with a BIMEISEE-U subplan, ISEE-BS with a ISEEMS-U or ISEEEGMT-U subplan, CHME-BS with a CHMEISEE-U subplan or those with 5th year standing in ISEE-BS or ISEEDU-BS.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-640 Computer-Aided Design & Mfg (3 Credits)
This course provides an introduction to computer-aided design and manufacturing (CAD/CAM) using Solidworks and MasterCAM. Students will learn how to model individual parts and assemblies. These skills will then be applied in a manufacturing context to produce CAD models of molds, jigs, and fixtures. Lastly, students will learn to generate CNC toolpaths from their CAD models. Students may not take this course for credit if they have already taken another Solidworks modeling course.
Prerequisites: ISEE-140 or MECE-104 or equivalent course or students in ISEE-MS, ENGMGT-MS, MECE-MS, MECE-ME, MIE-PHD, or BIME-BS students with a BIMEISEE-U subplan or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-660 Applied Statistical Quality Control (3 Credits)
An applied approach to statistical quality control utilizing theoretical tools acquired in other math and statistics courses. Heavy emphasis on understanding and applying statistical analysis methods in real-world quality control situations in engineering. Topics include process capability analysis, acceptance sampling, hypothesis testing and control charts. Contemporary topics such as six-sigma are included within the context of the course. Note: Students required to take ISEE-560 for credit may not take ISEE-660 for credit.
This course is restricted to students in ISEE-MS, ENGMGT-MS, STATQL-ACT, or (BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan that have completed STAT-205 or MATH-251 or ISEE-325 or MCEE-205 or equivalent course).
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-661 Data Analytics and Predictive Modeling (3 Credits)
In systems where parameters can vary, we often want to understand the effects that some variables exert on others and their impact on system performance. "Data Analytics and Predictive Modeling" describes a variety of machine learning and data analysis techniques that can be used to describe the interrelationships among such variables. In this course, we will examine these techniques in detail, including data cleansing processes, data clustering, associate analysis, linear regression analysis, classification methods, naïve Bayes, neural networks, random forests, variable screening methods, and variable transformations. Cases illustrating the use of these techniques in engineering applications will be developed and analyzed throughout the course. Note: Students required to take ISEE-561 for credit may not take ISEE-661 for credit.
This course is restricted to students in ISEE-MS, ENGMGT-MS, MIE-PHD, or (BIME-BS students with a BIMEISEE-U subplan or CHME-BS students with a CHMEISEE-U subplan that have completed STAT-205 or MATH-251 or ISEE-325 or MCEE-205 or equivalent course).
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-682 Lean Six Sigma Fundamentals (3 Credits)
This course presents the philosophy and methods that enable participants to develop quality strategies and drive process improvements. The fundamental elements of Lean Six Sigma are covered along with many problem solving and statistical tools that are valuable in driving process improvements in a broad range of business environments and industries. Successful completion of this course is accompanied by "yellow belt" certification and provides a solid foundation for those who also wish to pursue a "green belt." (Green belt certification requires completion of an approved project which is beyond the scope of this course).
This course is restricted to degree-seeking graduate students and dual degree BS/MS or BS/ME students in KGCOE.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ISEE-684 Engineering and the Developing World (3 Credits)
This course helps students develop a system of holistic thinking about engineering pursuits which includes the natural environment, humans as individuals, economics, culture, institutions, policies, and civil society. Topics include research, design, dissemination, and evaluation techniques of the Human Centered Design Methodology (also called Design Thinking), Systems Practice tools for understanding complex problems, comparison of competing economic viewpoints, and evaluation of project case studies for triple bottom line sustainability. The course will include an extensive community engaged experiential learning component with a community partner in the city of Rochester which requires periodic travel to the partner's site for interviews and activities. The course project is intended to lead to ideas that can be continued into social impact design capstone projects for implementation.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-689 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-698 Part-time Graduate Co-op (0 Credits)
One semester of paid part-time work experience in the field of industrial engineering or sustainable engineering. See the graduate program coordinator or RIT's Office of Cooperative Education for further details. This course is restricted to students in the ISEE-MS, ENGMGT-ME, MFLEAD-MS, or PRODDEV-MS programs.
Typically Offered: Fall, Spring, Summer

ISEE-699 Graduate Co-op (0 Credits)
One semester of paid full-time work experience in the field of industrial engineering or sustainable engineering. See the graduate program coordinator or RIT's Office of Cooperative Education for further details. This course is restricted to students in the ISEE-MS, SUSTAIN-MS, ENGMGT-ME, MFLEAD-MS, or PRODDEV-MS programs.
Typically Offered: Fall, Spring, Summer

ISEE-701 Linear Programming (3 Credits)
Computational techniques for solving constrained optimization problems. Linear programming, the Simplex method and variations, duality and sensitivity testing.
Prerequisite: ISEE-301 or ISEE-601 or IDAI-620 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-702 Integer and Nonlinear Programming (3 Credits)
An introduction to the mathematical foundations of integer programming and nonlinear optimization techniques. Study of algorithms and computer-aided solutions for applied optimization problems.
Prerequisite: ISEE-301 or ISEE-601 or IDAI-620 or equivalent course.
Contact Hours: Lecture 3

ISEE-703 Supply Chain Management (3 Credits)
Supply chain management is unique in that it is one of the oldest business activities and yet has been recently discovered as a potentially powerful source of competitive advantage. Supply chain system activities, such as planning production levels, forecasting demand, managing inventory, warehousing, transportation, and locating facilities have been performed since the start of commercial activity. It is difficult to visualize any product that could reach a customer without a consciously designed supply chain. Yet it is only recently that many firms have started focusing on supply chain management. There is a realization that no company can do any better than its supply chain and logistics systems. This becomes even more important given that product life cycles are shrinking and competition is intense. Logistics and supply chain management today represents a great challenge as well as a tremendous opportunity for most firms.
Prerequisites: ISEE-420 or equivalent course or degree-seeking graduate students, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-704 Logistics (3 Credits)
This course discusses several strategic, tactical, and operational concepts used in improving the distribution of goods and services by companies worldwide. The course emphasis is on understanding when and how these concepts are applied, as well as on using mathematical programming and optimization methods for their adequate implementation.
Prerequisites: ISEE-420 or ISEE-601 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-708 Simulation Analysis (3 Credits)
Simulation Analysis focuses on simulation design, analysis, and applied research methods for industrial and service systems. In particular, the course covers discrete-event, agent-based, and continuous simulation modeling approaches; data driven simulation models; design and analysis of simulation experiments and optimization; artificial intelligence (AI) simulation methods; and Industry 4.0/Digital Twin simulation.
Prerequisites: ISEE-510 or equivalent course or students in ISEE-MS, ENGMGT-MS, MIE-PHD, MMSI-MS programs, or MMSI-MS dual degree students, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-711 Advanced Simulation (3 Credits)
An advanced course in developing simulation models using good model building, verification and validation procedures. Emphasis will be on review and use of probability distributions, simulation output data analysis for making good decisions, comparison of alternative system configurations, use of designed experiments and the use of advanced simulation techniques. Real world case studies will be examined to convey understanding and teaching of the material. Students will be asked to build models, so simulation experience and working knowledge of a simulation language will be required.
Prerequisites: ISEE-510 or ISEE-610 or ISEE-708 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-720 Production Control (3 Credits)
This course covers the process and the analysis methods used to produce goods and services to support of the production and operations management functions. Topics include: forecasting, inventory policies and models, job shop scheduling, aggregate production planning, and ERP systems. Students will understand the importance of production control and its relationship to other functions within the organization, and the role of mathematical optimization to support production planning. The course emphasizes how a production process can be characterized by a process that requires answering a sequence of decision-making problems. The course will show how the production functions integrate with each other and how their coordination can be automated through mathematical programming. Identifying opportunities for improvement through optimization is also highlighted.
Prerequisites: ISEE-601 or (ISEE-301 and (STAT-251 or MATH-251)) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-723 Global Facilities Planning (3 Credits)
Facilities planning determines how an activity's tangible fixed assets best support achieving the activity's objective. This course will provide knowledge of the principles and practices of facility layout, material handling, storage and warehousing, and facility location for manufacturing and support facilities. Tools for sizing the resources needed, planning, design, evaluation, selection, and implementation will be covered. The focus of the course will cover both management and design aspects, with the focus being more heavily on the management aspects.
This course is restricted to RIT degree-seeking graduate students, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-728 Production Systems Management (3 Credits)
The focus of this course is Lean. Students who take this course should be interested in building on their basic knowledge of (lean) contemporary production systems and developing the breadth and depth of their understanding, with a focus on the managerial, quantitative, and systems aspects. It will also address value streams beyond manufacturing - specifically logistics. This course should enable the student to practice the application of lean concepts in the context of systems design at the enterprise level.
Prerequisites: ISEE-420 or ISEE-626 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-730 Data-Driven Human Biomechanics (3 Credits)
Topics include musculoskeletal anatomy and mechanics, theory and application of electromyography, motion and force measuring equipment and techniques, human locomotion, balance and falls, inverse dynamics modeling of the human body, and current topics in musculoskeletal biomechanics research. Students collect data in the lab and conduct the data analysis using MATLAB software or Python software.
Prerequisites: ISEE-330 or MECE-320 or BIME-200 or equivalent course or KGCOE graduate students, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-731 Advanced Topics in Human Factors and Ergonomics (3 Credits)
Advanced topics are selected based on current ergonomic and human factors issues and interests of students. Course is taught using a seminar format. Students are required to select, read, and discuss scientific literature relevant to the fields of human factors and ergonomics.
Prerequisites: ISEE-330 or equivalent course or students in ISEE-MS, ENGMGT-MS, or MIE-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-732 Systems Safety Engineering (3 Credits)
Acquaints students with practical aspects of safety engineering. Students acquire a working knowledge of legal and technical aspects of safety. Focuses on a systems approach to safety engineering. Topics include Workers Compensation, OSHA, Consumer Product Safety Commission, NIOSH Guidelines and various hazard analysis and utilization techniques. Students also are exposed to various theories of accident causation, research methodology and ways of evaluating safety programs and related research.
This course is restricted to students in the ISEE-MS, ENGMGT-MS, or MIE-PHD programs, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan, or those with 4th year standing in ISEE-BS.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-734 Graduate Engineering Psychology (3 Credits)
In this course the students will learn to recognize the integrated (systems) nature of Engineering Psychology, the centrality of human beings in systems design, and to use the topics covered and the available knowledge base to adapt the environment to people. This course will cover several fundamental models of human information processing in the context of human-system interactions. The models may include but are not limited to Signal Detection Theory, Information Theory, theories of attention, both normative and naturalistic decision making-models, Control Theory, and the Lens Model of Brunswick, as well as models of the human as a physical engine, that is, anthropometry, biomechanics, and work physiology. Most topics include readings in addition to the course text as well as a lab exercise with a detailed lab report.
This course is restricted to students in the ISEE-MS, ENGMGT-MS programs, or BIME-BS students with a BIMEISEE-U subplan, CHME-BS students with a CHMEISEE-U subplan, or those with 5th year standing in ISEE-BS or ISEEDU-BS.
Contact Hours: Lecture 3

ISEE-740 Design for Manufacture and Assembly (3 Credits)
Course reviews operating principles of prevalent processes such as casting, molding, and machining. Students will use this knowledge to select appropriate production processes for a given component. For each process covered, guidelines governing proper design for manufacturability practices will be discussed and applied.
Prerequisites: ISEE-140 or MECE-104 or equivalent course or students in ISEE-MS, ENGMGT-MS, MECE-MS, MECE-ME, MMSI-MS, MIE-PHD, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-741 3D Printing (3 Credits)
This course begins with an introduction to commercial rapid prototyping processes, the materials involved, and the physics behind how they work. The course then transitions to research topics involving novel processes, applications, and materials. Class activities include a mix of lecture, lab, and project work.
Prerequisites: ISEE-140 or ISEE-304 or MECE-104 or MECE-305 or equivalent course or students in ISEE-MS, ENGMGT-MS, MECE-MS, MECE-ME, MIE-PHD, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall, Spring

ISEE-742 Metal and Composite Additive Manufacturing (3 Credits)
This course provides students with depth in the topics of metal additive manufacturing and composite additive manufacturing. For metal AM, established processes such as powder bed fusion, binder jetting, and bound particle extrusion will be covered along with emerging processes such as molten metal droplet jetting, cold spray, friction stir, and wire arc. The composite AM portion of the course will focus on polymer matrix composite materials. The fundamentals of how fiber reinforcement and the polymer matrix interact will be covered, as will strategies for optimizing material properties though local control of fiber orientation. Students will use design tools for light weighting of structures via engineered lattice structures, generative design, and topology optimization. Students are expected to have previous introductory experience with 3D printing and computer-aided design.
This course is restricted to KGCOE graduate students and KGCOE UG students with 5th year status.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-743 Personalized 3D Printing (3 Credits)
This course covers the use of 3D printing technologies to produce products that have been personalized for the individual who will use them. Examples include customized invisible braces, hearing aids, footwear, helmets, swimming goggles, and bone implants. The course will cover digital scanning technologies, such as structured light and medical CT scanning, as well as the software workflow to convert point cloud scan data into editable CAD surfaces and solids. Design tools will be used to create customized digital material properties in which color, stiffness and/or other properties are manipulated. 3D printing technologies, including multi-material 3D printing, will be used to fabricate designs. Students are expected to have previous introductory experience with 3D printing and computer-aided design.
This course is restricted to KGCOE graduate students and KGCOE UG students with 5th year status.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-745 Manufacturing Systems (3 Credits)
This course will provide an introduction to concepts and techniques in the design and analysis of production systems. A blend of traditional and modern approaches is brought into the classroom. At the end of the term, the student will be able to assess and analyze the performance of a given manufacturing system as well as to provide a framework for system redesign and improvement. Modern aspects such as lean manufacturing and setup time reduction are included in the context of the course.
This course is restricted to RIT degree-seeking graduate students, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-750 Systems and Project Management (3 Credits)
This course ensures progress toward objectives, proper deployment and conservation of human and financial resources, and achievement of cost and schedule targets. The focus of the course is on the utilization of a diverse set of project management methods and tools. Topics include strategic project management, project and organization learning, chartering, adaptive project management methodologies, structuring of performance measures and metrics, technical teams and project management, risk management, and process control. Course delivery consists of lectures, speakers, case studies, and experience sharing, and reinforces collaborative project-based learning and continuous improvement.
Prerequisites: ISEE-350 or equivalent course or students in ISEE-MS, ENGMGT-MS, PRODDEV-MS, MFLEAD-MS, or MIE-PHD programs, or BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-751 Decision and Risk Benefit Analysis (3 Credits)
This course addresses decision making in the face of risk and uncertainty. Various methodologies will be introduced that are useful in describing and making decisions about risks, with particular emphasis on those associated with the design of products. Students will be exposed to issues related to balancing risks and benefits in situations involving human safety, product liability, environmental impact, and financial uncertainty. Presentations will be made of risk assessment studies, public decision processes, and methods for describing and making decisions about the societal risks associated with engineering projects. Topics include probabilistic risk assessment, cost-benefit analysis, reliability and hazard analysis, decision analysis, portfolio analysis, and project risk management.
This course is restricted to students in MFLEAD-MS and PRODDEV-MS .
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-752 Decision Analysis (3 Credits)
This course presents the primary concepts of decision analysis. Topics important to the practical assessment of probability and preference information needed to implement decision analysis are considered. Decision models represented by a sequence of interrelated decisions, stochastic processes, and multiple criteria are also addressed. We cover EMV and Non-EMV decision-making concepts. Finally, the organizational use of decision analysis and its application in real-world case studies is presented.
Prerequisites: ISEE-325 or MATH-251 or MATH-252 or STAT-205 or MCEE-205 or equivalent course or students in ISEE-MS, ENGMGT-MS, or MIE-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-760 Design of Experiments (3 Credits)
This course presents an in-depth study of the primary concepts of experimental design. Its applied approach uses theoretical tools acquired in other mathematics and statistics courses. Emphasis is placed on the role of replication and randomization in experimentation. Numerous designs and design strategies are reviewed and implications on data analysis are discussed. Topics include: consideration of type 1 and type 2 errors in experimentation, sample size determination, completely randomized designs, randomized complete block designs, blocking and confounding in experiments, Latin square and Graeco Latin square designs, general factorial designs, the 2k factorial design system, the 3k factorial design system, fractional factorial designs, Taguchi experimentation.
Prerequisites: ISEE-325 or STAT-257 or MATH-252 or MCEE-205 or STAT-205 or equivalent course or students in ISEE-MS, ENGMGT-MS, or MIE-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-761 Forecasting Methods (3 Credits)
Forecasting Methods will provide the engineering student with the skills necessary to perform data driven time series analysis from an engineering applications perspective. A process driven approach will be used covering the entire forecasting process from data preparation and pre-processing techniques to model selection, performance evaluation, and monitoring. A special emphasis will be placed on performance evaluation and improvement of models used to predict RIT energy demand and peak load days. The course will cover topics in data cleansing, data transformation, trend and seasonality analysis, smoothing techniques, regression analysis for forecasting, seasonal and non-seasonal ARIMA models, dynamic regression, neural networks and advanced modeling techniques for multivariate time series analysis. Lectures and assignments will focus on predicting RIT energy demand considering circuits with 2MW solar fields or similar data sets.
Prerequisites: ISEE-561 or ISEE-661 or IDAI-610 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Biennially

ISEE-770 Design Project Leadership (3 Credits)
This course focuses on preparing students to take on a leadership role in design project teams. Topics include product development processes, management of design project teams, developing a business case for design projects, understanding customer needs and translating them into engineering specifications, tools for developing design concepts, tools for assessing the feasibility of design concepts, conducting engineering tradeoffs and analysis to synthesize a preliminary design. Students use the concepts and tools discussed throughout the course in a team-based environment to develop project readiness packages for subsequent use by senior design teams.
Prerequisites: ISEE-350 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-771 Engineering of Systems I (3 Credits)
The engineering of a system is focused on the identification of value and the value chain, requirements management and engineering, understanding the limitations of current systems, the development of the overall concept, and continually improving the robustness of the defined solution. EOS I & II is a 2-semester course sequence focused on the creation of systems that generate value for both the customer and the enterprise. Through systematic analysis and synthesis methods, novel solutions to problems are proposed and selected. This first course in the sequence focuses on the definition of the system requirements by systematic analysis of the existing problems, issues and solutions, to create an improved vision for a new system. Based on this new vision, new high-level solutions will be identified and selected for (hypothetical) further development. The focus is to learn systems engineering through a focus on an actual artifact
This course is restricted to students in ISEE-MS, PRODDEV-MS, MFLEAD-MS, ENGMGT-MS, MIE-PHD, or ISE Dual Degree programs, or those with 5th year standing in ISEE-BS or ISEEDU-BS.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-772 Engineering of Systems II (3 Credits)
The engineering of a system is focused on the identification of value and the value chain, requirements management and engineering, understanding the limitations of current systems, the development of the overall concept, and continually improving the robustness of the defined solution. EOS I & II is a 2-semester course sequence focused on the creation of systems that create value for both the customer and the enterprise. Through systematic analysis and synthesis methods, novel solutions to problems are proposed and selected. This second course in the sequence revisits the first sequence and views the engineering of a system through a lean perspective, as such the emphasis is on the system development process itself.
Prerequisites: ISEE-771 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-773 Engineering Value Creation (3 Credits)
This course focuses on the role of engineering in value creation. In particular, the effective integration of engineering activities for the transformation of novel ideas and technologies into marketable products and services. Topics include value engineering and value analysis, the engineering value chain, the innovation process, engineering sustainable value, and the technology development and management process.
This course is restricted to students in ISEE-MS, ENGMGT-MS, MIE-PHD, BIME-BS with a BIMEISEE-U subplan, ISEE-BS with a ISEEMS-U or ISEEEGMT-U subplan, CHME-BS with a CHMEISEE-U subplan or those with 5th year standing in ISEE-BS or ISEEDU-BS.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-781 Excellence in New Product Development (3 Credits)
Success in today's competitive global economy depends substantially on a firm's ability to define, develop, and introduce outstanding new products more efficiently and effectively than its competitors. This course introduces students to best practices and attributes of world-class product development leaders and organizations. Critical success factors and inhibitors to the commercialization of complex products and systems are discussed, along with state-of-the-art methodologies, processes, and tools. Emphasis is placed on the role of the product development manager in leading product strategy, high performing product development teams, and transformational initiatives essential to competitiveness.
This course is restricted to students in MFLEAD-MS and PRODDEV-MS .
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-782 Product Development in the Extended Enterprise (3 Credits)
Today's complex products and shorter product development life cycles have dramatically increased dependence on external resources. This course will examine a broad range of collaborative arrangements from traditional contracting and functional outsourcing to cross-enterprise partnerships, in the context of the product delivery process and the challenges faced by product development managers.
This course is restricted to students in MFLEAD-MS and PRODDEV-MS .
Contact Hours: Lecture 3

ISEE-783 Advanced Topics in New Product Development (3 Credits)
This modular course is designed to complement previous coursework in the MPD program, with an emphasis on leadership/engineering concepts and tools needed by technical leaders of product development projects and organizations. The course is intended to fill gaps in the MPD program by covering important topics for product development leaders that were not covered or topics for which students have expressed interest in additional coverage.
This course is restricted to students in MFLEAD-MS and PRODDEV-MS .
Contact Hours: Lecture 3

ISEE-785 Fundamentals of Sustainable Engineering (3 Credits)
This is a high level survey course that reviews the product lifecycle from various perspectives and highlights the leverage over material, process, and environmental impacts available at the design phase. Tools and strategies for reducing the environmental impacts associated with the sourcing, manufacture, use, and retirement of products will be reviewed and evaluated.
This course is restricted to students in ISEE-MS, ENGMGT-MS, MECE-MS, MECE-ME, SUSPRD-MN, MIE-PHD, or ISE Dual Degree programs, or those with at least 4th year standing in ISEE-BS or ISEEDU-BS.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-786 Lifecycle Assessment (3 Credits)
This course introduces students to the challenges posed when trying to determine the total lifecycle impacts associated with a product or a process design. Various costing models and their inherent assumptions will be reviewed and critiqued. The inability of traditional costing models to account for important environmental and social externalities will be highlighted. The Lifecycle Assessment approach for quantifying environmental and social externalities will be reviewed and specific LCA techniques (Streamlined Lifecycle Assessment, SimaPro) will be covered.
This course is restricted to students in ISEE-MS, ENGMGT-MS, MECE-MS, MECE-ME, SUSPRD-MN, MIE-PHD, or ISE Dual Degree programs, or those with at least 4th year standing in ISEE-BS or ISEEDU-BS.
Contact Hours: Lecture 3
Typically Offered: Spring

ISEE-787 Design for the Environment (3 Credits)
This course will provide the student with systematic approaches for designing and developing environmentally responsible products. In particular, design trade-offs will be explored.
Prerequisites: ISEE-140 or ISEE-304 or MECE-305 or students in SUSPRD-MN, ISEE-MS, ENGMGT-MS, BIME-BS with a BIMEISEE-U subplan, CHME-BS with a CHMEISEE-U subplan, MECE-MS, MECE-ME, or MIE-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ISEE-788 Project with Paper (3 Credits)
This course is used by students as a capstone experience. The student must demonstrate an acquired competence in a topic that is chosen in conference with a faculty advisor. The work may involve a research and/or design project with demonstration of acquired knowledge. A written paper and an oral presentation of the work are required.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

ISEE-789 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-790 Thesis (1-6 Credits)
In conference with a faculty adviser, an independent engineering project or research problem is selected. The work may be of a theoretical and/or computational nature. A state-of-the-art literature search in the area is normally expected. A formal written thesis and an oral defense with a faculty thesis committee are required. Submission of bound copies of the thesis to the library and to the department and preparation of a written paper in a short format suitable for submission for publication in a refereed journal are also required. Approval of department head and faculty adviser needed to enroll.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ISEE-792 Engineering Capstone (3 Credits)
Students must investigate a discipline-related topic in industrial and systems engineering. The general intent of the engineering capstone is to demonstrate the students' knowledge of the integrative aspects of a particular area. The capstone should draw upon skills and knowledge acquired in the program.
This course is restricted to students in ISEE-MS, ENGMGT-ME, PRODDEV-MS, MFLEAD-MS, BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan, or ISEE-BS students with a ISEEMS-U or ISEEEGMT-U subplan.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-793 Manufacturing Leadership Capstone (3 Credits)
For the MS in Manufacturing Leadership program. The purpose of the project is for students to demonstrate integrative application of knowledge and skills acquired during the program. A capstone project will be oriented to the solution of a manufacturing, operations, or supply chain management problem or to a technically related process. A suitable project will be multi-disciplinary or multi-functional in nature and will have significant impact on one or more competitive capabilities of the organization, e.g., quality, lead time, cost, flexibility, or service. Team-based projects are encouraged. Projects must be approved in advance of registration.
This course is restricted to MFLEAD-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-794 Leadership Capstone (0 Credits)
For students enrolled in the BS/ME dual degree program. Student must either: 1) serve as a team leader for the multidisciplinary senior design project, where they must apply leadership, project management, and system engineering skills to the solution of unstructured, open-ended, multi-disciplinary real-world engineering problems, or 2) demonstrate leadership through the investigation of a discipline-related topic.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring

ISEE-795 Graduate Seminar (0 Credits)
This class introduces students to state of the art research and research methods in industrial and systems engineering. Presentations include off campus speakers and students/faculty presentations on current research under way in the department.
This course is restricted to students in ISEE-MS, ENGMGT-MS, BIME-BS students with a BIMEISEE-U subplan, or CHME-BS students with a CHMEISEE-U subplan, or ISEE-BS students with a ISEEMS-U or ISEEEGMT-U subplan.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

ISEE-796 Graduate Seminar II (0 Credits)
The second in a two course sequence that introduces students to research methods in industrial engineering and presents the state of the art in industrial engineering research. The two-course sequence is designed to promote discussion and interaction on IE research topics and to present research methods such as conducting critical reviews of research literature, initiating background research on a thesis topic, and preparing a formal thesis proposal.
This course is restricted to students in ISEE-MS, SUSTAIN-MS or ISEE BS/MS.
Contact Hours: Seminar 1
Typically Offered: Spring

ISEE-797 Product Development Capstone I (3 Credits)
For the MS in Product Development (MPD) program. Students in the program must demonstrate intellectual leadership in the field of new product development. The general intent of the Capstone is to demonstrate the students' knowledge of the integrative aspects of new product development in the context of a corporate-oriented problem solving research project. The project should address issues of significance to multiple functions or disciplines and should draw upon skills and knowledge acquired from various courses and experiences in the program. Students are encouraged to start work on the project in advance of receiving formal credit. Team-based projects are strongly recommended.
This class is restricted to PRODDEV-MS Major students.
Typically Offered: Fall

ISEE-798 Product Development Capstone (3 Credits)
For the MS in Product Development (MPD) program. Students in the program must demonstrate intellectual leadership in the field of new product development. The general intent of the Capstone is to demonstrate knowledge of the integrative aspects of new product development in the context of a company-oriented problem solving project. The project should address issues of significance to multiple functions or disciplines and should draw upon skills and knowledge acquired from various courses and experiences in the program Team-based projects are encouraged. Projects must be approved in advance of registration.
This class is restricted to PRODDEV-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISEE-799 Independent Study (1-3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student must obtain the permission of the appropriate faculty member before registering for the course. Students registering for more than four credit hours must obtain the approval of both the department head and the adviser.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Industrial Design (IDDE)

IDDE-607 Technology Studio (3 Credits)
This course explores the use of computer-aided design (CAD) and other related technologies as tools for designing, modeling, visualizing, simulating and fabricating design solutions. Emphasis is given to the combination of digital and analog technologies, and the workflows for using them effectively in design process.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

IDDE-620 The Studio 2.0 (3 Credits)
This course will focus on developing ideas in art, design and craft. The specific topics for this course will vary each time it is taught. Potential topics may include the creation of public spaces, products, analog and digital fabrication, furniture, inter-disciplinary collaborations, etc. This course can be taken multiple times but individual topics must be different.
This course is restricted to students in FNAS-MFA, CCER-MFA, GLASS-MFA, WOOD-MFA, METAL-MFA, VISCOM-MFA and CMGD-MFA.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

IDDE-665 Experimental Studio (3 Credits)
The course focuses on implementing advanced, newly developing ideas in industrial design. The specific sub-topic for this course will vary. As a result this course may be repeated. The subtopic is determined by the instructor. Potential topics may include the creation of exhibits, consumer products, sustainable design, analog and digital fabrication, furniture, interior landscapes, vehicle design, medical and healthcare design, inter-disciplinary design, etc.
This course is restricted to students in IDDE-MFA.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall, Spring

IDDE-667 Industry, Technology and Design (3 Credits)
This lecture-based course explores how historical events, technology and culture connect with and influence the current state and future direction of design. Special attention is given to the sequence of the technical skills and innovations that have been necessary to drive progress. Students will make relevant connections between the role of design, manufacturing, business and other disciplines, all involved in the development of new products, graphics, interfaces, systems and experiences. This analysis is done from a diverse and inclusive range of geographies, cultures and societies beyond euro-centric design. Activities include readings and discussions, guest lectures, participation in design events, and written assignments. Additional tools may include mind mapping, and strategic foresight.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

IDDE-669 Master Seminar (3 Credits)
The Master Seminar course is a forum for cross-disciplinary presentations and discussions of methods, techniques, processes, and interpretations. Luminaries discuss conceptual and practical studio activities, their current and past endeavors, and the contextualization of their work. Assignments may range from ideation exercises, charrettes, studio visits, research papers, and presentations.
This course is restricted to students in IDDE-MFA.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

IDDE-671 Graduate ID Studio I (3 Credits)
This is the first part of a two-course series that provides opportunities for fine-tuning of design process and development of meaningful solutions across multiple scenarios. Projects and assignments will explore the application of design methods and skills. Projects will also address large-community and global problems requiring team-based, trans-disciplinary collaborations. **Fee: A course fee is required for this course and applied via student account**
This course is restricted to students in IDDE-MFA.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

IDDE-672 Graduate ID Studio II (3 Credits)
This is the second part of a two-course series that provides opportunities for fine tuning of design process and development of meaningful solutions across multiple scenarios. Projects and assignments will expand on the application of design methods and collaboration. Course content will integrate current and emerging technologies that influence design practice as well as society and culture. A strong focus will be on the testing and implementation of design solutions in effective ways.
This course is restricted to students in IDDE-MFA.
Contact Hours: Studio 6
Typically Offered: Spring

IDDE-673 ID Sketching Studio (3 Credits)
A studio styled course in freehand sketching and visualization techniques using a combination of orthogonal, perspective and empathic and any other two-dimensional methods of developing and communicating design concepts.
This course is restricted to students in IDDE-MFA.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall, Spring

IDDE-698 Industrial Design Internship (1-6 Credits)
The Industrial Design Internship provides students the option to work in the industrial design field. Students must obtain permission of an instructor and complete the Internship Permission Form to enroll.
Prerequisites: This class is restricted to students in IDDE-MFA with department permission.
Typically Offered: Fall, Spring, Summer

IDDE-699 Industrial Design Co-op (0 Credits)
Cooperative Education will provide Industrial Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in IDDE-MFA with department permission.
Typically Offered: Fall, Spring, Summer

IDDE-701 Design Laboratory I (3 Credits)
Design Laboratory I is part one of a studio sequence that provides a forum for discourse and experimentation in design. Critical analysis, contextual relevance and research methodologies are developed and used as a means to define the role of design and the designer in creating consequential solutions for the social, economical and environmental betterment of the global communities. Projects will extend these ideas into the practice of industrial design as a mode of understanding the relationships that exist between the user, the community and the designed artifacts. Opportunities for inter and trans-disciplinary collaborations will broaden the scope of the projects. We will design through a process of iteration and reiteration, empathic exploration, and the development of the physical artifacts. Categories of products may include: consumer goods, equipment, transportation, furniture, or packaging.
This course is restricted to students in IDDE-MFA.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

IDDE-702 Design Laboratory II (3 Credits)
This course is the second of a two-course studio sequence that provides a forum for discourse and experimentation in design. Course continues the methodology established in Design Laboratory I, and extends the scope to human-centered concepts, artifacts and systems at both local and global levels. Assignments will include topics such as: responsible design practices, universal design, environmental sensibility, project management and fabrication.
Prerequisites: IDDE-701 or equivalent course and a student in the IDDE-MFA program.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

IDDE-703 Function of Form (3 Credits)
The first of a two-semester sequence, the course emphasizes the experience of seeing, developing, and manipulating three-dimensional forms and compositions. Projects focus on developing the ability to see, organize, and understand the ambiguity inherent in the design process through the study of three-dimension design elements, the analysis of their relationships and the subsequent sensory responses. **Fee: A course fee is required for this course and applied via student account**
This course is restricted to students in IDDE-MFA.
Contact Hours: Studio 6
Typically Offered: Fall

IDDE-704 Form of Function (3 Credits)
The second of a two-semester sequence, this course emphasizes the technical skills necessary to manipulate material and data for the accurate three-dimensional communication of design intent. Projects focus on understanding the relationship of materials, manufacturing processes, products and the user.
Prerequisites: IDDE-703 or equivalent course and a student in the IDDE-MFA program.
Contact Hours: Studio 6
Typically Offered: Spring

IDDE-705 2D Ideation and Visualization (3 Credits)
The first of a two-semester visualization sequence, this course focuses on developing the skills and methods necessary to generate, visualize and define design concepts in two-dimensions, in both analog and digital formats. Assignments may include orthogonal views, perspective drawings and descriptive illustrations, as means to develop and communicate design solutions.
This course is restricted to students in IDDE-MFA.
Contact Hours: Studio 6
Typically Offered: Fall

IDDE-706 Integrated Design Visualization (3 Credits)
The second of a two-semester visualization sequence, this course further develops analog and digital visualization techniques, while expanding on graphic and three-dimensional components needed to create effective presentations and the workflows to achieve them. Assignments will also include crafting visual and verbal presentations that synthesize the concepts developed.
Prerequisite: IDDE-705 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

IDDE-710 Industrial Design History, Theory, and Culture (3 Credits)
This course explores key moments in industrial design's evolution from multiple angles: historical, theoretical, technological and cultural. While the emphasis is on industrial design, other integral design disciplines (i.e. visual communication, UX, systems, service, etc.) will be discussed. This combination of perspectives provides deeper understanding of how design addresses needs and wants of society, commerce, and environment beyond euro-centric contexts. Students are expected to read seminal design articles, write critical essays and questions and to participate in discussion groups.
This course is restricted to students in IDDE-MFA.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

IDDE-711 Design Research and Proposals (3 Credits)
This course focuses on developing research skills in the field of design. Emphasis is placed on an exposure to a wide range of methods, research sources, data collection, and evaluation. Students will select and plan a design research topic, conduct a search for background material, construct a proposal, and defend their research topic.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA, CMGD-MFA and IDDE-MFA majors and other CIAS and RIT graduate students with permission of instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

IDDE-790 Thesis: Research and Planning (6 Credits)
The first of a two-course thesis sequence, the focus of this course is on establishing content, planning, scheduling, and research seeking innovative solutions through the process of concept development, ideation, and in-process evaluation. Final articulation of the project is approved by a faculty committee, presented in a graduate thesis show and accompanied by a written document that addresses how the theories and methods used in the project impact the current and future state of design in society.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall

IDDE-799 Industrial Design Independent Study (1-6 Credits)
Industrial Design Independent Study provides students the means to study in a specialized area with an individual faculty member. With the assistance of their faculty advisers, students will propose a course of study. Students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll. **NOTE: Student must have a minimum 3.0 GPA **
Prerequisites: This class is restricted to students in IDDE-MFA or VISCOM-MFA with instructor permission.
Typically Offered: Fall, Spring

IDDE-887 Industrial Design Part-Time Co-op (0 Credits)
Cooperative Education will provide Industrial Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in IDDE-MFA with department permission.
Typically Offered: Fall, Spring, Summer

IDDE-890 Thesis: Implementation and Evaluation (6 Credits)
The second of a two-course thesis sequence, this course focuses on continued concept development of a thesis, concluding with the implementation and retrospective evaluation of chosen design problem. Solution is presented in a public exhibition, complemented by a written articulation of how the theories and methods employed in the project impact the current and future state of design in society.
Prerequisite: IDDE-790 or equivalent course.
Contact Hours: Thesis 9
Typically Offered: Spring

IDDE-892 Continuation of Thesis Industrial Design (0 Credits)
The Industrial Design Continuation of Thesis course provides student additional semester(s) to complete their thesis research, project, and thesis document.
Prerequisite: IDDE-890 or equivalent course and student standing in the IDDE-MFA program.
Typically Offered: Fall, Spring

Information Sciences & Technologies (ISTE)

ISTE-600 Foundations of Data Mining (3 Credits)
This course provides students with exposure to foundational data mining techniques. Topics include analytical thinking techniques and methods, data/exploring data, classification algorithms, association rule mining, cluster analysis and anomaly detection. Students will work individually and in groups on assignments and case study analyses.
Prerequisite: ISTE-200 and (DECS-782 or STAT-145) or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

ISTE-605 Scholarship In Information Technology And Analytics (3 Credits)
ITA graduate students are expected to make a scholarly contribution as a requirement for the MS degree. The Scholarship in Information Technology and Analytics course provides students with the fundamental skills needed to define and conduct a program of scholarly investigation in the form of a capstone or thesis project. The course focuses on skills such as academic writing, searching the literature, identifying and articulating interesting and important topics and problems, scholarship ethics, developing capstone proposals, critical thinking, and effective oral and written communication and presentation of scholarship.
This course is restricted to INFOST-MS, INFOTEC-MS and NETSYS-MS students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ISTE-608 Database Design And Implementation (3 Credits)
An introduction to the theory and practice of designing and implementing database systems. Current software environments are used to explore effective database design and implementation concepts and strategies. Topics include conceptual data modeling, methodologies, logical/physical database design, normalization, relational algebra, schema creation and data manipulation, and transaction design. Database design and implementation projects are required.
Contact Hours: Lecture/Lab 4
Typically Offered: Fall, Spring

ISTE-610 Non-Relational Data Management (3 Credits)
This course provides students with exposure to foundational concepts and technologies for non-relational data management. Topics include an overview of data types, structuring and processing data and knowledge, data transformation, and data storage. Students will work with non-traditional (NoSQL) data stores to manage large datasets in the context of specific problem scenarios, gaining practical experience with data modeling, querying, and scalability considerations. Web application development exercises are required.
Prerequisites: ISTE-608 or DSCI-623 or CSCI-620 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

ISTE-612 Information Retrieval and Text Mining (3 Credits)
This course provides students with exposure to foundational data analytics technologies, focusing on unstructured data. Topics include unstructured data modeling, indexing, retrieval, text classification, text clustering, and information visualization.
Prerequisites: ISTE-608 and (DECS-782 or STAT-145 or STAT-614) or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall or Spring or Summer

ISTE-645 Foundations of Web Technologies I (3 Credits)
This class provides an introduction to internet and web technologies. Topics include an introduction to the internet and basic internet technologies (including, but not limited to: SSH, SFTP, UNIX, XHTML, CSS, Client-Side programming, and website publishing).
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-646 Foundations Of Web Technologies II (3 Credits)
This course builds on the basic aspects of web page development that are presented in the first course and extends that knowledge to focus on issues and technologies related to the design and development of web sites. Topics include advanced internet technologies (including, but not limited to: AJAX, server-side programming, database use and access, client libraries, server frameworks, and creating and consuming information services).
Prerequisites: ISTE-645 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-690 School of Information Graduate Seminar (1-4 Credits)
This iSchool seminar course provides an opportunity for special one-time offerings of graduate topics or allows faculty to pilot possible new graduate offerings. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering. (Graduate standing with topic-specific prerequisites as appropriate)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall, Spring, Summer

ISTE-699 Graduate Co-op (0 Credits)
An optional cooperative educational experience is available to graduate students to add practical employment experience to their studies to support their career objectives and personal goals. Permission of Graduate Coordinator is required. (Graduate standing with the IST department, and prerequisites plus at least 12 credits completed with a 3.0 GPA or better)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ISTE-721 Information Assurance Fundamentals (3 Credits)
This course provides an introduction to the topic of information assurance as it pertains to an awareness of the risks inherent in protecting digital content in today's networked computing environments. Topics in secure data and information access will be explored from the perspectives of software development, software implementation, data storage, and system administration and network communications. The application of computing technologies, procedures and policies and the activities necessary to detect, document, and counter unauthorized data and system access will be explored. Effective implementation will be discussed and include topics from other fields such as management science, security engineering and criminology. A broad understanding of this subject is important for computing students who are involved in the architecting and creation of information and will include current software exploitation issues and techniques for information assurance.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-722 Database Connectivity and Access (3 Credits)
In this course, students will build applications that interact with databases. Through programming exercises, students will work with multiple databases and programmatically invoke the advanced database processing operations that are integral to contemporary computing applications. Students will examine and evaluate alternative approaches for each of these operations. Topics include the database drivers, the data layer, connectivity operations, security and integrity, and controlling database access.
Prerequisites: ISTE-608 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-724 Data Warehousing (3 Credits)
This course covers the purpose, scope, capabilities, and processes used in data warehousing technologies for the management and analysis of data. Students will be introduced to the theory of data warehousing, dimensional data modeling, the extract/transform/load process, warehouse implementation, dimensional data analysis, and summary data management. The basics of data mining and importance of data security will also be discussed. Hands-on exercises include implementing a data warehouse.
Prerequisites: ISTE-608 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

ISTE-726 Database Management and Access (3 Credits)
Students will be introduced to issues in client/server database implementation and administration. Students will configure, test, and establish client-server communication and server-server communication with single and multiple database servers. Topics such as schema implementation, storage allocation and management, user creation and access security, backup and recovery, and performance measurement and enhancement will be presented in lecture and experienced in a laboratory environment. Students will configure and demonstrate successful communication between a database file server and multiple clients.
Prerequisites: ISTE-608 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-728 Database Management and Access II (3 Credits)
Students will explore the theory and application of advances database administration including database performance monitoring and tuning techniques. Standard topics in DBMS performance will be discussed including: physical and logical design issues, the hardware and software environment, SQL statement execution, indexes and front-end application issues. Techniques in performance monitoring and tuning will be investigated. In addition, advanced database backup and recovery, disaster recovery and other DBA topics will be explored.
Prerequisites: ISTE-726 or equivalent course.
Contact Hours: Lecture/Lab 4
Typically Offered: Fall

ISTE-730 Foundations of IoT (3 Credits)
Internet of Things (IoT) refers to physical and virtual objects that are connected to the Internet to provide intelligent services for energy management, logistics, retail, agriculture and many other domains. IoT leverages sensors, wireless communication, mobile devices, networking and cloud technologies to create many smart applications. In this course, the students learn about IoT design and development methodologies that enable the development of IoT applications. The students have hands-on opportunities to program and build IoT prototypes through lab assignments and a course project. The students should have some programming knowledge and required to purchase a IoT kit.
This course is restricted to students in INFOST-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

ISTE-732 IoT Analytics (3 Credits)
IoT is simply interconnected devices that generate and exchange data from observations, facts, and other data, making it available to anyone. This includes devices that generate data from sensors, smart phones, appliances, and home network devices. IoT solutions are designed to make our knowledge of the world around us more aware and relevant, making it possible to get data about anything from anywhere at any time. This course teaches how IoT data could help and execute data driven operational and business decisions. The students learn how IoT analytics can create adaptive business and operational decisions in intelligent, effective and efficient ways. First, this course provides students with an understanding of different types of IoT data and the knowledge of how to handle the data relate to IoT. Then, the students learn how to create and setup a cloud analytic environment, exploring IoT data. The course also teaches how to apply analytics and statistics to extract value from the data. Lastly, the course explores different use-cases for IoT data. Purchasing a IoT kit is required.
This course is restricted to INFOST-MS or HUMCOMP-MS or DATASCI-MS students.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-740 Geographic Information Science And Technology (3 Credits)
This course provides a survey of the theory, concepts, and technologies related to representation and understanding of the earth - a scientific domain known as Geographic Information Science and Technology (GIS & T). Students will gain hands-on experience with technologies such as Global Positioning Systems (GPSs), Geographic Information Systems (GISs), remote sensing, Virtual Globes (Google Earth), and web mapping mashups. Furthermore, students will learn relevant GIS & T theory, concepts, and research trends such as spatial reasoning, spatiotemporal data representation, and spatial analysis.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-742 Introduction To Geographic Information Systems (3 Credits)
This course introduces students to the world of Geographic Information Systems (GIS). Course lectures, reading assignments, and practical lab experiences will cover a mix of conceptual, practical and technical GIS topics. Topics include GIS data models, basic cartography, geodatabases, spatial analysis, GIS software, and theory and concepts from the Geographic Information Science and Technology domain.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-744 Thematic Cartography And Geographic Visualization (3 Credits)
This course examines concepts and techniques associated with dynamic map construction, usage, and assessment. Specific topics include thematic cartography, geographic information visualization, sources of dynamic geographic information, developing animated and interactive maps, mapping mashup development, using maps as a means to support group work, usability of dynamic maps, and current geovisualization research areas. Development of a visualization prototype and an associated scholarly paper in an area related to thematic cartography and geographic visualization are required.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-750 Internet Middleware Design and Implementation (3 Credits)
This course provides students with an introduction to the design and implementation of Internet middleware application programming interfaces (APIs) and services. Topics include the blending of interactive and dynamic content from multiple servers and services utilizing data from heterogeneous sources, with a strong design focus on the needs of client software and human users which will utilize those services. Provides a practical and theoretical basis for the design and implementation of APIs and middleware, and for the design and development of custom servers and services built on top of existing frameworks (such as Apache/PHP). Emphasis is placed on fundamentals, concepts and standards. Exercises, programming, and projects are required.
Prerequisites: ISTE-612 or equivalent course and graduate standing in INFOST-MS or INFOTEC-MS.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-754 Client Design And Development (3 Credits)
This course will explore the analysis, design, development, and implementation of client-side programming in the context of Internet technologies, mobile devices, and Web-based client systems. Students will learn to design and build usable and effective interactive systems, clients, and interfaces. Key features addressed will include browser and platform compatibility, object reusability, bandwidth and communications issues, development environments, privacy and security, and related technologies and APIs. Programming is required.
Prerequisites: ISTE-200 and ISTE-140 or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

ISTE-756 Server Design And Development (3 Credits)
This course provides students with advanced work in the design and implementation of highly-scalable server-side applications, and application programming interfaces (APIs). Topics include the effects of client requirements upon design, creating and blending heterogeneous data for analysis and visualization, and approaches to building highly-scalable services. Students will develop dynamic, data centric web systems, as well as building information services systems that are independent of the technologies that use them. Students will implement their own servers and services using programming languages. Exercises, programming, and projects are required.
Prerequisites: ISTE-754 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-758 Semantic Web Technologies (3 Credits)
This course provides students with an in-depth introduction to Semantic Web technologies, utilizing ontologies and relationship metadata. Topics include the creation of data linkage through metadata, practical approaches to the design and implementation of ontologies, server- and client-side parsing and transformation of data and ontologies, and machine interpretation of relationships. Emphasis is placed on fundamentals, concepts and standards. Exercises, programming, and projects are required.
Prerequisites: ISTE-610 and ISTE-612 or equivalent courses and graduate standing in the INFOTEC-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-759 Secure Web Application Development (3 Credits)
When building larger-scale web applications, there are a myriad of concerns that range from technology, security, framework, and architecture selection to runtime performance optimization. This course focuses on the development of secure integrated web applications that consume information served from one or many sources. Trends in web application development are identified and assessed. Programming projects are required.
Prerequisites: ISTE-756 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-760 Design, Development, and Deployment of Applications (3 Credits)
What's the difference between writing an application for a school project and writing an application for mass marketing? What makes an application production-ready? In this course we will look at several factors that must be considered including help systems, installation routines, code design, and error handling. Students will need to have had one year of programming in a high-level language to be successful in this course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-762 Software Economics (3 Credits)
In addition to developing software using an organization's own software development staff, new approaches for the acquisition of software systems continue to emerge and to be adopted. This course provides students with the necessary foundational knowledge to compare, evaluate, and assess, from financial and economic perspectives, the alternatives for developing or acquiring software systems. Topics include motivations for studying software economics, basic financial and economic concepts, measurements of software development productivity and software quality, software development cost estimation models, modeling software development and deployment activities, and acquisition alternatives such as open source, purchase, lease, cloud, and outsourcing.
This course is restricted to students in INFOST-MS or INFOTEC-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

ISTE-764 Project Management (3 Credits)
Information technology projects require the application of sound project management principles in order to be developed on time, on budget, and on specification. This course takes students through the nine knowledge areas of modern project management and the utilization of project management principles in both traditional and agile environments.
Contact Hours: Lecture 3
Typically Offered: Fall

ISTE-773 XML Transformation And Presentation (3 Credits)
This course will explore techniques and technologies for transforming XML documents using XSLT and XSL-FO or other frameworks. The emphasis will be on transformation of XML data into human-readable documents, such as HTML pages and PDF files. Topics covered will include XSLT syntax and processing, XPath, and XSLT. Students will implement projects to present XML data using a variety of transformation tools and technologies.
Prerequisites: ISTE-610 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

ISTE-774 Mobile Application Development I (3 Credits)
This course extends the material covered in the Foundations of Mobile Design course and provides students with individual and team-based experience of creating interesting native applications for small-size form factor mobile devices such as smartphones using one of the major platforms. These devices are exceptionally portable, have unique sets of hardware and communications capabilities, incorporate novel interfaces, are location aware, and provide persistent connectivity. Students are encouraged to make creative use of these unique device characteristics and operating properties to develop innovative applications including inter-device communications. Programming projects are required.
Prerequisites: IGME-770 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-776 Mobile Application Development II (3 Credits)
This course extends the Foundations of Mobile Design course in that students will learn to apply mobile design skills to develop applications in the Android platform. Students will design, develop, and test mobile applications using the Android Studio IDE. This course covers the major components such as activities, receivers, content providers, permissions, intents, fragments, data storage, and security. Programming projects are required.
Prerequisites: IGME-770 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

ISTE-780 Data Driven Knowledge Discovery (3 Credits)
Rapidly expanding collections of data from all areas of society are becoming available in digital form. Computer-based methods are available to facilitate discovering new information and knowledge that is embedded in these collections of data. This course provides students with an introduction to the use of these data analytic methods, with a focus on statistical learning models, within the context of the data-driven knowledge discovery process. Topics include motivations for data-driven discovery, sources of discoverable knowledge (e.g., data, text, the web, maps), data selection and retrieval, data transformation, computer-based methods for data-driven discovery, and interpretation of results. Emphasis is placed on the application of knowledge discovery methods to specific domains.
Prerequisite: DSCI-633 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Summer

ISTE-782 Visual Analytics (3 Credits)
This course introduces students to Visual Analytics, or the science of analytical reasoning facilitated by interactive visual interfaces. Course lectures, reading assignments, and practical lab experiences will cover a mix of theoretical and technical Visual Analytics topics. Topics include analytical reasoning, human cognition and perception of visual information, visual representation and interaction technologies, data representation and transformation, production, presentation, and dissemination of analytic process results, and Visual Analytic case studies and applications. Furthermore, students will learn relevant Visual Analytics research trends such as Space, Time, and Multivariate Analytics and Extreme Scale Visual Analytics.
This course is limited to degree-seeking graduate students.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

ISTE-790 Thesis in Information Technology and Analytics (1-6 Credits)
The thesis capstone experience for the Master of Science in Information Technology and Analytics program. Students must submit an approved capstone proposal in order to enroll. (Permission of capstone committee and graduate coordinator).
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ISTE-791 Project in Information Technology and Analytics (3 Credits)
The project-based culminating experience for the Master of Science in Information Technology and Analytics program. A MS project will typically include a software system development component requiring a substantial and sustained level of effort. Students must submit an approved project proposal in order to enroll. (Permission of project committee and graduate program director).
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

ISTE-792 Capstone Guidance Colloquium (1 Credit)
This course supports the proposal development process for graduate students enrolled in the MS in information sciences and technologies, the MS in networking and system administration, or the MS in human-computer interaction program who are beginning the project or thesis experience and require additional structure and support. Students begin the development of an acceptable proposal and through weekly meetings students are guided toward the completion of the proposal, which is a prerequisite for formal thesis or project registration. Note: Students must have completed all their course work prior to enrollment which is by permission of the graduate program director.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

ISTE-793 Capstone in Information Technology and Analytics (3 Credits)
This course is one of the capstone options in the MS in Information Technology and Analytics. It provides the student with an individual opportunity to implement a solution to a substantial project in the field of Information Technology and Analytics. Students will enter the course having successfully written a proposal for a project that was chosen from a list of possible projects that were crafted by faculty members in the School of Information. Several checkpoint meetings will be held throughout the semester to ensure that students remain on track for project completion. The project culminates in a well-written and professional report documenting the results of the project as well as a high-quality presentation of the project work and its results.
Prerequisite: ISTE-605 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

ISTE-795 Capstone In Information Sciences And Technologies (3 Credits)
This is the project-based capstone course for the master of science in information sciences and technologies program. Students work in teams to complete a substantial, integrative large scale system development projects. Submission of a project proposal, a formal set of development artifacts, a final project report, and a public defense with system demonstration are required.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture/Lab 2
Typically Offered: Fall, Spring

ISTE-798 Graduate Seminar In Information Sciences And Technologies (3 Credits)
This IST seminar course provides an opportunity for special one-time offerings of graduate topics or allows faculty to pilot possible new graduate offerings. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

ISTE-799 Independent Study (3 Credits)
The student will work independently, under the supervision of one or more faculty advisers, on a topic of mutual interest that is beyond the depth of or not covered in other courses.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

ISTE-909 Proposal Development (0 Credits)
This course supports the proposal development process for graduate students who are beginning the thesis experience. Students begin the development of an accepted proposal as a prerequisite for formal thesis registration.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Inorganic Chemistry (CHMI)

CHMI-664 Modern Inorganic Chemistry (3 Credits)
This course provides an advanced investigation into fundamental principles of inorganic chemistry. Topics covered include molecular symmetry, molecular orbital theory, solid state chemistry, ligand field theory, and the application of physical techniques used in inorganic chemistry. The course will begin with a discussion of symmetry elements and operations, followed by a detailed examination of point groups and their applications to molecular symmetry. The course will then cover molecular orbital theory, including the construction of molecular orbitals and their use in predicting the properties of molecules. The course will also cover solid state chemistry, including crystal structures, defects, and electronic properties of solids. Ligand field theory will be introduced, including the use of symmetry and group theory to understand the electronic structure of transition metal complexes. Finally, the course will cover physical techniques used in inorganic chemistry, including X-ray diffraction, NMR spectroscopy, and electron microscopy.
Prerequisites: CHMI-464 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

Institute for Sustainability (ISUS)

ISUS-600 Graduate Seminar (1 Credit)
This is a required course for students admitted to the Sustainability Ph.D. program. Students will learn about current research in sustainable production systems from faculty and guest speakers. Topics pertaining to the development of plans of study and research preposals, and as well as teaching skills, will also be covered.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

ISUS-619 Tools for Graduate Research (3 Credits)
This class will introduce graduate students to tools and software that will be of use in conducting, analyzing, and presenting their research. An introduction, highlights of key features, and the basics of operation will be taught for software aimed at: bibliographic referencing (e.g. Endnote, Latex), statistical analysis (e.g. Excel, SPSS, SAS), analytical work (e.g. Matlab, Mathematic, Maple), advanced plotting (e.g. Deltagraph, Illustrator, Origin), equation editing (e.g. Mathtype), and search engines (e.g. setting up RSS feeds, material property databases). Assignments will be direct applications to thesis / dissertation research.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-620 Sustainability in the Global South (3 Credits)
This course will examine sustainability challenges in the Global South through the frame of the United Nations Sustainable Development Goals. The course will examine the history of economic growth and development globally, how this history has created inequities between and within countries today, and the pressures this development has placed on the natural environment. The course will discuss the Sustainable Development Goals through case studies, with a particular focus on the role of policy and technology. Students will apply core sustainability skills to assess sustainable solutions and policy options to solve development problems. Throughout the course, students will develop a more global view of sustainability and the multi-dimensional challenges faced by countries in the Global South.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-699 Sustainability Co-op (0 Credits)
The Sustainability Co-Op is designed to provide Capstone research experience for MS students or enhance the educational experience of PhD students through full-time employment.
Typically Offered: Fall, Spring, Summer

ISUS-700 Special Topics (3 Credits)
A critical examination of issues in some area of sustainability not covered in other Golisano Institute for Sustainability courses. Topic depends on specific offering.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

ISUS-701 Independent Study (1-3 Credits)
An independent project in sustainability not covered in the available courses. This project can be experimental research, literature review, or other appropriate work. This course requires a formal proposal and a faculty sponsor.
Typically Offered: Fall, Spring, Summer

ISUS-702 Fundamentals of Sustainability Science (3 Credits)
This course prepares students to understand grand challenges in sustainability, conduct original research related to sustainable production and consumption systems, and apply the scientific method in an integrative, team-based approach to graduate research. This course introduces fundamental concepts that are essential to understanding the interaction of economic, environmental, and social systems. Successful students will understand multiple perspectives on sustainability, the importance of sustainability as an ethical concept, behavioral impacts to sustainable solutions, and a life-cycle approach to organizing research related to sustainability. It is a core course within the Sustainability program.
This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-704 Industrial Ecology (3 Credits)
Industrial ecology is the study of the interaction between industrial and ecological systems. Students in this course learn to assess the impact and interrelations of production systems on the natural environment by mastering fundamental concepts of ecology as a metaphor for industrial systems and the resultant tools from industrial ecology, including life cycle assessment, material flow analysis, and energy and greenhouse gas accounting. This is a core course within the Sustainability Ph.D. program.
This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-705 Technology, Policy, and Sustainability (3 Credits)
Public policy is a multidisciplinary field aimed at understanding how policy and regulation can be used to achieve certain social goals. These goals may include the notion of sustainability, whereby society's present needs are met without compromising the ability to meet society's future needs. This course introduces students to public policy and its role in building a sustainable society. The course places particular emphasis on the policy process; the relationship among technology, policy, and the environment; and policy mechanisms for addressing market and government failures that threaten sustainability.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-706 Economics of Sustainable Systems (3 Credits)
The goal of this course is to introduce students to economic concepts and analysis pertaining to sustainable systems. This course offers a nontechnical but rigorous introduction to microeconomic theory, engineering economics, and benefit-cost analysis. A thorough treatment of models relevant to each topic is provided. The over-arching goal is for students to gain an understanding of the logic of economic reasoning and analysis as it pertains to the study of sustainable systems.
This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-708 Sustainability Practice (3 Credits)
This course covers theoretical and practical issues associated with analysis and progress towards sustainability. Methods and concepts covered include optimization, stochastic analysis, multicriteria decision-making and resource economics. Societal perception and response to sustainability is covered sector by sector (industry, government, academia and civil society) and through integrative case studies of particular sustainability issues (e.g. natural gas fracking). Emerging sustainability governance mechanisms are explored, in particular environmental certifications and standards (e.g. LEED, EnergyStar) and multilateral agreements.
This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ISUS-710 Sustainable Product Design (3 Credits)
The application of sustainability and product design methods. Lectures and projects will incorporate strategies such as effective sustainability methods and life-cycle assessment; enhancement of product value and prolonged use; and balance between recycling, reusing and repurposing. Sustainable Product Design enables an interdisciplinary collaboration between Sustainability and Industrial Design. Both areas will offer their unique approach while learning and integrating knowledge from each other.
Contact Hours: Lecture/Lab 6
Typically Offered: Fall

ISUS-712 Sustainable Product Realization (3 Credits)
This course draws on concepts and methods pertaining to risk, life-cycle assessment, innovation, and policy introduced in various core courses to make strategic product-system decisions during the earliest stages of product development.
Contact Hours: Lecture 3
Typically Offered: Spring

ISUS-718 Sustainable Energy Systems (3 Credits)
Energy will play an increasingly vital role in economic, environmental and political developments around the world. This course first investigates the current trends in energy production, distribution, and consumption associated with the primary incumbent energy system technologies: fossil fuel combustion and nuclear power. An understanding of the economic, environmental and social limitations of these technologies will lead to analysis of the potential benefits of 3 key renewable technologies: solar (including wind), biomass and hydrogen/fuel cells. Potential paths to market penetration for these technologies will be introduced, including geographical variations expected to occur globally and within the United States.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-780 Capstone (1-6 Credits)
An independent project in sustainability serving as a capstone experience for students completing the non-thesis option. This course requires a formal proposal and a faculty sponsor.
Typically Offered: Fall, Spring, Summer

ISUS-790 Thesis (1-6 Credits)
Independent research in sustainability leading to the completion of the MS thesis. This course requires a formal proposal and a faculty sponsor.
Typically Offered: Fall, Spring, Summer

ISUS-791 Continuation of Thesis (0 Credits)
MS or PhD students requiring additional time to complete their thesis
Typically Offered: Fall, Spring, Summer

ISUS-806 Risk Analysis (3 Credits)
This course examines risk identification, quantification, and management from the standpoint of the three key components of sustainability science (economics, environment, and society). Subjects include cost-benefit analysis, value of information, time value of money, basic decision analysis, value functions, monetizing challenges for ecosystem services, sustainability risk management, toxicological perspectives such as fate and transport and dose-response relationships, risk perception, ethical issues in risk quantification, and impact statements.
This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Contact Hours: Lecture 3
Typically Offered: Fall

ISUS-807 Research (1-9 Credits)
Research in fulfillment of Sustainability Ph.D. dissertation or M.S. capstone requirements.
Typically Offered: Fall, Spring, Summer

ISUS-808 Multicriteria Sustainable Systems (3 Credits)
This class will explore how decisions are made when confronted with multiple, often conflicting, criteria or constraints. The focus will be on the following analytical methods: linear and stochastic programming, optimization, and Monte Carlo simulation. Case studies will focus on sustainability multi-criteria problems such as energy planning, sustainable development, resource management, and recycling. Students will apply methods learned to a project involving their graduate research. This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Contact Hours: Lecture 3
Typically Offered: Spring

ISUS-809 Data Analysis for Sustainability (3 Credits)
This course will introduce students to the study and practice of data analysis in sustainability and expand on core concepts from probability and statistics. Analysis methods presented will be applied to datasets ranging from energy consumption at the household and commercial building levels, to other national datasets, such as the national household travel survey (NHTS) and pollutant or vehicle emissions data from the EPA. Topics include (i) numerical and graphical summaries of data, (ii) hypothesis testing, (iii) confidence intervals, (iv) counts and tables, (v) analysis of variance, (vi) regression, (vii) principal components, and (viii) cluster analysis. Additionally, topics in data collection and survey design will also be introduced. These include: (a) sampling and weighting; (b) questionnaire design; and (c) design of experiments. At the end of this course, students should be able to think critically about data and apply standard statistical inference procedures to draw conclusions from such analyses. This course will be computationally, not mathematically, intensive and will use the R language and environment for statistical computing and graphics.
Contact Hours: Lecture 3
Typically Offered: Spring

ISUS-810 Thermodynamics for Sustainability (3 Credits)
As energy plays a fundamental role in the system sustainability framework, it is essential that students and practitioners have an understanding of the laws of thermodynamics which govern the processes of energy usage and conversion. This course investigates the differences between energy and exergy analysis, where the latter includes not only the quantities of energy exchanged, but also the quality of the energy relative to some reference state. After establishing the fundamentals of exergy analysis, this concept is applied to practical sustainability problems associated with sustainable development, industrial systems and energy policy. Specific examples are also explored, including thermal storage and fuel cell systems, and life cycle assessment.
Contact Hours: Lecture 3
Typically Offered: Spring

ISUS-821 Applied Life Cycle Assessment (3 Credits)
Life cycle assessment (LCA) is a tool used in the field of industrial ecology to evaluate the environmental impacts of products or processes over their entire life cycle – from raw material extraction, manufacturing, use, and end-of-life management. This course will build on fundamental principles of LCA by allowing students to conduct project-based studies on the application of LCA to real-world sustainability issues. Students will apply process, economic input-output, and hybrid methodologies to evaluate technological systems for opportunities of environmental improvement.
Contact Hours: Lecture 3
Typically Offered: Spring

ISUS-822 Materials Cycling (3 Credits)
This class will explore the economic and environmental incentives for recycling and resource recovery. The focus will be on end-of-life fate of materials (including plastics, metals, glass, and e-waste) while setting these within the context of overall ecosystem flows (carbon, sulfur, and nitrogen cycles, waste water, etc.). Technologies for the upgrading of secondary material streams will be studied including: physical and physico-chemical (beneficiation, electrostatic and magnetic separation), hydrometallurgical (selective precipitation, leaching, ion exchange), biotechnological (biosorption, sulfate reduction),and pyrometallurgical (filtration and fluxing). Production issues (product quality, remelt thermodynamics, exergy accounting, etc.) within the secondary industry will be explored with an emphasis on removing barriers to increased usage of scrap. Efforts for enhanced collection efforts and motivation of consumer and firm participation will also be covered (municipal collection fees, corporate take-back initiatives, legislation such as the WEEE directive, state deposits, etc.)
Contact Hours: Laboratory 3
Typically Offered: Fall

ISUS-877 Research Internship (0 Credits)
The Research Internship is designed to enhance the educational experience of PhD students through full-time employment.
This class is restricted to students in the SUSTSY-MS, SUST-PHD, SUSTSY-BS/MS & SUSBUS MS-MBA programs.
Typically Offered: Fall, Spring, Summer

ISUS-890 Dissertation Research (1-9 Credits)
Research fulfillment of Sustainability Ph.D. dissertation requirements.
Typically Offered: Fall, Spring, Summer

Integrative Design (INGD)

INGD-650 Contemporary Issues in Design: Topic (3 Credits)
This course will explore a range of contemporary debates, themes, and issues relevant to designers. Through critical dialogue, students will examine the roles and responsibilities of designers now and in the future —particularly as they pertain to "wicked problems" and sustainable development. Underlying themes include systems analysis, critical thinking, and ethical practice.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

INGD-674 Design Charrettes (3 Credits)
This is an interdisciplinary course developing charrettes that address product, service and social challenges. In collaboration with individuals and organizations, students will utilize design ideation and iterative methods in defining and developing contextually relevant solutions. Final concepts will be analyzed and presented in a public forum.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

INGD-721 Elements and Methods (3 Credits)
This course is an introductory experience building the visual, verbal and cognitive understanding of three-dimensional design elements and principles. Projects focus on developing the ability to see, organize, and manipulate design elements and abstraction to achieve the desired sensory responses.
This course is restricted to INTEGDE-MS Major students.
Contact Hours: Studio 6
Typically Offered: Fall

INGD-722 Emotion and Implementation (3 Credits)
This course builds from the Elements and Methods course and introduces emotional design as a means of creating, understanding and implementing the relationship between the object, the user and the desired sensory response. Concepts of material selection, production processes, and sustainability are explored. Through projects students develop the tools and technical skills necessary for hands-on problem solving and three-dimensional communication of design intent.
Prerequisites: INGD-721 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

INGD-726 Visualization I: Development (3 Credits)
This course is an introduction to drawing objects and three-dimensional space as a means of developing and communicating design concepts. Students will understand and use the basics of perspective sketching, mechanical perspective, grids and orthogonal views to communicate design concepts.
This course is restricted to INTEGDE-MS Major students.
Contact Hours: Studio 6
Typically Offered: Fall

INGD-727 Visualization II: Communication (3 Credits)
This course continues developing more advanced visualization techniques, while expanding on visual communication skills: such as storytelling, graphic layout and presentations. Exercises will introduce students to various types of analog and digital visual communication techniques.
Prerequisites: INGD-726 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

INGD-731 Design Studio I: Concepts (3 Credits)
This course is a theoretical and pragmatic approaches to responsible design practices through processes of iteration, divergent/convergent thinking and critical analysis. Projects focus on human-centered approaches and the contextual relevance of products, service and systems.
This course is restricted to INTEGDE-MS Major students.
Contact Hours: Studio 6
Typically Offered: Fall

INGD-732 Design Studio II: Capstone (3 Credits)
This course will focus on the application of design methods and processes, design thinking, problem solving, concept development. Students will work with faculty and advisors in establishing a design project. Emphasis will be placed on collaborating with multidisciplinary partners and external resources such as clients or project sponsors. The course culminates with a public presentation of the design project.
Prerequisites: INGD-731 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

INGD-748 Continuation of Capstone (0 Credits)
The course provides a student additional semester(s) to complete their capstone research, project and documentation.
Prerequisites: INGD-732 or equivalent course.
Typically Offered: Fall, Spring, Summer

Interactive Games & Media (IGME)

IGME-601 Game Development Processes (3 Credits)
This course examines the individual and group roles of the development process model within the game design and development industry. Students will transform design document specifications into software and hardware needs for developers, testers, and end users. Students will examine team dynamics and processes for technical development, content development, testing, deployment, and maintenance. Students will explore the design process through the deconstruction of the game industry's software lifecycle model.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-602 Game Design (3 Credits)
This course presents students with core theories of game design, informed by research results from media theory, narrative methods and models, theories of ideation, and the nature of games, play and fun. Specific emphasis is placed on the examination of historical successes and failures, along with presentation of ethical and cultural issues related to the design of interactive software. Students will engage in formal critique and analysis of media designs and their formal elements.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-603 Gameplay and Prototyping (3 Credits)
This course explores the pragmatic issues of creative concept development through story-boarding, pitching, prototyping and play-testing. Students will use various tools and techniques to build game prototypes that they will evaluate through play-testing in an incremental design process informed by market research and analysis.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-609 Programming for Designers (3 Credits)
This course is an introduction to programming for students with a background in design. Students will write programs to construct and control interactive, media-rich experiences. Students will employ fundamental concepts of object-oriented computer programming such as classes, variables, control structures, functions, and parameters in their code. Students will develop their problem solving skills and begin building a logical toolkit of algorithms and program design strategies. Students will extend existing software objects provided by the instructor, as well as create new objects of their own design. Programming projects will be required.
Prerequisites: VCDE-709 or equivalent course and graduate standing in VISCOM-MFA.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

IGME-621 Board and Card Game Design and Development (3 Credits)
This course explores issues pertaining to design, mechanics, development, and production of analog, tabletop “hobby” games, which include board games, card games, wargames, and other non-digital games catering to multiple players. Students will analyze and apply concepts and mechanics of modern tabletop game design, and build and test both competitive and cooperative tabletop games, designed specifically for a global audience. Students will work with development and prototyping tools, explore component design and art direction, and work with desktop publishing technologies. In addition, they will work directly with board game publishing and manufacturing technologies and services, and study factors pertaining to the business of tabletop games, and produce a professional, polished tabletop game.
Prerequisites: (IGME-602 and student is matriculated in GAMEDES-MS); or (IGME-220 and student is matriculated in GAMEDES-BS/NWMEDID-BS)
Contact Hours: Lecture 3
Typically Offered: Spring

IGME-622 Game Balance (3 Credits)
This course is an in-depth exploration of the sub-field of game design known as balance. Topics include: transitive mechanics and cost/power curves; economic systems in games; probability and the psychology of randomness; pseudorandom numbers; situational balance; level/XP curves, advancement and pacing; tuning; statistics, metrics, and analytics; intransitive mechanics, game theory, and payoff matrices; and the applied use of spreadsheets.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

IGME-623 Theory and Design of Role Play and Interactive Narrative (3 Credits)
Role playing games (RPGs) are among the most popular game forms. RPG design incorporates elements from most game genre. This course will address all aspects of design relevant to role play, both digital and analog, and the course will focus on the underlying theory of role play as a practice. We will talk about popular games, but will also spend time on experimental and innovative role play. Students should expect to study playing styles, RPG structure, and to both study and produce effective interactive narrative.
Prerequisites: IGME-220 or IGME-602 or equivalent courses.
Contact Hours: Laboratory 3
Typically Offered: Spring

IGME-624 Tabletop Role-Playing Game Design and Development (3 Credits)
This course explores the concepts and mechanics of analog role-playing games, such as tabletop "pencil-and-paper" and live-action role-playing games, from a practical, hands-on perspective. In this project-based course, students will develop their own rule systems to facilitate various facets of role-playing and associated game mechanics, then playtest and publish their games. Students will also use desktop publishing tools to produce game rules and supplemental materials suitable for publication. By the end of the course, students will have written and published a fully-realized RPG book. Note that this course assumes that students have extensive experience in playing tabletop role-playing games.
Prerequisites: (IGME-602 or equivalent course and GAMEDES-MS student standing); or (IGME-220 or equivalent course and (GAMEDES-BS or NWMEDID-BS student standing or GAMED-MN student standing).
Contact Hours: Lecture 4
Typically Offered: Fall

IGME-670 Digital Audio Production (3 Credits)
Technologies and techniques for producing and manipulating digital audio are explored. Topics include digital representations of sound, digital audio recording and production, MIDI, synthesis techniques, real-time performance issues, and the application of digital audio to multimedia and Web production.
Students must be in GAMEDES-MS or GAMEDES-BS and have taken IGME-202. Undergraduate students may not take and receive credit for this course if they have already taken IGME-570.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-671 Interactive Game Audio (3 Credits)
This course provides students with exposure to the design, creation and production of audio in interactive applications and computer games. Students will become familiar with the use of sound libraries, recording sounds in the studio and in the field, generating sound with synthesizers, and effects processing. Students will create sound designs for interactive media, integrating music, dialog, ambient sound, sound effects and interface sounds within interactive programs.
Students must be in GAMEDES-MS or GAMEDES-BS and have taken IGME-202. Undergraduate students may not take and receive credit for this course if they have already taken IGME-571.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

IGME-680 IGM Production Studio (3 Credits)
This course will allow students to work as domain specialists on teams completing one or more large projects over the course of the semester. The projects will be relevant to experiences of the interactive games and media programs, but they will require expertise in a variety of sub-domains, including web design and development, social computing, computer game development, multi-user media, human-computer interaction and streaming media. Students will learn to apply concepts of project management and scheduling, production roles and responsibilities, and their domain skill sets to multidisciplinary projects. Students will complete design documents, progress reports and final assessments of themselves and their teammates in addition to completing their assigned responsibilities on the main projects.
Prerequisites: IGME-601 or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

IGME-689 IGM Graduate Research Studio (3 Credits)
This course will allow students to work as domain specialists on teams completing one or more faculty-led research projects over the course of the semester. The faculty member teaching the class will provide the research topic(s). Students will learn about research methodology to implement, test, and evaluate results of projects. Students will complete research reports and final assessments of themselves and their teammates in addition to completing their assigned responsibilities on the main projects.
Prerequisites: This course is restricted to students in the GAMEDES-BS or GAMEDES-MS programs.
Contact Hours: Laboratory 3
Typically Offered: Fall or Spring

IGME-690 IGM Seminar (1-6 Credits)
This is intended to allow for special one-time offerings of graduate topics. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering. (Varies)
This course is restricted to GAMEDES-MS students or (GAMEDES-BS or NWMEDID-BS students with at least 3rd year standing).
Typically Offered: Fall, Spring, Summer

IGME-695 Colloquium in Game Design and Development (1 Credit)
This required colloquium will introduce students to a range of emerging topics and themes in the field of game design and development. Students will attend lectures by and discussions with RIT faculty and visitors, complete related readings, and offer both oral and written responses to readings and presentations.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 2
Typically Offered: Fall, Spring

IGME-699 Graduate Co-op (0 Credits)
Cooperative education is a work experience designed to supplement the educational process. Students may select from a range of activities designated as cooperative education, including relevant industrial experience, internships, entrepreneurial activities, as well as faculty supervised research and innovation opportunities.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

IGME-704 Research Methods: Human-Centered Research in Games (3 Credits)
The goal of this course is to familiarize graduate students with the diverse range of research in industry and academia in the fields of game design and development. Students will be introduced to research including inquiry through development, through analytics, and through direct observation. Students will become familiar with identifying and creating research questions, the difference between primary and secondary research, and methods for qualitative and quantitative data collection and analysis. We will discuss the ethical ramifications and the practical applications of research.
This course is restricted to students in the GAMEDES-MS, GAMEDES-G, or GAMEDES-U programs.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-705 Game Development Research and Problem Solving (3 Credits)
There is a diverse range of research in industry and academia for game development, from optimizing a core loop for rendering to creating new techniques and algorithms for procedural generation. Students will become familiar with critically evaluating resources for development techniques, identifying, and creating research questions, performance analysis, and using and altering existing algorithms for games. The ethical ramifications and practical applications of research will be discussed.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

IGME-720 Social and Pervasive Game Design (3 Credits)
This course presents students with core theories of sociology, psychology, economics, law, and politics in the context of social and pervasive (or "alternate reality") games. Students will engage in formal critique and analysis of media designs and their formal elements.
Prerequisites: IGME-602 or equivalent course and graduate standing in GAMEDES-MS.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-730 Game Design and Development for Casual and Mobile Platforms (3 Credits)
This course explores the design and development of casual and mobile game applications. Students will begin by exploring the design practices relevant to casual and mobile games, including hardware constraints, player expectations, play experiences, mechanics for casual and mobile experiences, as well as the aesthetics and presentation of casual and mobile game elements. As students learn the theoretical concepts, they will also learn the development process for casual and mobile games. Development topics will include technology platforms, physical and logical interface control, graphics and interaction, tools and APIs, connectivity, data management, data persistence, delivery mechanisms, and systems integration with desktop and web-based platforms.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

IGME-740 Game Graphics Programming (3 Credits)
Students will explore the use of an advanced graphics API to access hardware-accelerated graphics in a real-time graphics engine context. The course will involve discussion of scene graphs, optimizations, and integration with the API object structure, as well as input schemes, content pipelines, and 2D and 3D rendering techniques. Students will also explore the advanced use of the API calls in production code to construct environments capable of real-time performance. Students will construct from scratch a fully functional graphics engine, with library construction for game development. Advanced topics will be explored, including real-time special effects, custom shading pipelines, and advanced deferred rendering techniques.
Prerequisites: IGME-601 or equivalent courses.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

IGME-742 Level Design (3 Credits)
This course introduces level design theory and best practice through game level analysis, evaluation, and creation. Students will explore the history of various game genres and the design of their levels, analyze game levels from existing games, and discuss what made those levels successful or unsuccessful. Through their analysis and hands-on experience, students will gain an understanding of overall level design including layout, flow, pacing, narrative, and balance. They will enhance their understanding of level design principles by creating their own game levels.
Prerequisites: IGME-602 or equivalent courses.
Contact Hours: Laboratory 3
Typically Offered: Fall, Spring

IGME-750 Game Engine Design and Development (3 Credits)
This course will provide students with theory and practical skills in game engine design topic areas such as understanding the graphics pipeline as it influences engine design, hardware principles and the relationship to game engine construction, mathematical principles involved in game engine design, scene graph construction and maintenance, texture and materials management, collision systems, physics systems, particle systems, and control systems. Furthermore, this course will examine software and toolsets that assist game engine designers in their tasks. Students will be expected to design and implement a game engine in teams as well as properly document their design and development strategy.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-753 Console Development (3 Credits)
This course explores the history and modern implementation of software for game consoles. Cross-platform development will be emphasized along with software concepts such as memory management, scheduling, parallelization, graphics, and virtual reality. Programming projects are required.
Prerequisites: IGME-540 or IGME-740 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

IGME-760 Artificial Intelligence for Gameplay (3 Credits)
This course explores artificial intelligence concepts and research through both a theoretical perspective and a practical application to game development. In particular the course focuses on AI concepts and paradigms such as search and representation, reasoning under uncertainty, intelligent agents, biologically inspired computing and machine learning to real-time situations and applications as relevant to the field of entertainment technology and simulation.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-770 Spatial Data Science (3 Credits)
This course will introduce students to the spatial data science life cycle, which provides location- specific algorithms and analytical methods to solve big spatial data problems. This course Students are provided with s a hands-on experience in capturing, engineering, visualizing, analyzing, and sharing results of spatial data science workflows. Lastly, the course will provide students with a background in core spatial data science methods and theories, including Geographic Information Systems (GIS), spatial analysis, geographic visualization cartography, and web mapping.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-771 Introduction To Geographic Information Systems (3 Credits)
This online course introduces students to the world of Geographic Information Systems (GIS). Course lectures, reading assignments, and practical lab experiences will cover a mix of conceptual, practical and technical GIS topics. Topics include GIS data models, basic cartography, geodatabases, spatial analysis, GIS software, and theory and concepts from the Geographic Information Science and Technology domain.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

IGME-772 Geographic Visualization (3 Credits)
This course examines concepts and techniques associated with dynamic map construction, usage, and assessment. Specific topics include thematic cartography, geographic information visualization, sources of dynamic geographic information, developing animated and interactive maps, mapping mashup development, using maps as a means to support group work, usability of dynamic maps, and current geovisualization research areas. Development of a visualization prototype and an associated scholarly paper in an area related to thematic cartography and geographic visualization are required.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

IGME-788 Capstone Design (3 Credits)
This course allows students within the game design and development program to develop a capstone proposal and design document. The capstone design document specifies the scope and depth of the capstone project. In addition, it defines the group and individual responsibilities for the cohort capstone project experience.
Prerequisites: IGME-601 and IGME-602 and IGME-603 or equivalent courses.
Contact Hours: Lecture 5
Typically Offered: Fall

IGME-789 Capstone Development (3 Credits)
This course provides master of science in game design and development students with capstone project experiences. Students are expected to work in cohorts towards the implementation of a game system that properly illustrates proficiency in the application of theory and practice towards a large-scale project. For each student, individual responsibilities for the group project will be defined in consultation with both the group and the faculty. Students must successfully complete the Capstone Design course and present a satisfactory capstone project proposal to the faculty before enrolling in this course.
Prerequisites: IGME-788 or equivalent course.
Contact Hours: Lecture/Lab 5
Typically Offered: Spring

IGME-790 Graduate Seminar in IGM (1-6 Credits)
This is intended to allow for special one-time offerings of graduate topics. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering.
This course is restricted to students in the GAMEDES-MS program.
Typically Offered: Fall, Spring, Summer

IGME-795 Game Industry Themes and Perspectives (1 Credit)
This required course prepares students for a career in the field of game design and development. Students will attend lectures by and discussions with RIT faculty and visitors and produce material to assist in their career preparation.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 2
Typically Offered: Fall

IGME-796 Advanced Topics in Game Design (3 Credits)
This course examines current topics in game design. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

IGME-797 Advanced Topics in Game Development (3 Credits)
This course examines current topics in Game Development. Specific course details (such as prerequisites, course topics, format, learning outcomes, assessment methods, and resource needs) will be determined by the faculty member(s) who propose a specific topics course in this area.
This course is restricted to students in the GAMEDES-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

IGME-799 Independent Study (1-6 Credits)
The student will work independently under the supervision of a faculty adviser on a topic not covered in other courses.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Interdisciplinary Art, Design, Photo (IDEA)

IDEA-601 Vertically Integrated Projects (VIP) for College of Art and Design (CAD) (1-3 Credits)
The Vertically Integrated Projects (VIP) engage students in long-term, large-scale, multidisciplinary project teams that are led by faculty. VIP courses are project-based, team-based courses directly supporting faculty research and scholarship with a particular focus on technology, art, and design. The VIP teams are a mix of undergraduate and graduate students each semester. Graduates can participate through their tenure at RIT. Graduate students will have foundations within their discipline, pursue needed knowledge/skills, make meaningful contributions, assume technical/leadership responsibilities, and serve as mentors for junior members. Students will be required to make contributions to the project, maintain detailed notebooks describing their contribution to the project, attend and participate in team meetings, and explore topics specific to each VIP via tutorials and readings from appropriate literature. Presentations and reports on work created will also be required.
Typically Offered: Fall or Spring

IDEA-621 Experiential Urban Landscapes (3 Credits)
This course focuses on learning a variety of assessment, problem-solving, and representational approaches; merging and developing new approaches and solutions through the medium of a complex urban design problem; and evolving a modus operandi for transdisciplinary creative activity for more resilient urban design interventions.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

IDEA-650 Experimental Workshop (3 Credits)
This course will focus on implementing and developing interdisciplinary design projects. The specific topics for this course will vary each time it is taught but may be limited to repeatability. The topic is determined by the instructor. Technical, cultural, and human-centered aspects will be covered through a series of projects. Students will participate in extended group projects with a range of design problems, goals, tools, and procedures. Activities include branding, physical prototyping, fabrication, and digital product design. The specific topic varies and is determined by the instructor. This course can be taken multiple times but individual topics must be different.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

IDEA-690 TravelSem: Topic (3 Credits)
This course will provide students with an intensive seminar experience in art, craft, design, photography, film, or animation while traveling internationally. Topics will vary depending on the faculty member or members leading the study abroad program associated with the course. A description will be published for each iteration of the course. This course can be taken multiple times but individual topics must be different.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

IDEA-691 Travel Studio: Topic (3 Credits)
This course will provide students with an intensive studio experience in art, craft, design, photography, film, or animation while traveling internationally. Topics will vary depending on the faculty member or members leading the study abroad program associated with the course. A description will be published for each iteration of the course. This course can be taken multiple times but individual topics must be different. Admission to the course is based on application through RIT Global and instructor permission. Students may not enroll in or withdraw from the course independently. Additional fees are required for this course.
Contact Hours: Studio 6
Typically Offered: Fall, Spring, Summer

IDEA-705 Thinking About Making: The Practice of Art in a Global Society (3 Credits)
The course seeks to bridge the gap between studio practice and contemporary art history. Course content will explore current work and ask questions about what is art, who is the audience, what is “our” art making practice, and how does that fit within the larger context of the current state of the global art world. How do we measure success and artistic failure? The course emphasizes observation, critical analysis, and written interpretation.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

IDEA-708 Inside the Artist's Studio (3 Credits)
This course will provide students with the opportunity to visit with professional working artists from various disciplines in the arts and design. Through in-person and virtual studio visits students will engage in live discussions relating to each artist's studio practice. Topics discussed will include the development of creative inspiration and source materials, work methods, techniques and process for studio practice, and professional and business practice. Introductions and discussions with a range of creative artists and designers will lead to a broader understanding of creative problem solving, contemporary issues in art and design, and the development of a business acumen in art and design. This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 3
Typically Offered: Spring

IDEA-713 Art in Person (3 Credits)
This course will engage students in aesthetic research through field trips to museums, galleries and other locations of significance to the art and design fields. Through in person examinations of art, architecture and design, students will gain an awareness of the historical and cultural context of a range of significant creative work. Participants in this immersive course will be expected to gather visual references and source material in support of a personal aesthetic, design philosophy and studio practice. Location(s) of field trip excursions will be determined by the instructor.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 3
Typically Offered: Fall

IDEA-776 College Teaching and Learning (3 Credits)
This course will provide students with an introduction to the scholarship of teaching and learning in the university environment. Students will explore a range of perspectives on pedagogical practice, curriculum development and the assessment of learning in a studio, lab and seminar based classroom. Additionally, students will focus on ways that students learn, how learning can be improved, and different methods of conducting research into teaching and learning. Students are expected to write critical papers and essays, develop curriculum resources, and to participate in weekly small and large format discussion groups. Online technology is utilized in addition to lectures, videos, and other forms of media.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

Interdisciplinary Science (ITDS)

ITDS-611 STEM Education: Concepts and Practice (3 Credits)
This course is an introduction to concepts and practices that support effective STEM education. The course will emphasize concrete applications: specific pedagogical techniques, how they support a wide range of learning objectives, and why they are effective. Specific pedagogical techniques include: flipped classrooms, small-group workshops, think-pair-share methodologies, elicit/confront/resolve approaches, and project-based curricula. Students will learn how to connect specific pedagogical approaches with sophisticated course objectives that support diverse student populations to achieve conceptual, epistemological, communication, critical thinking, problem solving, and affective goals. Students will read foundational papers that describe concepts of how people learn to provide a theoretical understanding of why particular approaches are more effective. Students will also be introduced to “action research” methods by which STEM educators can assess effectiveness in their own classrooms.
Contact Hours: Lecture 3
Typically Offered: Biennially

ITDS-613 STEM Education: Research Methods and Theory (3 Credits)
This course is an introduction to major research themes, methodology, theories of learning, and research ethics relevant to discipline-based education research (DBER) in biology, chemistry, and physics. Research methods related to studying learning and development of expertise in science will include: the design of quantitative studies (surveys, assessments, and statistical analysis methods) and the design of qualitative studies (interviews, observations, coding). Relevant theories of learning will include cognitivist, developmental, and social/cultural perspectives. The course will use case studies from current literature on biology, chemistry, and physics education research to introduce these topics. Students will apply their understanding to develop and execute a semester-long research project in STEM education research. As part of the research project, students will develop a research question, become familiar with procedures to satisfy RIT's Institutional Review Board (IRB) and ethical requirements, and apply a quantitative, qualitative or mixed-methods approach. The project will include learning appropriate software, e.g. R (quantitative) or NVivo (qualitative).
Contact Hours: Lecture 3
Typically Offered: Biennially

ITDS-689 Special Topics (1-3 Credits)
This is a graduate-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall, Spring, Summer

Interdisciplinary-Liberal Arts (ITDL)

ITDL-610 Vertically Integrated Projects (0-3 Credits)
Vertically Integrated Projects (VIP) engage undergraduate students in long-term, large-scale, multidisciplinary project teams that are led by faculty. VIP courses are project-based, team-based courses directly supporting faculty research and scholarship. VIPs under this course number have a particular focus on interdisciplinary humanities and social sciences expertise, with membership in teams across RIT colleges.
This course is available to RIT degree-seeking graduate students.
Typically Offered: Fall or Spring or Summer

Interior Design (INDE)

INDE-799 Interior Design Graduate Independent Study (1-6 Credits)
Interior Design Graduate Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser will propose a course of study. Students must maintain a GPA of 3.0 or higher. Students must obtain permission of an instructor and complete the Independent Study Form to enroll.
Contact Hours: Independent Study 2
Typically Offered: Fall, Spring, Summer

International Business (INTB)

INTB-710 Global Business Analytics (3 Credits)
This course is designed to help students, regardless their backgrounds, to identify global business opportunities, possess necessary analytical skills to evaluate these opportunities, and understand the strategies to explore these opportunities to serve transnational businesses' goals. Students will be exposed to a variety of analytical skill sets such as collecting and analyzing institutional and primary international business data, reading the multinational firm-level data and understanding how global expansion impacts firms' bottom lines, developing foreign exchange hedging strategies, and apprehending the basic practices of international trade and foreign investment.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

INTB-730 Cross-Cultural Management (3 Credits)
An analysis of comparative global business behavior and organization with particular emphasis on values, authority, individual and group relations, labor-management ties, risk tolerance, and motivational techniques. The course will prepare students to recognize different values and cultural factors in the global business community and how these shape and determine appropriate management behavior. The problems and opportunities of transferring management practices from one culture to another will also be examined.
Contact Hours: Lecture 3

INTB-750 Global Marketing Management (3 Credits)
A managerial-focused course that examines global marketing from a strategic perspective. This course provides a framework for identifying and analyzing the cultural and environmental differences of countries and regions that impact global marketing. Students will evaluate opportunities and challenges in global markets to develop appropriate marketing programs and market-entry strategies. Topics include foreign market opportunity assessment, commercialization and entry strategy development, customer analysis, distribution channels, and promotion in global markets.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

INTB-755 Export, Import, and Global Sourcing (3 Credits)
Exporting, importing, global sourcing and cross-border investing practice is detailed-oriented and complex. Market forces and government regulations create challenges and opportunities to move goods, services and capital between nations. Students will study issues of compliance, risk assessment and management, analyze international information, understand logistics and intermediaries, and management of international payments and financing. Students will be able to apply their knowledge and skills to the practice of cross border transactions.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

INTB-758 Seminar in Global Business (3 Credits)
This course offers an in-depth analysis of the global institutional environment and provides students the opportunity to research a variety of global business issues, such as regional business studies, emerging markets, and global industry analysis. Specific topics will vary depending upon student and faculty interest and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. (Instructor determined)
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

INTB-780 Global Issues and Strategies (3 Credits)
This course will focus on contemporary international and global business issues, such as governance, outsourcing and offshoring, role of non-governmental organizations (NGOs), etc. It will emphasize faculty-directed student research projects.
Prerequisites: INTB-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

INTB-799 Independent Study - International Business (3 Credits)
The student will work independently under the supervision of a faculty adviser. *Note: Instructor approval
This course requires permission of the Instructor to enroll.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

INTB-820 International Business (2 Credits)
The primary objective of the course is to examine the strategies, concepts, theories, and practices associated with conducting international business. It seeks to develop practical and theoretical problem solving skills needed in the global business environment.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 2
Typically Offered: Fall

INTB-825 International Study Seminar (2 Credits)
This international study tour is an integral part of semester long focus on the strategic and operational issues facing organizations in a global competitive environment. Students will engage in lectures, plant visits, and interviews with international corporate managers. Students will apply the insights gained from their previous and concurrent coursework. This seminar offers students an inside view of individual companies and industries, and some of the broader economic, political, social, and cultural factors that influence business opportunities and practices in a particular region of the world.
Corequisites: INTB-820 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall

Management (MGMT)

MGMT-610 Global Entrepreneurship (3 Credits)
Global entrepreneurs need to utilize both domestic and overseas resources, explore transnational opportunities, and leverage worldwide networks at early stages of the development. This course is designed to address the unique challenges of this global challenge, as well as the richer opportunities faced by the “born globals.” Students will learn how to discover, evaluate, and enact opportunities across national borders in order to create goods and services that serve various company goals. Students will also be informed of the competitive strategies normally adopted by international entrepreneurs in other major economies such as EU, China, and India.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-620 Entrepreneurship & the Circular Economy (3 Credits)
This course studies the process of creating new ventures on the basis of circular economy principles, with an emphasis on understanding the concept of circular economy, the existing tools for circular opportunity recognition such as material flow analysis and life cycle assessments, and the different circular economy business models to implement to generate environmental, consumer and business values. The course also establishes fundamental knowledge regarding entrepreneurial orientation and its intersection with circular economy. The course uses project-based learning. The project begins with students innovating circular economy products and services from scratch using the tools mentioned above. By the end of the course, students will have developed comprehensive business plans and investor pitches.
Contact Hours: Lecture 3
Typically Offered: Fall

MGMT-699 Honors Co-op (0 Credits)
One semester of paid MBA related work experience.
Typically Offered: Fall, Spring, Summer

MGMT-710 Sustainable Business Innovation: Strategy and Practice (3 Credits)
Environmental sustainability means satisfying today’s ecological needs without compromising the ability to meet tomorrow’s needs. This course will examine how firms can use sustainable practices, such as pollution prevention and green design, and still be successful in a competitive marketplace. The course will look at the concept of environmental sustainability and the current state of social and political pressures for more sustainable business practices. It will also explore successful sustainable business strategies, and the management processes needed to support them.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-720 Entrepreneurship and Technology Entrepreneurship (3 Credits)
This course studies the process of creating new ventures with an emphasis on understanding the role of the entrepreneur in identifying opportunities, seeking capital and other resources, and managing the formation and growth of a new venture.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MGMT-730 Technology Entrepreneurship (3 Credits)
This course addresses the unique challenges for the entrepreneur in management of value capture through innovation, and the importance of technology-based innovation for the establishment and growth of the new venture in global products and services industries. The course integrates four major themes: (1) Appropriability and Entrepreneurial Innovation (2) the relationships between innovation, value creation, and value capture amongst customers, stakeholders, and the marketplace, (3) the role of technology in creating global competitive advance in both product-based and services-based industries, and (4) developing and monitoring the operational framework for the delivery of new value in products and services.
Prerequisites: MGMT-720 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-735 Management of Innovation (3 Credits)
This course addresses the management of innovation, sustainable technology, and the importance of technology-based innovation for the growth of the global products and services industries. The course integrates three major themes: (1) leading-edge concepts in innovation, (2) the role of technology in creating global competitive advance in both product-based and services-based industries, and (3) the responsibility of businesses related to sustainability. The importance of digital technology as an enabler of innovative services is covered throughout the course. (completion of four graduate business courses)
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MGMT-740 Leading Teams in Organizations (3 Credits)
This course examines why people behave as they do in organizations and what managers can do to improve organizational performance by influencing people's behavior. Students will learn a number of frameworks for diagnosing and dealing with managerial challenges dynamics at the individual, group and organizational level. Topics include leadership, motivation, team building, conflict, organizational change, cultures, decision making, and ethical leadership.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MGMT-743 Advanced Topics in Technology Management (3 Credits)
This course is the advanced treatment of topics introduced in the core course offering, MGMT 735. It reviews topics introduced in the core such as disruptive technology and adds significant new content on such topics as user innovation and organizational ambidexterity. Successful completion will prepare students for leadership and significant contributions as group members for any new technology development project.
Prerequisites: MGMT-735 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-745 Business, Government, and Public Policy (3 Credits)
This class focuses on the interactions among business, government and society. The course illuminates the role of ethics, social ideology and government policy in guiding business decisions and in providing the conditions for successful competitive activity. Attention is given to understanding the reason for government regulation, the pros and cons of various regulatory approaches, and the role of the firm in the policy making process. The class also looks at current debates in business and public policy and their implications for different stakeholders, including government, consumers, employees, communities and the environment.
Contact Hours: Lecture 3
Typically Offered: Fall

MGMT-753 Field Experiences in Business Consulting (3 Credits)
Students work in consulting teams to assist startup ventures and/or small businesses. Students focus on multiple aspects of consulting including client engagement, negotiating statements of work, project management, and final briefings and reports. From problem identification through the application of relevant analytical models, course projects may focus on a number of areas. For example, they may seek to develop commercialization plans for specific technologies, products, or services; craft marketing plans; focus on unique problems associated with small businesses; and develop growth strategies. Recommended for students nearing the completion of their program.
Prerequisites: ACCT-603 and FINC-721 and MKTG-761 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-755 Negotiations (3 Credits)
This course is designed to teach the art and science of negotiation so that one can negotiate successfully in a variety of settings, within one's day-to-day experiences and, especially, within the broad spectrum of negotiation problems faced by managers and other professionals. Individual class sessions will explore the many ways that people think about and practice negotiation skills and strategies in a variety of contexts.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MGMT-758 Seminar in Management (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to management. Specific topics will vary depending upon student and faculty interest and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics normally vary from semester to semester. (Depends on topic)
Contact Hours: Lecture 3

MGMT-759 Competitive Strategy (3 Credits)
This course reviews the techniques and tools firms use to create a sustainable competitive advantage in the global economy. Cross-functional analysis is a core element in the course. Topics covered include the mission and vision of the firm, analysis of the external environment, analysis of internal resources and capabilities, the role of innovation in strategy development, analysis of global business strategies, developing and implementing business-level and corporate-level strategies, and managing strategy in the multi-business corporation. *Note: All MBA core courses.
Prerequisites: ACCT-603 and DECS-743 and ESCB-705 and FINC-721 and MGIS-650 and MKTG-761 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MGMT-761 Managing Research and Innovation (3 Credits)
This course deals with the responsibilities and operating problems of managers responsible for research and innovation within firms. Topics will include: internal technology assessments, the acquisition of technology, domestic and international technology transfer, and the selection and management of research and development projects. Managerial techniques for stimulating and managing innovation are discussed, based on descriptive and prescriptive readings and cases. Particular attention will be given to managing creative individuals, the nature of disruptive technical innovations, and techniques for overcoming barriers to innovation.
Prerequisites: MGMT-742 or MGMT-735 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-765 Applied Venture Creation (3 Credits)
This graduate course enables students to learn the entrepreneurial (value creation) process by advancing a business idea. The course provides weekly seminars focusing on customer discovery and business model development and weekly coaching mentoring sessions with an established entrepreneur/early stage marketer. The project is team based. Students may enter the course with a business concept or be integrated into an existing team in the course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MGMT-770 Business Research Methods (3 Credits)
This course concerns the development, presentation, and use of research in managerial decision making. Included are the processes by which meaningful research problems are generated, identification of the relevant literature, rationalization of the research design and interpretation of findings. Students typically work in small groups to execute a research project in one of the functional areas of business.
Prerequisites: DECS-782 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MGMT-775 Ethical Decision Making and Corporate Social Performance (3 Credits)
This course is designed to equip business practitioners with scientifically supported frameworks and methods for recognizing, analyzing, deciding on, and implementing ethical courses of action in business. Selected topics include stakeholders needs analysis, the science of decision-making, corporate social performance, issues involved with emerging technologies, and doing business in a global context.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MGMT-780 Technology Strategy (3 Credits)
Strategy-making in technology faces special challenges: risk assessment in the face of uncertainty, predicting trends and changes in social issues, government policy, and technology, stakeholder management and technology ethics, fitting your organization to the evolving demands of your technology, integrating new technology with your existing technology, globalization, and more. It also calls for decisions on issues such as how to diversify your technology, collaboration, merger and acquisition possibilities. This course covers how to make technology strategy, including such components as quantitative and qualitative forecasting, risk assessment, the use of statistical analysis in decision-making, and the application of decision-making theories. The class includes a capstone experience.
Prerequisites: MGIS-650 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MGMT-790 Field Exam Prep (0 Credits)
All MS-Management students who do not complete a capstone project will take a field exam at the end of their program. This course provides basic help to students taking this exam. *Note: All required courses in the MS-Management program.
This course is restricted to MGMT-MS Major students.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Spring, Summer

MGMT-791 Graduate Project (3-6 Credits)
This course is used to fulfill the graduate project requirement for the MS degree in management. The candidate must obtain approval from an appropriate faculty member to supervise the paper before registering for this course. A corporate-oriented research project designed by the candidate and his or her advisor to explore a salient management-related issue.
This course is restricted to MGMT-MS Major students.
Typically Offered: Spring, Summer

MGMT-794 Innovation Project (3 Credits)
This course is limited to students in the Master of Science in Innovation Management Program. It is the first of two courses (Innovation Project and Innovation Capstone) that complete the degree program. Students will analyze an innovation issue and develop a plan to put the innovation into practice. Circumstances permitting, they may test the plan. Students will further define the innovation and the project, collect and analyze relevant data and information, develop alternative solutions, and make recommendations to the professor and outside experts as appropriate. Students will integrate knowledge of innovation, creativity, and business practice while developing and applying innovation skills. Students will receive a grade of Incomplete for this course. A final grade for both the Innovation Project and Innovation Capstone courses will be assigned upon completion of the Capstone course. Students will be required to write and have approved by the Program Director a one-page description of their proposed innovation before they register for the class. *Note: Permission of the Program Director.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MGMT-795 Innovation Capstone (3 Credits)
Students work with faculty and industry advisors to integrate their business and innovation learning through an applied project. In this project, real-world business problems will be addressed, and solutions will be planned, developed, and potentially deployed. The project may be entrepreneurial in nature, or it may be carried out within an existing company. The project will be conducted under the supervision of the course instructor and other advisors as appropriate. Learning from the applied project will be generalized so that the importance of the work in a broader business context will be clear. Students are required to formally present and defend their proposed innovation to the program director and capstone committee at least six weeks before they start this course. Students may not register for the course unless they have successfully completed this defense. *Note: Permission of program director.
Prerequisites: MGMT-794 or MGMT-765 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MGMT-799 Independent Study Management (3 Credits)
The student will work independently under the supervision of a faculty adviser. *Note: Instructor approval
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

MGMT-800 Leadership Development I (1 Credit)
This course builds on the assessment activities that are part of course MGMT-806. Each student participates in a 360-degree leadership assessment process. Based on this formal review, personal development plans are created and serve as dynamic documentation of individual professional progress. Students arrange individual counseling sessions with a leadership coach. Students then take action on the feedback received in order to develop self awareness.
Corequisite: MGMT-806 or equivalent course
Contact Hours: Lecture 1
Typically Offered: Summer

MGMT-801 Leadership Development II (1 Credit)
This course is a continuation of MGMT-800. Leadership Development II requires student to explore and expand their potential as leaders. Through self and peer assessment, one-on-one coaching, career counseling, and written assignments, students develop leadership goals and create a plan to realize those goals. Students arrange individual counseling sessions with a leadership coach.
Prerequisites: MGMT-800 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Fall

MGMT-804 Critical Thinking for Decision Making (2 Credits)
An introduction to the issues related to managerial problem solving, planning, decision making and implementation in complex organizations. The goal of the course is to help students think systematically about the practice of general management and how managers translate ideas into action. The types of decisions faced by executives and the various approaches available to managers for solving cross-functional, organizational-wide problems are examined. Students learn and practice essential skills required of general managers including critical thinking, problem solving, and oral and written communication.
Contact Hours: Lecture 2
Typically Offered: Fall

MGMT-805 Current Topics Seminar (2 Credits)
Current topics seminars offer an in-depth examination of current events, issues and problems. Specific topics will vary depending upon student and faculty interest and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. (topic-dependent)
Contact Hours: Lecture 2
Typically Offered: Fall

MGMT-806 Team Building and Ethics (1 Credit)
During this one-week course, students will understand how to motivate and lead teams as well as how to support the leadership of others. Students will undertake a critical evaluation of the ethical responsibilities of managers and corporations. Each incoming student joins a study group of around four or five students selected for diversity of skills and experience. This course also serves as a general orientation for incoming EMBA students.
Contact Hours: Lecture 1
Typically Offered: Summer

MGMT-810 Leadership (2 Credits)
This course focuses on the role of the general manager as a leader in an organization. The course addresses analytical and behavioral strategies and techniques for leadership by examining problem-solving models, personal values, and communications. The emphasis is on the interpersonal skills needs to express different leadership styles and behaviors. Cases, exercises, and class discussions will be used to examine and explore opportunities for managers to become more effective as leaders in modern organizations.
Prerequisites: MGMT-806 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall

MGMT-818 Strategic Thinking I (2 Credits)
The primary theme of this course is to examine how firms can achieve superior financial performance through the establishment of a sustainable competitive advantage at the business level. Contemporary theories of strategic management will be discussed and critically examined for their relevance to the problems facing many of today's managers. Topics include analysis of industry attractiveness, value-chain analysis, core competencies, and business-level strategies.
Prerequisites: ESCB-840 and FINC-845 or equivalent courses.
Contact Hours: Lecture 2
Typically Offered: Spring

MGMT-819 Strategic Thinking II (2 Credits)
This course covers corporate-level strategy and strategy implementation. The focus of the course is on the strategy of the firm as a whole, and the interrelations between different divisions. Topics will include related and unrelated diversification, and the various means of engaging in diversification, mergers and acquisitions, joint ventures, and strategic alliances. Contemporary theories of strategic management will be discussed and critically examined for their relevance to the problems facing many of today's managers.
Prerequisites: MGMT-818 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

MGMT-820 Foundations of Strategy Research (3 Credits)
This doctoral level seminar surveys the foundations of strategic management research, drawing primarily from economics, but also sociology and psychology theoretical perspectives towards understanding firm performance and related strategic issues. The main objective of the seminar is to familiarize students with the assumptions, concepts, and theories underlying the field of strategic management, as well as to help develop the skills necessary to evaluate, critique, and contribute to the field.
Contact Hours: Seminar 3
Typically Offered: Spring

MGMT-821 Organizational Behavior & Creativity (3 Credits)
This PhD seminar explores those topics in organizational behavior that explicate our understanding of creativity in organizations. This course draws upon trending as well as classic organizational behavior research to expose students to topics that are especially relevant to creativity, but it is not restricted to creativity literature. The objective of this course is to equip students with conceptual frameworks and analytical approaches that will serve as micro- and meso-level foundation to their understanding of organizational creativity and, ultimately, innovation.
Contact Hours: Seminar 3
Typically Offered: Spring

MGMT-822 Innovation (3 Credits)
This course covers foundational and advanced issues in innovation management, focusing on current trends as well as classic readings in innovation literature. This is a broad ranging seminar on the topics that undergird the organizational innovation, but excludes the individual level aggregation (i.e., creativity). The innovation seminar prepares the PhD candidate to understand conceptual frameworks and analytical approaches needed to critically evaluate and identify important issues underlying innovation in organizations.
Contact Hours: Seminar 3
Typically Offered: Fall

MGMT-823 Business, Technology and Society (3 Credits)
Business, Technology and Society introduces Ph.D. students to the theoretical foundations of research on the relationship between business, technology and society, including corporate social responsibility, the problems and promise of technological innovation, and the role of government policy and other institutional factors. The course will look at these issues within the context of a range of social issues. Students will be challenged to critically review seminal and emerging research, with a focus on both on theoretical arguments, research methods, and social relevance.
Contact Hours: Seminar 3
Typically Offered: Fall or Spring

MGMT-824 Contemporary Topics in Strategy Research (3 Credits)
Business, Technology and Society introduces Ph.D. students to the theoretical foundations of research on the relationship between business, technology and society, including corporate social responsibility, the problems and promise of technological innovation, and the role of government policy and other institutional factors. The course will look at these issues within the context of a range of social issues. Students will be challenged to critically review seminal and emerging research, with a focus on both on theoretical arguments, research methods, and social relevance.
Contact Hours: Seminar 3
Typically Offered: Fall

MGMT-825 Seminar: Emergent Topics in Management (3 Credits)
This research seminar focuses on timely, special topics not covered in other seminars. Topics rotate based on faculty expertise (such as Creativity and Innovation, Groups and Teams, Corporate Social Responsibility) and student needs as determined by the department.
Contact Hours: Seminar 3
Typically Offered: Fall, Spring, Summer

MGMT-850 Negotiations and Decision-making (2 Credits)
This course is designed to teach the art and science of negotiation so that one can negotiate successfully in a variety of settings, in day-to-day experiences and, especially, within the broad spectrum of negotiation problems faced by managers and other professionals. Individual class sessions will explore the many ways that people think about and practice negotiations skills and strategies in a variety of contexts. Special emphasis will be on decision-making biases that are often inherent in any negotiation setting and compromise the quality of negotiated agreements.
Contact Hours: Lecture 2
Typically Offered: Fall, Spring

MGMT-860 Executive Leadership Series (2 Credits)
The course explores leadership topics in depth with an emphasis on current management and leadership issues. During each class a community leader guest lectures on topics of leadership. Past speakers have included senior-level executives from local industry, government, and not-for-profit organizations.
Prerequisites: MGMT-810 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall

MGMT-861 Managing Technology, Innovation and Research (2 Credits)
This course deals with the responsibilities and challenges faced by managers responsible for research and innovation within high-technology firms. Topics will include: the critical role of innovation, internal technology assessments, technology transfer, the selection and management of R&D projects, and the identification of and management of disruptive technologies and business models. Particular attention will be given to overcoming systemic barriers to innovation.
Prerequisites: MGMT-818 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Summer

MGMT-862 Power and Influence (2 Credits)
Power and influence processes are pervasive and an important part of organizational life. This course has as its objectives enhancing the understanding of these processes and increasing the student's skills in using them. Topics covered include the conditions under which power and politics are more likely to dominate decision processes, assessing the relative power of various actors, understanding the basis for their positions on issues, the sources of both individual and departmental power, power and influence strategies and tactics, and some functional and dysfunctional aspects of organizational politics for both individuals and the organizations involved.
Prerequisites: MGMT-810 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

MGMT-877 Graduate Part-Time Co-op (0 Credits)
Half semester of paid MBA related work experience. *Note: Departmental approval required.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall, Spring

MGMT-888 Graduate Co-op Summer (0 Credits)
One summer semester of paid MBA related work experience. *Note: Departmental approval required.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Summer

MGMT-889 Capstone Consulting Project I (3 Credits)
Teams of students analyze specific operational problems or improvement opportunities in client organizations. Under the guidance of a faculty supervisor, teams identify relevant issues, collect data, develop alternatives and make recommendations to the client. The project, a two-course equivalent, is the capstone experience of the Executive MBA program.
Prerequisites: MGMT-818 and FINC-846 and MKTG-851 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Summer

MGMT-890 Capstone Consulting Project II (3 Credits)
This course is a continuation of MGMT-889. Teams of students analyze specific operational problems or improvement opportunities in client organizations. Under the guidance of a faculty supervisor, teams identify relevant issues, collect data, develop alternatives and make recommendations to the client. The project, a two-course equivalent, is the capstone experience of the Executive MBA program.
Prerequisites: MGMT-889 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

MGMT-999 Graduate Co-op (0 Credits)
One semester of paid MBA related work experience. *Note: Departmental approval required.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall, Spring, Summer

Management Information Systems (MGIS)

MGIS-650 Introduction to Data Analytics and Business Intelligence (3 Credits)
This course serves as an introduction to data analysis including both descriptive and inferential statistical techniques. Contemporary data analytics and business intelligence tools will be explored through realistic problem assignments.
Contact Hours: Lecture 3
Typically Offered: Fall

MGIS-720 Information Systems Design and Development (3 Credits)
This course provides students with fundamental knowledge and skills required for successful analysis of problems and opportunities related to the flow of information within organizations and the design and implementation of information systems to address identified factors. Students are provided with knowledge and experience that will be useful in determining systems requirements and developing a logical design.
Contact Hours: Lecture 3
Typically Offered: Fall

MGIS-725 Data Management and Analytics (3 Credits)
This course discusses issues associated with data capture, organization, storage, extraction, and modeling for planned and ad hoc reporting. Enables student to model data by developing conceptual and semantic data models. Techniques taught for managing the design and development of large database systems including logical data models, concurrent processing, data distributions, database administration, data warehousing, data cleansing, and data mining.
Contact Hours: Lecture 3
Typically Offered: Spring

MGIS-735 Design and Information Systems (3 Credits)
Students who complete this course will understand the principles and practices employed to analyze information needs and design appropriate IT-based solutions to address business challenges and opportunities. They will learn how to conduct requirements analysis, approach the design or redesign of business processes, communicate designs decisions to various levels of management, and work in a project-based environment.
Contact Hours: Lecture 3
Typically Offered: Spring

MGIS-745 Information Systems Development (3 Credits)
Systems development provides MBA students with the fundamental techniques and concepts necessary for programming in a modern programming language. Emphasis will be placed on object-oriented programming concepts. By the end of the course, students will demonstrate core programming concepts, and will be able to write simple business applications.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MGIS-758 Seminar in Management Information Systems (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to MIS. Specific topics will vary depending upon student and faculty interests and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics will normally vary from semester to semester. (Instructor determined)
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MGIS-760 Integrated Business Systems (3 Credits)
This course focuses on the concepts and technologies associated with Integrated Business Information Systems and the managerial decisions related to the implementation and ongoing application of these systems. Topics include business integration and common patterns of systems integration technology including enterprise resource planning (ERP), enterprise application integration (EAI) and data integration. The key managerial and organizational issues in selecting the appropriate technology and successful implementation are discussed. Hands-on experience with the SAP R/3 system is utilized to enable students to demonstrate concepts related to integrated business systems. (familiarity with MS Office suite and Internet browsers)
Contact Hours: Lecture 3
Typically Offered: Spring

MGIS-799 Independent Study Management Information Systems (3 Credits)
The student will work independently under the supervision of a faculty adviser. (Instructor approval)
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

MGIS-805 Advanced Data Analytics (3 Credits)
This Ph.D. research methodology course will introduce students to contemporary and advanced analytics techniques related to data acquisition, data preparation, data mining, and data reporting. Students will engage in hands-on experience with different techniques and will demonstrate the ability to carry a research project on their own using a combination of techniques taught in class.
Prerequisites: MGIS-650 or equivalent course.
Contact Hours: Seminar 3
Typically Offered: Fall

MGIS-810 Societal Impacts of Digital Transformation (3 Credits)
Digital transformation refers to the widespread integration of digital technologies into almost all aspects of organizational and social interaction. This phenomenon has engendered a wide variety of new markets, ways of organizing, mechanisms for the delivery of goods and services, and modes of interpersonal exchange. In so doing, it has simultaneously engendered novel challenges to prevailing business models, organizational routines, foundational assumptions of social interaction, and traditional ethical frameworks. This doctoral seminar course explores the societal impacts engendered by the phenomenon of digital transformation. The course places a special emphasis on the implications for three facets of social interaction: (1) organizing and organizational forms, (2) consumer markets and experiences, and (3) interpersonal dynamics.
Contact Hours: Seminar 3
Typically Offered: Spring

MGIS-811 Qualitative Research Methods (3 Credits)
In this course, students learn and apply qualitative data collection and analysis methods in the context of business research. The course provides an overview of prominent qualitative research designs, including case study, field study, and ethnography. Students learn critical qualitative data collection techniques, including interviewing, field observation, and historical analysis. Finally, students explore different techniques for qualitative data analysis, including grounded theory methodology, thematic analysis, discourse analysis, and conversation analysis. Students will engage in hand-on experiences in each of the analytical methods to demonstrate skills in managing selected design, data collection, analysis and writing strategies of qualitative research.
Contact Hours: Seminar 3
Typically Offered: Spring

MGIS-812 Management Information Systems: Theories and Perspectives (3 Credits)
The doctoral seminar course introduces students to the most prominent theoretical streams within the scholarly discipline of Management Information Systems. Students read, analyze, and discuss seminal research manuscripts within the field. Through these analyses, they discern underlying assumptions, philosophical/ ontological stances, and central arguments of the various works. In addition, students complete a focused exploration of the research corpus of one or more significant researchers within the discipline.
Contact Hours: Seminar 3
Typically Offered: Fall

MGIS-815 Research Design (3 Credits)
The doctoral seminar course introduces students to the most prominent theoretical streams within the scholarly discipline of Management Information Systems. Students read, analyze, and discuss seminal research manuscripts within the field. Through these analyses, they discern underlying assumptions, philosophical/ ontological stances, and central arguments of the various works. In addition, students complete a focused exploration of the research corpus of one or more significant researchers within the discipline.
Contact Hours: Seminar 3
Typically Offered: Fall

Marketing (MKTG)

MKTG-758 Seminar in Marketing (3 Credits)
Special topics seminars offer an in-depth examination of current events, issues and problems unique to marketing. Specific topics will vary depending upon student and faculty interest and on recent events in the business world. Seminar topics for a specific semester will be announced prior to the course offering. These seminars may be repeated for credit since topics normally vary from semester to semester. (varies according to topic)
Contact Hours: Lecture 3

MKTG-761 Marketing Concepts and Commercialization (3 Credits)
An introduction to contemporary principles and practices of marketing. The course is structured around the process of marketing planning leading to the development of successful marketing strategies, including the commercialization of products and services in domestic and international environments. Focus is on environmental scanning techniques, setting and evaluating measurable objectives, innovating and controlling the interrelated components of product/service offering, planning and executing the marketing mix (channels of distribution, price, and promotion), and enhancing customer relationships through the delivery of customer value.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MKTG-762 Strategic Marketing Management (3 Credits)
This course is an advanced study of the strategic and operational decisions facing a marketing executive today. Topics covered include market segmentation, branding and positioning, channel management, strategic pricing, marketing communications, marketing analytics and marketing in the new social economy. The course will present various concepts and tools for evaluating the marketplace (external environment, competitors, marketing opportunities and threats), and analyzing marketing strategies. Time will be spent on developing, evaluating and implementing marketing strategy at the corporate level using case analysis and formal decision making techniques. Students will be expected to make use of analytical, problem solving and communication skills to drive the development of a marketing plan focused on an actual company. The course also includes a business simulation with emphasis on advanced marketing management skills (Capsim: Capstone). The course will weave together a study of classical marketing theory and strategic planning with applied marketing management skills within the context of a business simulation.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MKTG-763 Buyer Behavior (3 Credits)
The course reviews the major theories that frame the understanding of both consumer (end-user) and business buying behavior. Topics include the buying decision process, the impact of emotion, product knowledge, and product involvement on purchasing decisions. In addition, behavioral, social and psychological perspectives will be discussed. All perspectives will be applied to designing marketing strategy.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

MKTG-767 Advertising and Integrated Marketing Communications (3 Credits)
An in-depth view of tools of advertising, sales promotion, public relations, personal selling, direct marketing, and internet Marketing. Basic concepts of advertising using print, broadcast, Internet and outdoor media are studied. Planning, budgeting and the roles of advertising agencies are also covered. Students develop a comprehensive promotion plan beginning with the marketing strategy and ending with implementation and evaluation. The project, in which the student plans and prepares a promotion/advertising campaign for a product or service in consultation with the instructor is an integral part of the course.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MKTG-768 Marketing Analytics (3 Credits)
This course provides an overview of marketing analytics in the context of marketing research, product portfolios, social media monitoring, sentiment analysis, customer retention, clustering techniques, and customer lifetime value calculation. Students will be introduced to, mathematical and statistical models used in these applications and their implementation using statistical tools and programming languages such as SAS, SPSS, Python and R. Multiple data sources will be used ranging from structured data from company databases, scanner data, social media data, text data in the form of customer reviews, and research databases. Students will complete guided projects using real time data and make effective use of visualization to add impact to their reports. There are no listed pre or co-requisites; however, instructor permission is required – student aptitude for quantitative work will be assessed; waived for students enrolled in quantitative programs such as the MS-Computational Finance which have pre-requisites in the areas of calculus, linear algebra, and programming.
Contact Hours: Lecture 3
Typically Offered: Spring

MKTG-771 Marketing Research Methods (3 Credits)
This course provides an overview of marketing research and practice, especially the methods of measuring, examining, and predicting factors that affect the marketing process. Students will learn about the process of conducting surveys and experiments that includes the following: determining customer requirements, questionnaire design, telephone, mail and electronic surveys, sampling plan design, and data analysis.
Prerequisites: MKTG-761 and DECS-782 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MKTG-772 Internet Marketing: Strategy & Tactics (3 Credits)
This course examines the impact that the internet has on traditional and contemporary business-to-consumer marketing activities. It explores these implications in both strategic and tactical terms to enhance organizations' levels of competitiveness. The course identifies the use of the internet in enhancing value for consumers and considers the leverage of the latest technologies, trends, e-culture and innovation through the medium of the internet.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MKTG-776 Product and Brand Management (3 Credits)
An essential element of corporate success is the management of products and brands. Firms in both consumer and commercial industries often manage their marketing strategies and tactics through the activities of their product and brand managers. This course will examine the role of product and brand managers in the development and execution of strategies that deliver value to targeted customers and grow the business. The role of product and brand managers will be examined through all phases of the firm's product and brand life cycle. The course emphasizes the decisions that firms expect product and brand managers to make to achieve market share and financial objectives.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MKTG-778 Commercialization and Marketing of New Products (3 Credits)
This course emphasizes the marketing and product strategy-related activities required to create, develop, and launch successful new products. Topics covered include identifying the market opportunity for new products, defining the product strategy, understanding customer requirements, developing and updating the product business plan, marketing's role in the firm's product development process, developing the marketing plan for launching new products, and managing the product life cycle. The course emphasizes best practices in marketing-related activities required for successful new product commercialization.
Prerequisites: MKTG-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MKTG-799 Independent Study Marketing (3 Credits)
The student will work independently under the supervision of a faculty adviser. (Instructor approval)
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

MKTG-805 Psychological Foundations of Business Research (3 Credits)
This doctoral seminar course explores a range of theories and principles from the field of psychology with an eye to their applicability to contemporary business research. Critical topics explored include the study of human motivation, the nature of perception and learning, diverse models of cognition, principles of decision-making and choice, the role of personality and perceptions of the self, and group dynamics. Students will develop an understanding of the foundational role of these concepts in variety of business research disciplines.
Contact Hours: Seminar 3
Typically Offered: Spring

MKTG-810 Marketing Theory (3 Credits)
This doctoral-level seminar course provides students with an introduction to the research literature in the marketing discipline. The purpose of this course is to learn about marketing theory, analyze the literature and allow students and faculty to expose their work to others, receive feedback, and foster knowledge diffusion. In this course, students will read and discuss recent articles in top marketing journals. This course offers: (1) In-depth discussion of important topics in marketing by PhD students and faculty; (2) Exposure to existing theory/ literature of marketing for conducting research in those areas; and (3) The opportunity to experience on-going research being presented and discussed, rather than just experiencing finished-and-polished research products through manuscripts or publications.
Contact Hours: Seminar 3
Typically Offered: Spring

MKTG-825 Multivariate Methods and Analyses (3 Credits)
This course is designed introduce doctoral students to statistical methodology as it pertains to the study of multivariate techniques used in the behavioral sciences. The course will cover a range of statistical procedures and programs for multivariate data analysis. The focus is on practical issues such as selecting the appropriate analysis, preparing data for analysis, interpreting output, and presenting results of a complex nature. Topics covered include multivariate data screening, analysis of variance, multi-dimensional scaling, factor analysis, OLS regression, mediation and moderation among others.
Contact Hours: Seminar 3
Typically Offered: Fall

MKTG-830 Structural Equation Modeling (3 Credits)
This course provides a detailed look at structural equation modeling (SEM) for doctoral students. SEM is a technique for modeling the relationships among multiple latent variables. It includes models that have multiple indicators of constructs (latent variables; confirmatory factor analysis) that have directional relationships among constructs (path analysis; structural equations). The course will cover both conceptual and practical aspects of SEM, with the goal of preparing the student to use SEM in original research and to critically evaluate its use in scholarly work. Further, it introduces the student to partial least squares modeling and to Bayesian approaches in structural equations modeling.
Prerequisites: MKTG-825 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

MKTG-835 Experimental Design (3 Credits)
This course is aimed at Ph.D. students who intendt to conduct experimental and quasi-experimental research in business (e.g., marketing, organizational behavior) and related disciplines (e.g., economics, psychology). The primary objective of the course is to provide such students with the concepts and tools needed for collecting and analyzing behavioral data. A secondary objective is to provide these future academic reviewers the foundations for the methodological evaluation of other behavioral researchers' work. The course thus covers the designs and analyses that are most often used by experimental researchers in the following fields: marketing, organizational behavior, and psychology. Topics include: factorial designs, repeated (within-subject) and mixed designs, fractional (e.g., Latin squares) designs, and analysis of covariance.
Prerequisites: MKTG-825 or ESCB-830 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

MKTG-851 Marketing Strategy (2 Credits)
A general management perspective on the critical impact of marketing in organizations. Topics include an overview of the marketing process, market research, segmentation, and target markets. The focus is on the process of creating, communicating, and delivering customer value through the marketing mix. The course is structured around the managerially controllable elements of product, price, promotion and distribution, plus the interrelationships of these elements.
Pre or Corequisites: MGMT-818 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

MKTG-865 Managing New Product Commercialization (2 Credits)
This course emphasizes the marketing and product strategy activities required to create, develop, and launch successful new products. Topics covered include identifying the market opportunity for new products, defining the product strategy, understanding customer requirements, developing and updating the product business plan, marketing's role in the product development process, developing the marketing plan for launching new products, and managing the product life cycle. Best practices in activities required for successful new product commercialization are reviewed.
Prerequisites: MKTG-851 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Summer

Materials Science & Engineering (MTSE)

MTSE-601 Materials Science (3 Credits)
This course provides an understanding of the relationship between structure and properties necessary for the development of new materials. Topics include atomic and crystal structure, crystalline defects, diffusion, theories, strengthening mechanisms, ferrous alloys, cast irons, structure of ceramics and polymeric materials and corrosion principles. Term paper on materials topic.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MTSE-602 Polymer Science (3 Credits)
Polymers are ubiquitous. They are used in everyday applications as well as for specialty and cutting-edge technologies. This course is an introduction to the chemistry and physics of synthetic polymers, which include plastics, elastomers and fibers. The synthesis of polymers, their fundamental properties, and the relations between their syntheses, structure, and properties will be studied. Among the topics discussed are the morphology, thermal behavior, solubility, viscoelasticity and characterization of polymers. Copolymerization, tacticity and sustainability of polymers will also be covered.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

MTSE-617 Material Degradation (3 Credits)
This course introduces the basic electrochemical nature of corrosion and considers the various factors that influence the rate of corrosion in a variety of environments. Various means of controlling corrosion are considered with demonstrations.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MTSE-632 Solid State Science (3 Credits)
This course is an introduction to the physics of the solid state including crystal structure, x-ray diffraction by crystals, crystal binding, elastic waves and lattice vibrations, thermal properties, the free electron model of solids, and band theory and its applications.
This course is restricted to MSENG-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MTSE-689 Graduate Special Topics (1-6 Credits)
This is a master-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture/Lab 6
Typically Offered: Fall, Spring, Summer

MTSE-699 Materials Science Graduate Co-op (0 Credits)
This course is a cooperative education experience for materials science and engineering masters-level students.
Typically Offered: Fall, Spring, Summer

MTSE-704 Theoretical Methods in Materials Science and Engineering (3 Credits)
This course includes the treatment of vector analysis, special functions, waves, and fields; Maxwell Boltzmann, Bose-Einstein and Fermi-Dirac distributions, and their applications. Selected topics of interest in electrodynamics, fluid mechanics, and statistical mechanics will also be discussed.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MTSE-705 Experimental Techniques (3 Credits)
This course introduces students to state-of-the-art experimental techniques in materials science and engineering. Emphasizing the skill set needed for next-generation semiconductors and advanced manufacturing, the course covers essential materials sample preparation methods, followed by a deep dive into materials characterization using optical and electron spectroscopies, microscopies, and electrical/electronic probes. Students will also explore interface and structure characterization techniques. A highlight of the course is the introduction to advanced and world-class tools, including photoemission spectroscopy and synchrotron-based characterization techniques.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

MTSE-777 Graduate Project (3 Credits)
This course is a capstone project using research facilities available inside or outside of RIT.
This class is restricted to degree-seeking graduate students or those with permission from instructor.

MTSE-780 Theory of Microsensors and Actuators (3 Credits)
This course introduces the theory and development of sensors at the molecular and ionic levels. Mechanism details for operation of the sensors and actuators will be discussed. Fundamental aspects related to chemical, biochemical, piezoresistive, magnetic, thermal, and luminescent sensors will be discussed with an emphasis on the development of innovative products. Control systems based on ion selectivity for biomedical applications will be covered in detail. Neurotransmitters, neural network, and directional selectivity using conducting polymers will also be covered.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

MTSE-789 Graduate Special Topics (1-4 Credits)
This is a master-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring

MTSE-790 Research & Thesis (1-9 Credits)
Dissertation research by the candidate for an appropriate topic as arranged between the candidate and the research advisor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MTSE-791 Seminar (1 Credit)
This seminar course is designed to develop the ability to assimilate useful information while increasing a student's breadth and depth of knowledge of materials science and engineering research topics. This seminar requires the students to attend weekly seminars and present a seminar summarizing their thesis research at RIT which serves as the public portion of their thesis defense.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Seminar 1
Typically Offered: Spring

MTSE-792 External Research (1-4 Credits)
Research conducted off-site by the candidate for an appropriate topic as arranged between the student, the RIT advisor, and the off-site research mentor.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MTSE-793 Continuation of Thesis (0 Credits)
Continuation of Thesis
Typically Offered: Fall, Spring

MTSE-799 Independent Study (1-4 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for a masters-level student.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Mathematics (MATH)

MATH-601 Methods of Applied Mathematics (3 Credits)
This course is an introduction to classical techniques used in applied mathematics. Models arising in physics and engineering are introduced. Topics include dimensional analysis, scaling techniques, regular and singular perturbation theory, and calculus of variations.
Prerequisites: MATH-221 and MATH-231 or equivalent courses or students in the ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-602 Numerical Analysis I (3 Credits)
This course covers numerical techniques for the solution of nonlinear equations, interpolation, differentiation, integration, and matrix algebra.
Prerequisites: MATH-411 or equivalent course and graduate standing.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-603 Optimization Theory (3 Credits)
This course provides a study of the theory of optimization of linear and nonlinear functions of several variable with or without constraints. The theory is applied to solve problems in business, management, engineering, and the sciences. Algorithms for practical applications will be analyzed and implemented. Students taking this course will be expected to complete applied projects and/or case studies.
This course is restricted to students in the ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-605 Stochastic Processes (3 Credits)
This course is an introduction to stochastic processes and their various applications. It covers the development of basic properties and applications of Poisson processes and Markov chains in discrete and continuous time. Extensive use is made of conditional probability and conditional expectation. Further topics such as renewal processes, reliability and Brownian motion may be discussed as time allows.
Prerequisites: ((MATH-241 or MATH-241H) and MATH-251) or equivalent courses or graduate standing in ACMTH-MS or MATHML-PHD or APPSTAT-MS programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-606 Graduate Seminar I (1 Credit)
The course prepares students to engage in activities necessary for independent mathematical research and introduces students to a broad range of active interdisciplinary programs related to applied mathematics.
This course is restricted to students in the ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 2
Typically Offered: Fall

MATH-607 Graduate Seminar II (1 Credit)
This course is a continuation of Graduate Seminar I. It prepares students to engage in activities necessary for independent mathematical research and introduces them to a broad range of active interdisciplinary programs related to applied mathematics.
Prerequisite: MATH-606 or equivalent course or students in the ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 2
Typically Offered: Spring

MATH-620 Introductory Mathematics for Artificial Intelligence (2 Credits)
This course serves as a bridge course that builds the mathematical foundations needed for the IDAI-620 course, Mathematical Methods for Artificial Intelligence, a course introducing the mathematical background for AI systems in the MS in AI program. It focuses on the basic constructions, structures, and results in four key areas: (1) linear algebra (vectors, matrices, and their operations) (2) optimization theory (multivariable functions and their calculus) (3) probability and statistics (basic combinatorics, elementary statistics) and (4) numerical analysis (basic notions of approximation).
Contact Hours: Lecture 2
Typically Offered: Summer

MATH-622 Mathematical Modeling I (3 Credits)
This course will introduce graduate students to the logical methodology of mathematical modeling. They will learn how to use an application field problem as a standard for defining equations that can be used to solve that problem, how to establish a nested hierarchy of models for an application field problem in order to clarify the problem's context and facilitate its solution. Students will also learn how mathematical theory, closed-form solutions for special cases, and computational methods should be integrated into the modeling process in order to provide insight into application fields and solutions to particular problems. Students will study principles of model verification and validation, parameter identification and parameter sensitivity and their roles in mathematical modeling. In addition, students will be introduced to particular mathematical models of various types: stochastic models, PDE models, dynamical system models, graph-theoretic models, algebraic models, and perhaps other types of models. They will use these models to exemplify the broad principles and methods that they will learn in this course, and they will use these models to build up a stock of models that they can call upon as examples of good modeling practice.
This course is restricted to students in the ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-625 Applied Inverse Problems (3 Credits)
Most models in applied and social sciences are formulated using the broad spectrum of linear and nonlinear partial differential equations involving parameters characterizing specific physical characteristics of the underlying model. Inverse problems seek to determine such parameters from the measured data and have many applications in medicine, economics, and engineering. This course will provide a thorough introduction to inverse problems and will equip students with skills for solving them. The topics of the course include existence results, discretization, optimization formulation, and computational methods.
Prerequisites: MATH-431 or equivalent course or graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-631 Dynamical Systems (3 Credits)
This course is a study of dynamical systems theory. Basic definitions of dynamical systems are followed by a study of maps and time series. Stability theory of solutions of differential equations is studied. Asymptotic behavior of solutions is investigated through limit sets, attractors, Poincaré–Bendixson theory, and index theory. The notion of local bifurcation is introduced and investigated. Chaotic systems are studied.
Prerequisites: (MATH-231 and (MATH 241 or MATH-241H)) or equivalent courses or graduate standing in ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-633 Measure Theory of Elements and Functional Analysis (3 Credits)
This course will provide a general introduction to Lebesgue measure as applied to the real numbers, real-valued functions of a real variable, and the Lebesgue integral of such functions. It also covers topics in functional analysis relevant to application of measure theory to real-world problems. Students will be expected to read and understand proofs, and to demonstrate their understanding of topics by writing their own proofs of various facts.
Prerequisites: Graduate student standing in COS, GCCIS or KGCOE or B+ or better in MATH 432 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-641 Logic, Set Theory, and Computability (3 Credits)
This course studies Peano's axioms for the natural numbers, induction principles, and recursive definitions. The topics in set theory include axiomatic set theory and the Cantor Bernstein theorem. The topics in logic are propositional logic and First-order logic. The section on computability covers formulation of the family of the computable functions and a discussion of the halting problem
This course is restricted to students in the ACMTH-MS, ACMTH-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-645 Graph Theory (3 Credits)
This course introduces the fundamental concepts of graph theory. Topics to be studied include graph isomorphism, trees, network flows, connectivity in graphs, matchings, graph colorings, and planar graphs. Applications such as traffic routing and scheduling problems will be considered.
This course is restricted to students with graduate standing in the College of Science or Graduate Computing and Information Sciences.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-646 Combinatorics (3 Credits)
This course introduces the fundamental concepts of combinatorics. Topics to be studied include counting techniques, binomial coefficients, generating functions, partitions, the inclusion-exclusion principle and partition theory.
This course is restricted to students in the ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-655 Biostatistics (3 Credits)
This course is an introduction to the probabilistic models and statistical techniques used in the analysis of biological and medical data. Topics include univariate and multivariate summary techniques, one and two sample parametric and nonparametric inference, censoring, one and two way analysis of variance, and multiple and logistic regression analysis.
This class is restricted to graduate students in COS, KGCOE, GCCIS, CHST or CLA.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-671 Number Theory (3 Credits)
This course is an introduction to the standard results and techniques of number theory. Topics include divisibility, congruences, Diophantine equations, Moebius inversion, quadratic reciprocity, and primitive roots. Cryptography and other applications will be discussed. Projects may be required.
This course is restricted to students in the ACMTH-MS, ACMTH-BS/MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-689 Advanced Special Topics (1-4 Credits)
Special Topics courses cover content that is not represented in the main curriculum on an experimental or trial basis.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MATH-699 Math & Stats Graduate Co-op (0 Credits)
This course is a cooperative education experience for graduate math and stats students.
Typically Offered: Fall, Spring, Summer

MATH-702 Numerical Analysis II (3 Credits)
The course covers the solutions of linear systems by direct and iterative methods, numerical methods for computing eigenvalues, theoretical and numerical methods for unconstrained and constrained optimization, and Monte-Carlo simulation.
Prerequisite: MATH-602 or equivalent course and graduate standing.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-709 Complex Networks (3 Credits)
In this course, students will explore complex networks: the mathematical objects used in the modeling and analysis of various complex systems in nature and society. This course will introduce students to basic network models, methods for the classification of networks, mechanisms that generate multiple classes of networks, measures and algorithms for quantifying local and global network structures, and frameworks used in modeling dynamical processes involving networks, including the diffusion of social and biological contagions on networks. Students will also learn Python-based software packages, including visualization techniques used in network analysis.
This class is restricted to graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-712 Numerical Methods for Partial Differential Equations (3 Credits)
This is an advanced course in numerical methods that introduces students to computational techniques for solving partial differential equations, especially those arising in applications. Topics include: finite difference methods for hyperbolic, parabolic, and elliptic partial differential equations, consistency, stability and convergence of finite difference schemes.
Prerequisite: MATH-702 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-722 Mathematical Modeling II (3 Credits)
This course will continue to expose students to the logical methodology of mathematical modeling. It will also provide them with numerous examples of mathematical models from various fields.
Prerequisite: MATH-622 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-731 Advanced Dynamical Systems (3 Credits)
This course covers an analysis of iterations of maps, symbolic dynamics, their uses, and fractals. It includes methods for simplifying dynamical systems (center manifolds and normal forms), Melnikov's method, and applications.
Prerequisites: MATH-631 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-735 Mathematics of Finance I (3 Credits)
This is the first course in a sequence that examines mathematical and statistical models in finance. By taking a mathematical viewpoint the course provides students with a comprehensive understanding of the assumptions and limitations of the quantitative models used in finance. Topics include probability rules and distributions, the binomial and Black-Scholes models of derivative pricing, interest and present value, and ARCH and GARCH time series techniques. The course is mathematical in nature and assumes a background in calculus (including Taylor series), linear algebra and basic probability. Other mathematical concepts and numerical methods are introduced as needed.
Prerequisites: ((MATH-241 or MATH-241H) and MATH-251) or equivalent courses or graduate standing in the ACMTH-MS or MATHML-PHD or CMPFINC-MS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-736 Mathematics of Finance II (3 Credits)
This is the second course in a sequence that examines mathematical and statistical models in finance. By taking a mathematical viewpoint the course provides students with a comprehensive understanding of the assumptions and limitations of the quantitative models used in finance. Topics include delta hedging, introduction to Ito calculus, interest rate models and Monte Carlo simulations. The course is mathematical in nature and assumes a background in calculus (including Taylor series), linear algebra and basic probability. Other mathematical concepts and numerical methods are introduced as needed.
Prerequisites: MATH-735 or equivalent course or students in ACMTH-MS or MATHML-PHD or CMPFINC-MS programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-741 Partial Differential Equations I (3 Credits)
This course uses methods of applied mathematics in the solution of problems in physics and engineering. Models such as heat flow and vibrating strings will be formulated from physical principles. Characteristics methods, maximum principles, Green's functions, D'Alembert formulas, weak solutions and distributions will be studied.
Prerequisites: MATH-231 or equivalent course or graduate student standing in ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-742 Partial Differential Equations II (3 Credits)
This is a continuation of Partial Differential Equations I and deals with advanced methods for solving partial differential equations arising in physics and engineering problems. Topics to be covered include second order equations, Cauchy-Kovalevskaya theorem, the method of descent, spherical means, Duhamels principle, and Greens function in higher dimensions.
Prerequisites: MATH-741 or equivalent course or students in ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-751 High-performance Computing for Mathematical Modeling (3 Credits)
Students in this course will study high-performance computing as a tool for solving problems related to mathematical modeling. Two primary objectives will be to gain experience in understanding the advantages and limitations of different hardware and software options for a diverse array of modeling approaches and to develop a library of example codes. The course will include extensive hands-on computational (programming) assignments. Students will be expected to have a prior understanding of basic techniques for solving mathematical problems numerically.
Prerequisite: MATH-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MATH-761 Mathematical Biology (3 Credits)
This course introduces areas of biological sciences in which mathematics can be used to capture essential interactions within a system. Different modeling approaches to various biological and physiological phenomena are developed (e.g., population and cell growth, spread of disease, epidemiology, biological fluid dynamics, nutrient transport, biochemical reactions, tumor growth, genetics). The emphasis is on the use of mathematics to unify related concepts.
Graduate Science
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-771 Mathematics of Cryptography (3 Credits)
This course is an introduction to the mathematical problems and techniques that serve as a foundation for modern cryptosystems. The topics include: classical cryptosystems computational number theory, primality tests, finite fields, private and public key encryption scheme (RSA, El-Gamal), and applications such as digital signatures, one way functions, and zero knowledge proofs. Use of elliptic curves in cryptography will also be covered.
Prerequisites: MATH-371 or MATH-671 or equivalent course or students in ACMTH-MS or MATHML-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MATH-789 Special Topics (1-6 Credits)
This is a master-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This class is restricted to degree-seeking graduate students or those with permission from instructor.

MATH-790 Research & Thesis (0-9 Credits)
Masters-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
This course is restricted to students in the ACMTH-MS or MATHML-PHD programs.
Typically Offered: Fall, Spring, Summer

MATH-791 Continuation of Thesis (0 Credits)
Continuation of Thesis

MATH-799 MATH GRADUATE Independent Study (1-3 Credits)
Independent Study
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

MATH-831 Mathematical Fluid Dynamics (3 Credits)
The study of the dynamics of fluids is a central theme of modern applied mathematics. It is used to model a vast range of physical phenomena and plays a vital role in science and engineering. This course provides an introduction to the basic ideas of fluid dynamics, with an emphasis on rigorous treatment of fundamentals and the mathematical developments and issues. The course focuses on the background and motivation for recent mathematical and numerical work on the Euler and Navier-Stokes equations, and presents a mathematically intensive investigation of various models equations of fluid dynamics.
Prerequisite: MATH-741 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

Mechanical & Industrial Engineering PhD (MIEP)

MIEP-795 Doctoral Seminar (1 Credit)
This seminar course presents topics of contemporary interest to graduate students enrolled in the program. Presentations include off campus speakers, and assistance with progressing on your research. Selected students and faculty may make presentations on current research under way in the department.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

MIEP-877 Doctoral Internship (0 Credits)
Internship is designed to enhance the educational experience of PhD students through full-time employment. Students must submit a proposal for the internship, to be approved by an employing supervisor and the department prior to enrolling. Students are required to submit an evaluation report at the conclusion of the internship.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Internship 40
Typically Offered: Fall, Spring, Summer

MIEP-889 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MIEP-890 Dissertation and Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students may count a maximum of 9 credits towards degree requirements. If the student enrolls cumulatively in more than 9 credits, the additional credits above 9 will not be counted towards the degree.
Typically Offered: Fall, Spring, Summer

MIEP-892 Graduate Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students may count a maximum of 9 credits towards degree requirements. If the student enrolls cumulatively in more than 9 credits, the additional credits above 9 will not be counted towards the degree.
Contact Hours: Research 40
Typically Offered: Fall, Spring, Summer

MIEP-899 Independent Study (3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student and instructor must prepare a plan of study and method of evaluation for approval by the program director prior to course registration.
Contact Hours: Independent Study 9
Typically Offered: Fall, Spring, Summer

Mechanical Engineering (MECE)

MECE-605 Finite Elements (3 Credits)
This course focuses upon theoretical and applied concepts pertaining to the finite element method. Direct and weighted residual formulation methods are derived and applied to problems in the area of structural analysis, fluid flow, and heat transfer. Foundational topics include shape functions, element formulation, element assembly, boundary conditions, matrix solution methods, mesh refinement, and convergence. The use of a standard commercial finite element software package is introduced.
Prerequisites: MECE-350 or equivalent course or graduate standing in MECE-MS or MECE-ME program. Co-requisite: MECE-707 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-606 Systems Modeling (3 Credits)
This course is designed to introduce the student to advanced systems modeling techniques and response characterization. Mechanical, electrical, fluid, and mixed type systems will be considered. Energy-based modeling methods such as Lagrange’s methods will be used extensively for developing systems models. System performance will be assessed through numerical solution using MATLAB/Simulink. Computer projects using Matlab/Simulink will be assigned and graded in this course including concepts of data analysis and how it performs to parameter estimation. Linearization of nonlinear system models and verification methods are also discussed.
Prerequisites: MECE-320 or equivalent course or graduate standing in the MECE-ME or MECE-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-610 Flight Dynamics (3 Credits)
Flight Dynamics is a three (3) credit hour, three (3) contact hour lectures to introduce the student to dynamics of aircraft flight. This course deals with the three-dimensional dynamics of aircraft, including general aircraft performance, stability and control, and handling qualities. Topics include: static and dynamic stability; longitudinal and lateral/directional control; mathematical development of rigid-body 6DOF equations-of-motion describing full range of aircraft motion; attitude dynamics and quaternion alternative; aerodynamic forming term coefficient development; linearization of nonlinear aircraft models; simulation of aircraft trajectories; aircraft system modes; and aircraft handling qualities introduction. Graduate students are expected to learn additional topics, e.g., quaternion methods, DATCOM programming, and frequency domain analysis of aircraft modes.
Co-requisites: MECE-320 or equivalent course or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-611 Orbital Mechanics (3 Credits)
Orbital Mechanics is a three (3) credit hour, three (3) contact hour lectures to introduce the student to mechanics of orbits. This course introduces orbital mechanics and space flight dynamics theory with application for Earth, lunar, and planetary orbiting spacecraft. Content includes: historical background and equations of motion, two-body orbital mechanics, orbit determination, orbit prediction, orbital maneuvers, lunar and interplanetary trajectories, orbital rendezvous and space navigation. The two-body orbital mechanics problem, first approximation to all exploration orbits or trajectories, is covered in full detail. Students develop computer based simulations using Matlab of orbital mechanics problems including a final mission project simulation from Earth to Mars requiring a number of orbit phases and transfers between these phases. Graduate students are expected to learn additional topics, e.g., Gibbs Method, Lambert’s Problem, Sidereal Time, and Orbit Determination from Angle and Range Measurements.
Prerequisites: MECE-205 or equivalent course or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-620 Introduction To Optimal Design (3 Credits)
This course is an introduction to basic optimization techniques for engineering design synthesis. Topics covered include: techniques, the general problem statement, necessary conditions of optimization, numerical techniques for unconstrained optimization, constrained optimization through unconstrained optimization, and direct methods. Numerical solutions are obtained using MATLAB.software. A design project is required.
Co-requisite: MECE-320 or equivalent course or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-623 Powertrain Systems and Design (3 Credits)
This course will introduce the analysis and design of power transmission systems. Topics covered include power transmission shafts: spur, helical, bevel, and worm gears drives; planetary gear systems; belt and chain drives. Students will use this foundation to complete a design project for a powertrain system that will contain detailed calculations of its different components.
Prerequisites: MECE-350 or graduate standing in MECE-ME or MECE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-624 Vehicle Dynamics (3 Credits)
The course focuses on the fundamentals of ground vehicle motion, control, and stability. The structure, stiffness, and mechanisms by which tires generate longitudinal and lateral forces and self-aligning moments are discussed. Steering geometry and steady-state and transient steering response for bicycle and four-wheel vehicle models are analyzed. The effect of suspension geometry and stiffness on stability and ride are discussed. Transmission system design to match engine characteristics and achieve required vehicle performance is discussed.
Co-requisites:MECE-320 or equivalent course or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-629 Renewable Energy Systems (3 Credits)
This course provides an overview of renewable energy system design. Energy resource assessment, system components, and feasibility analysis will be covered. Possible topics to be covered include photovoltaics, wind turbines, solar thermal, hydropower, biomass, and geothermal. Students will be responsible for a final design project.
Prerequisites: MECE-310 or equivalent course or graduate standing in MECE-MS or MECE-ME or SUSTAIN-MS or SUSTAIN-ME.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-638 Design of Machine Systems (3 Credits)
This is an applied course in the selection of components and integration of those components into electro-pneumatic-mechanical devices and systems. Topics involve all aspects of machine design, including drive components and systems, motion generation and control, and electrical control hardware and strategy.
Prerequisites: MECE-205 and MECE-350 or equivalent courses or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 4

MECE-643 Classical Controls (3 Credits)
This course introduces students to the study of linear control systems, their behavior and their design and use in augmenting engineering system performance. Topics include control system behavior characterization in time and frequency domains, stability, error and design. This is accomplished through classical feedback control methods that employ the use of Laplace transforms, block diagrams, root locus, and Bode diagrams. An integrated laboratory will provide students with significant hands-on analysis and design-build-test experience.
Prerequisites: MECE-320 or equivalent course or graduate standing in the MECE-ME or MECE-MS program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

MECE-644 Introduction To Composite Materials (3 Credits)
This course is an introductory course to the fundamentals and applications of composite materials. Topics covered include constituents of composite materials, fabrication techniques, micromechanical analysis, macromechanical analysis, and the use of composites in design. Some laboratory work is to be performed, and a design project is required.
Prerequisites: MECE-203 and MECE 305 and MATH-241 or equivalent courses. Co-requisites: MECE-317 or equivalent course. Students with graduate standing in MECE-ME or MECE-MS programs do not need to meet the prerequisite or co-requisite listed above.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-650 Sustainable Energy Use in Transportation (3 Credits)
The transportation sector represents nominally a third of the total energy consumption in the US, and presently, over 90% of this comes from petroleum sources. Transportation is responsible for about a quarter of greenhouse gas emissions and is a major source for several criteria pollutants. This course will introduce students to engineering practices used to evaluate transportation technologies from the standpoint of sustainability with an emphasis on light duty vehicles. Several emerging technologies including battery and hybrid electric vehicles, fuel cell vehicles, and bio-fuels will be considered. Particular attention will be devoted to the energy efficiency and emissions of the technology at the both vehicle and the fuel source levels. Additionally, the economic and social impacts will be examined. No text book will be assigned, and instead we will rely on open-access publications, journal articles, and electronic text available through the library.
Co-requisites: MECE-305 or equivalent course or graduate standing in MECE-MS or MECE-ME.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-655 Biomechatronics (3 Credits)
Biomechatronics is an upper level undergraduate and graduate elective course designed to give students an introduction to fundament concepts in Biomechanics as well as how to relate the biomechanics of motion to robotic systems. Course topics will include Biomechanics of Human Motion, Muscle Mechanics, Biomechanics of Prostheses, Artificial Limbs, Rehabilitation Biomechanics and Robotics, Actuators and Control, Biomimetic Robotics, Robotic Surgery, and Sensors. Students will be provided with fundamental pre-requisite knowledge related to each topic through readings, online resources, and in-class demonstrations. A final project is required.
Prerequisites: MECE-205 or BIME-200 or equivalent course or graduate standing in MECE-ME or MECE-MS program.
Contact Hours: Lecture 3
Typically Offered: Biennially

MECE-657 Applied Biomaterials (3 Credits)
This course provides an overview of materials used in biomedical applications. Topics covered include structure and properties of hard and soft biomaterials, material selection for medical applications, material performance and degradation in hostile environments, and typical and abnormal physiological responses to biomaterials/environments. Some experiments will be performed in class and a major project is required.
Prerequisite: (MECE-305 or BIME-370) and (MECE-210 or BIME-320) or equivalent courses and restricted to MECE-ME or MECE-MS students.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-658 Introduction to Engineering Vibrations (3 Credits)
Is concerned with analytically finding the dynamic characteristics (natural frequencies and mode shapes) of vibratory mechanical systems (single-degree and multi-degrees of freedom systems), and the response of the systems to external excitations (transient, harmonic, and periodic). Application to vibration damping techniques (Dynamic Vibration Absorbers) is also covered. In addition, laboratory exercises are performed, and an independent design project is assigned.
Prerequisites: MECE-320 or equivalent course or graduate standing in the MECE-ME or MECE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-670 Manufacturing Processes and Engineering (3 Credits)
The overall objective of this course is to provide students the exposure of traditional and non-traditional manufacturing processes which include casting, thermoforming, sheet metal forming, machining, polymer processing, joining, additive manufacturing, and more. Students will learn how to apply the basic properties of materials to manufacturing analysis and product design within an economic framework from lectures and projects.
Prerequisites: MECE-104 and MECE-203 and MECE-305 or equivalent courses or graduate standing in MECE-MS or MECE-ME programs. Co-requisites: MECE-350 or equivalent course or graduate standing in MECE-MS or MECE-ME programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-685 Mentored Research (1-3 Credits)
The goal of this course is to introduce students to research methods in an immersive research environment. Students complete independent research under the supervision of faculty and PhD mentors in the mechanical engineering department. Research projects span the range of all engineering disciplines, as well as non-engineering majors such as medical illustration, public policy, business, math and science. Projects are directly related to and supportive of activities important to the faculty member's overall research goals. Students may wish to create a multi-year experience by taking one credit at a time each semester for several years. Student projects then grow and expand as the research and the student's skill set evolves. This course is ideally suited for any student interested in learning about the exciting research taking place at RIT, students considering a master's or PhD, and students in the honors program wanting to earn research credits towards their honors degree. Mechanical engineering dual degree and graduate students may wish to take this course to explore research topics prior to making the decision between project with paper and thesis. Project descriptions are updated regularly and made available on-line and through the mechanical engineering office. Interested students should contact the faculty listed for each project of interest. After meeting with the faculty, projects may be re-scoped to match the student's background, preparation and key interest areas. There may be a limited number of seats available.
Typically Offered: Fall, Spring

MECE-689 Grad.Lower Level Special Topic (1-3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
Typically Offered: Fall, Summer

MECE-699 Graduate Co-op (0 Credits)
Up to six months of full-time, paid employment in the mechanical engineering field. See the ME graduate program coordinator or RIT's Office of Cooperative Education for further details.
This course is restricted to students in the MECE-MS or MECE-ME program.
Typically Offered: Fall, Spring, Summer

MECE-701 Research Methods (3 Credits)
This course introduces students to research methods in mechanical engineering. A primary focus of the course is on conducting critical reviews of research literature, preparing a formal thesis proposal, and initiating background research on a thesis topic. At the conclusion of the course, the students are expected to submit a formal thesis proposal, literature review, and plan of study for the completion of the Master of Science degree. This course is specifically designed for students enrolled in the dual degree MS/BS program offered through the department.
This course is restricted to students in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-707 Engineering Analysis (3 Credits)
This course trains students to utilize mathematical techniques from an engineering perspective, and provides essential background for success in graduate level studies. An intensive review of linear and nonlinear ordinary differential equations and Laplace transforms is provided. Laplace transform methods are extended to boundary-value problems and applications to control theory are discussed. Problem solving efficiency is stressed, and to this end, the utility of various available techniques are contrasted. The frequency response of ordinary differential equations is discussed extensively. Applications of linear algebra are examined, including the use of eigenvalue analysis in the solution of linear systems and in multivariate optimization. An introduction to Fourier analysis is also provided.
Prerequisites: (MATH-241 and MATH-326) or graduate student standing in the MECE-MS or MECE-ME programs.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MECE-709 Advanced Engineering Mathematics (3 Credits)
Advanced Engineering Mathematics provides the foundations for complex functions, vector calculus and advanced linear algebra and its applications in analyzing and solving a variety of mechanical engineering problems especially in the areas of mechanics, continuum mechanics, fluid dynamics, heat transfer, and vibrations. Topics include: vector algebra, vector calculus, functions of complex variables, ordinary differential equations and local stability, advanced matrix algebra, and partial differential equations. Mechanical engineering applications will be discussed throughout the course.
Prerequisites: MECE-707 or equivalent course or graduate student standing in MECE-MS or MECE-ME.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MECE-725 Computational Methods in Fluid Dynamics (3 Credits)
This graduate-level course offers a comprehensive introduction to numerical methods applied to partial differential equations (PDEs) in the context of fluid dynamics. Students will also delve into various numerical techniques tailored for simulating viscous fluid flows. Student will gain the necessary knowledge to select the most appropriate numerical schemes for different flow configurations. By the end of the course, students will possess the expertise required to tackle complex fluid dynamics problems using advanced computational methods.
Prerequisites: (MECE-210 and MECE-355 or equivalent courses and graduate standing in MECEU-ME or MECEU-MS programs) or (enrolled in the MECE-ME, MECE-MS, MIE-PhD, or BMECHE-PHD programs).
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-730 Design Project Leadership (3 Credits)
This course focuses on preparing students to take on a leadership role in design project teams. Topics include product development processes, management of design project teams, developing a business case for design projects, understanding customer needs and translating them into engineering specifications, tools for developing design concepts, tools for assessing the feasibility of design concepts, conducting engineering tradeoffs and analysis to synthesize a preliminary design. Students use the concepts and tools discussed throughout the course in a team-based environment to develop project packages.
This course is restricted to students in an MECE-BS/MS program or MECE-MS or MECE-ME.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-731 Computational Fluid Dynamics (3 Credits)
This course covers the basics of introduction to Computational Fluid Dynamics (CFD) n fluid mechanics and heat transfer. CFD methods of flow modeling are introduced with emphasis of in-class use of CFD software for modeling and problem solution. Course work involves tutorials and design examples. This course also introduces the students to some of the commercial CFD codes being used for solving thermal-fluid problems. Students complete an individual CFD study project including a written report and a presentation of the results.
Prerequisites: MECE-210 and MECE-317 or equivalent courses or graduate standing in MECE-MS or MECE-ME.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

MECE-733 Sustainable Energy Management (3 Credits)
This course, Sustainable Energy Management, provides an overview of mechanical systems within energy intensive applications such as power plants, automobiles, and buildings with an emphasis on advanced thermodynamic analyses of sub-systems which possess the most visible energy signature in terms of energy usage, energy inefficiency, thermoeconomic costing, and exergy destruction. Fundamentals of system operation are explored as well as various sustainability measures. In addition, the interrelationship between energy intensive applications and public policy instruments and strategies are examined. Students will explore methods by which engineers evaluate energy-intensive systems to assess alignment with sustainability and communicate findings to inform the public policy process cycle.
Prerequisites: MECE-310 and MECE-352 or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-738 Ideal Flows (3 Credits)
This course covers the fundamental topics in the theory of aerodynamics and high speed flows. The course discusses modern aerodynamic applications in the areas of wing and airfoil design, wind tunnel testing and compressible flows.
Prerequisites: MECE-210 and MATH-231 and MATH-326 or equivalent courses or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-739 Alternative Fuels and Energy Efficiency (3 Credits)
This course provides an overview of the potential alternative fuels and energy efficiency technologies for powering current and future vehicles. Alternative fuel production technologies and utilization of fuels such as biodiesel, ethanol, and hydrogen will be covered. The primary technical and environmental issues associated with these alternative fuels will be discussed. Approaches to improving vehicle efficiency will also be explored. Students will be responsible for a final design or research project.
Prerequisites: MECE-352 or equivalent course or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-743 Digital Controls (3 Credits)
This course builds on the fundamentals of continuous feedback control to introduce the student to computer (digital) regulation of systems in closed-loop. Discrete-time modeling and stability of signals and systems are discussed. Analog and digital control schemes are compared using s domain to z-domain conversion, and time-domain response characterization. Closed-loop system design objective specification and evaluation is conducted through numerical simulation and experimental observation. Various discrete-time controller designs are implemented and evaluated using Matlab/Simulink. A series of experimental exercises included using concepts throughout the course on an embedded controller.
Prerequisites: MECE-643 or equivalent course or graduate student standing in MECE-MS or MECE-ME.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-744 Nonlinear Controls (3 Credits)
This course introduces the student to methods used to design advanced nonlinear control systems. Topics of this course include: Phase-State Plane Analysis, Existence of Limit Cycles, Lyapunov Stability (Direct and Indirect methods), nonlinear control design using Feedback Linearization, the Sliding Mode Control method, Numerical Optimization of PID laws, and Adaptive Control strategies. Students are expected to complete computer projects using Matlab/Simulink.
Co-requisites: MECE-643 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-746 Engineering Properties of Materials (3 Credits)
This course presents the principles behind various properties of materials from an atomic and molecular perspective. Topics from physical chemistry and solid state physics and engineering are covered. Topics include: crystallography, thermodynamics of condensed phases, and thermal, elastic, electrical and magnetic properties. This course is oriented for advance undergraduate and graduate students with previous knowledge of materials science.
Prerequisites: MECE-305 or equivalent course or graduate standing in MECE-MS or MECE-ME program.
Contact Hours: Lecture 4
Typically Offered: Fall

MECE-751 Convective Phenomena (3 Credits)
This course introduces the student to the flow of real incompressible fluids beginning with a review of ideal flows. The differential approach is used to develop and solve the equations governing the phenomena of mass, momentum, and heat transfer. The material in the course provides the necessary background for a study of computational fluid dynamics. Students should be familiar with concepts of ideal flows. MECE-738 is recommended.
Prerequisites: MECE-210 and MATH-231 and MATH-326 or equivalent courses or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-752 Tribology Fundamentals (3 Credits)
This course provides an overview of the role of fluid-film lubrication in mechanical design, with strong emphasis on applications. Various forms of the Reynolds equation governing the behavior of lubricant films for planar, cylindrical, and spherical geometry are derived. Mobility and impedance concepts as solution methods of the Reynolds equation are introduced for the performance assessment of lubricated journal bearings under static and dynamic loading. Short, long, and finite bearing assumptions are discussed. Finite element methods for the analysis of fluid-film bearings of arbitrary geometry will be introduced.
Prerequisites: MECE-203 and MECE-210 and MECE-317 or equivalent courses or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-754 Fundamentals of Fatigue and Fracture (3 Credits)
This course is an introduction to the fatigue life prediction methodologies and basic fracture mechanics. Students will be introduced to linear elastic fracture mechanics, including stress intensity factor and crack tip plastic zone models. The fatigue methodologies to be covered include the Stress-Life Theory (used for machine elements), Strain-Life Theory (used for large-displacement samples and low cycle fatigue problems), and a fracture mechanics approach to fatigue analysis (used in the aircraft and space industries).
Prerequisites: MECE-317 and MECE-350 or equivalent courses or graduate standing in the MECE-MS or MECE-ME program.
Contact Hours: Lecture 4

MECE-755 Microfluidics (3 Credits)
Applications areas of microfluidics, Fluid flow and heat transfer governing equations, continuum hypothesis, analytical solutions for laminar liquid flow at different Reynolds numbers, creeping flows, laminar flows, identification of forces - surface, body, inertia – and their importance in specific applications, surface tension effects, pressure drop and heat transfer calculations, slip flow in gas flows, single-phase liquid flow and flow boiling in microchannels, roughness effects, mixing, T-junction, bubble generators, diffusion effects, introduction to microfluidic devices and controls - Bubble generators, micro-reactors, lab-on-chip devices, microscale sensing, control and measurement.
Prerequisites: MECE-210 or equivalent course or graduate standing in MECE-ME or MECE-MS or ENGR-PHD or MCSE-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-756 Boiling and Condensation (3 Credits)
The course covers selected topics in boiling and condensation. The fundamental aspects will be introduced in the class. Fundamentals of phase change process will be emphasized. Several design examples will be covered to make students proficient in applying the theory to practical situations. The course has a design-oriented project that counts for majority of the grade. The projects are based on exciting new topics of current interest such as – visualization of boiling characteristics on enhanced surfaces, investigating different enhancement techniques, characterizing of nucleation behavior, effect of substrate on boiling, etc. Some of the topics covered include: Boiling curve, nucleation, bubble growth, critical heat flux, mechanisms of heat transfer, and enhancement techniques.
Prerequisites: MECE-210 and MECE-310 or equivalent course or graduate standing in MECE-ME or MECE-MS or ENGR-PhD or MCSE-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-758 Intermediate Engineering Vibrations (3 Credits)
Is concerned with analytically finding the dynamic characteristics (natural frequencies and mode shapes) of continuous mechanical vibratory systems (strings, rods, and beams), and the response of the systems to external excitations (transient and harmonic). Solutions using the finite element method is also introduced.
Prerequisites: MECE-658 or equivalent course or graduate student standing in MECE-MS or MECE-ME.
Contact Hours: Lecture 3
Typically Offered: Spring

MECE-777 Graduate Internship (3 Credits)
This course number is used by students in the master of engineering degree program for earning internship credits. Students must submit a proposal for the internship, to be approved by an employing supervisor and the department prior to enrolling. Students are required to submit an evaluation report at the conclusion of the internship.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MECE-785 Mechanics of Solids (3 Credits)
This course provides a more advanced treatment of stress and strain concepts pertaining to the mechanics of deformable media and provides a theoretical foundation for a concurrent or follow-on course in finite elements. Topics include stress and strain transformations, two-dimensional theory of elasticity, stress functions, torsion, plate bending, and energy methods.
Prerequisites: MECE-350 or graduate standing in MECE-ME or MECE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MECE-789 Graduate Special Topics (1-3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
This course is restricted to students in an MECE-BS/MS program or MECE-MS or MECE-ME.
Typically Offered: Fall, Spring

MECE-790 Thesis (0-6 Credits)
Thesis In conference with an adviser, a topic is chosen. Periodic progress reports and a final written document with an oral examination are required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MECE-792 Project with Paper (3 Credits)
This course is used by students in the master of engineering degree program for conducting an independent project. The student must demonstrate an acquired competence in an appropriate topic within mechanical engineering. The topic is chosen in conference with a faculty adviser. The work may involve an independent research and/or a design project and/or literature search with a demonstration of acquired skill. A written paper, approved by the advisor and the department, and an oral presentation of the work are required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MECE-795 Graduate Seminar (0-2 Credits)
This seminar course presents topics of contemporary interest to graduate students enrolled in the program. Presentations include off campus speakers, and assistance with progressing on your research. Selected students and faculty may make presentations on current research under way in the department. All graduate students enrolled full time (whether dual degree or single degree) are required to attend a designated number of seminars.
This course is restricted to MECEMS-U or MECE-MS or MECE-ME or MECEME-U Major students.
Contact Hours: Seminar 1
Typically Offered: Fall, Spring

MECE-799 Independent Study (1-3 Credits)
This course is used by students who plan to study a topic on an independent study basis. The student must obtain the permission of the appropriate faculty member before registering for the course.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Mechanical Engineering Technology (MCET)

MCET-620 Robust Design & Production Systems (3 Credits)
In this advanced course students explore methods, such as Taguchi arrays, that support the optimization and verification phases of the Design for Six Sigma development process. Topics covered include the experimental design process, additivity, static and dynamic signal-to-noise ratios, analysis of means, and ANOVA. The role of robust design methods in reducing variability for both products and processes and in integrating systems is emphasized. Students may not take and receive credit for this course if they have already taken MCET-582.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MCET-621 Structural Analysis (3 Credits)
This course will provide a thorough understanding of beam structures under combined shear, bending, and torsional loads. Topics include the study of semi-monocoque structure idealizations (ie. aircraft fuselages), effects of tapered and laminated structures, shear deformations and warping, location of elastic axis in open and closed sections, torsion of multi-cell sections. Matrix methods are introduced and utilized throughout the course. The course has a project component that combines analytical, theoretical, and experimental methods. Students may receive credit for only this course or MCET-521, not both.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3, Recitation 1
Typically Offered: Biennially

MCET-630 Polymer Engineering Research (3 Credits)
This course introduces new graduate students to the fundamental concepts and skills relevant to plastics and polymer engineering research. Students will learn concepts in the chemistry and physics of polymeric materials and the essential techniques used to characterize them. Laboratory skills in the preparation of polymers, polymer blends, their fabrication into useful test specimens and their characterization will be emphasized. Following the successful completion of this course students will be prepared to carry out graduate level polymer engineering research.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture/Lab 4
Typically Offered: Biennially

MCET-661 Multiphysics Modelling: Materials, Components, and Systems (3 Credits)
Multiphysics modeling is the study of multiple interacting and coupled physical phenomena including heat transfer, fluid flow, deformation, electromagnetics, acoustics, and mass transport. Students will use numerical methods, specialized software, and computer simulations to solve engineering problems and understand the underlying physics of interacting complex engineering systems. This course may be cross-listed with MCET-561; BSMS program students are advised to enroll in the graduate level course.
This class is restricted to MMSI-MS, MCETMMSI-U or MECAMMSI-U or EMETMMSI-U students.
Contact Hours: Lecture 2, Recitation 2
Typically Offered: Biennially

MCET-662 Advanced Fluid Mechanics and Modeling (3 Credits)
The main purpose of this course is to help students develop a mastery of the underlying principles and the ability to efficiently solve variety of real fluid dynamics problems. The course focuses on the physical phenomena, mathematical formulations, and advanced problem-solving techniques and modeling for flows ranging from laminar incompressible flows to turbulence, with examples from mechanical engineering practice and technology. This course may be cross-listed with MCET-562; BSMS program students are advised to enroll in the graduate level course.
This class is restricted to MMSI-MS, MCETMMSI-U or MECAMMSI-U or EMETMMSI-U students.
Contact Hours: Lecture 2, Recitation 2
Typically Offered: Spring

MCET-670 Concept/Product Design Management (3 Credits)
This course focuses on the design concept process. Critical product attributes specified by the customer are applied to the product, process design and performance parameters. Tools and techniques include understanding the product life cycle from conception through obsolescence, translating the voice of the customer into technical requirements, defining functions to fulfill the requirements, generating designs to physically fulfill the functions, product/system validation, and the evaluation and selection of superior product and subsystem designs that are safe to take to commercialization. Additionally, students will perform competitive analysis assessments. Students may not take and receive credit for this course if they have already taken MCET-570.
Contact Hours: Lecture 3
Typically Offered: Spring

MCET-674 Plastics and Composites Materials (2 Credits)
Study of advanced polymeric materials including their preparation, processing and application design. Topics will include both long and short fiber reinforced composites. Industrial modification of polymers into plastics compounds including polymer blends and additives will also be discussed. Students will complete a literature review of a current topic in advanced polymers. Students may receive credit for only this course or MCET-574, not both.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs. Co-requisites: MCET-675 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Fall

MCET-675 Plastics and Composites Materials Laboratory (1 Credit)
Laboratory exercises involving polymeric materials (e.g. composites, polymers blends) including their preparation, processing and application design. Conduct a research-oriented project including writing up the results as a conference paper/journal article submission. Students may receive credit for only this course or MCET-575, not both.
Students cannot take and receive credit for this course if they have taken MCET-575. Co-requisites: MCET-674 or equivalent course.
Contact Hours: Laboratory 2
Typically Offered: Fall

MCET-680 Plastics Manufacturing Technology (3 Credits)
The course studies plastic materials and processing technology to manufacture various plastic products in plastics industry. The course emphasizes new materials, such as bio-degradable, environmentally friendly polymers, and process selections for engineering applications and design. Students may not take and receive credit for this course if they have already taken and received credit for MCET-580.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MCET-683 Plastics Product Design (3 Credits)
The study of design guidelines for plastic products based on the interrelationships between design, the material selected, the manufacturing process selected, and the tooling to be used. Students will research the feasibility of using polymeric materials to design a part or assembly not traditionally manufactured using plastics. Students may receive credit for only one course: MCET-583 or MCET-683
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Spring

MCET-692 Spray Theory and Application (3 Credits)
This course covers the theory necessary to understand spray formation and evolution, as well as a host of spray applications. Knowledge of differential equations is required. Topics include drop size distributions, breakup of liquid sheets and ligaments, drop formation and breakup, drop motion and the interaction between a spray and its surroundings, drop evaporation, nozzle internal fluid mechanics, external spray characteristics, nozzle performance, and experimental techniques relevant to these subjects. Applications will include: (1) gas turbine engines, (2) internal combustion engine sprays, (3) sprays for geo-engineering, (4) agricultural sprays, (5) consumer products, (6) paints and coatings, and (7) use of non-traditional liquids in aero-propulsion and other systems. Time spent on each topic depends on student interest. Each student is expected to work on a final project, of their choosing, focused on a topic within the realm of spray theory and application. A research related topic is preferred, but not required. Students must design an experiment and correlate their results with their developed theoretical model. The project is the prime method for assessing student learning. Students will be asked to demonstrate a deep theoretical understanding of spray formation and applications. Students may take and receive credit for MCET-592 or MCET-692, not for both.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Biennially

MCET-695 Applied Finite Element Analysis (3 Credits)
This course focuses on using commercial finite element analysis (FEA) software to analyze complex linear and non-linear systems in the areas of structural mechanics and heat transfer. Students will utilize a wide variety of analysis techniques including deflection, stress, mode shapes, optimization, heat transfer, and thermal-stress. A semester long project using FEA to solve an advanced problem relevant to each student's interest area is required. In addition, students will be given problems that extend beyond the material covered in class that will require independent investigation. Students may not take and receive credit for this course if they have already taken MCET-595 Students that do not have undergraduate background in FEA should not take this graduate course. It is recommended students discuss in advance with the instructor before registering to determine their level of experience.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

MCET-720 Product and Production System Development and Integration (3 Credits)
This course covers topics, processes and best practices in product development. Using Design for Six Sigma (DFSS) as a motivating philosophy, students are introduced to concepts and techniques in the early stages of the product development process, including capturing the voice of the customer, critical parameter management, the phase-gate approach, and system integration for total product life cycle performance. The course provides an overview of DFSS goals, its development process, CDOV (Concept-Design-Optimize-Verify), and technology process (IDOV, Innovate-Develop-Optimize-Verify), as well as strategies in product commercialization.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Biennially

MCET-799 Independent Study (1-3 Credits)
Faculty directed study of appropriate topics on a tutorial basis. This course is generally used to allow an individual to pursue topics in depth under faculty sponsorship.
Contact Hours: Independent Study 4
Typically Offered: Fall, Spring

Mechatronics Engineering Technology (MECA)

MECA-672 Biomechatronic Systems Design (3 Credits)
This course explores the design of biomechatronic systems by integrating mechanical, electrical, and computer systems. It focuses on understanding the electrophysiological signals, sensors, bioinstrumentation, critical issues involved in the design of biomechatronic devices, and human-device interaction. Students will be introduced to the current state-of-art sensors and mechatronic principles and techniques for measuring, assisting, augmenting, and mimicking biological systems. Students will gain significant hands-on experience through the design, modeling, and development of biomechatronic systems. This course will address how to interface these devices with humans, along with safety and ethical aspects. Students will explore scientific literature and research methodologies and investigate emerging trends in biomechatronics. To ensure the reliability and functionality of biomechatronic systems in real-world applications, students will learn and apply advanced troubleshooting techniques, diagnosing and resolving system failures related to hardware, software, and human interaction. Students may not take and receive credit for this course if they have already taken MECA-572.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

Medical Illustration (ILLM)

ILLM-601 Human Gross Anatomy (6 Credits)
This course provides an in-depth study of the structure of the human body. Emphasis is on understanding the relationships between anatomical structures as well as their form, texture, and color. Dissection of a human cadaver is supplemented with lectures on the structure and function of the major organ systems.
This course is restricted to ILLM-MFA Major students.
Contact Hours: Laboratory 9, Lecture 3
Typically Offered: Fall

ILLM-602 Anatomic Studies (3 Credits)
Through independent research and acquired understanding of human gross anatomy, students create illustrations designed to support medical or graduate level instruction of Human Gross Anatomy. Course requires students to cognitively illustrate their subjects, rather than creating literal interpretations of their observations. Work is intended for full color print media.
This course is restricted to ILLM-MFA Major students.
Contact Hours: Studio 5
Typically Offered: Fall

ILLM-603 3D Modeling of Biomedical Forms (3 Credits)
This course introduces strategies to create polygonal models of biomedical subjects. Students will use contemporary research to accurately define structure and suggest function. Instruction will also focus on lighting and "shader" systems that emphasize form and are consistent with tissue characteristics.
This course is restricted to ILLM-MFA Major students.
Contact Hours: Studio 6
Typically Offered: Fall

ILLM-606 3D Animation of Biomedical Forms (3 Credits)
This course explores animating biomedical subjects and processes. Students will be asked to research contemporary theory defining their subjects' anatomy and create animations consistent with their findings. Frame by frame animation, blend shapes, non-linear deformers, and rigging systems will be introduced to permit students to choose the most effective method for creating motion and transformation.
Prerequisites: ILLM-603 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

ILLM-607 Computer Applications in Medical Illustration (3 Credits)
Students will learn to use industry-standard raster and vector illustration software to create images based on independent research of medical topics. Students will also use page layout applications to combine digital images with text and other graphic elements. Coursework emphasizes creation of illustrations to support medical education and publishing. This course is restricted to ILLM-MFA Major students.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

ILLM-608 Scientific Visualization (3 Credits)
Emerging technologies enable scientists to visualize structures that are otherwise invisible to the naked eye. For example, molecular visualization software allows us to construct highly accurate molecular models from x-ray crystallography and other structural data. Cryo-EM and confocal microscopy are revealing the previously unknown structure of cellular organelles. Medical imaging systems allow us to reconstruct the human body in three dimensions from actual patient data (CT scans, MRI, etc.). This course explores the use of these technologies to provide references for traditional artwork and to export models for digital rendering and animation.
Prerequisites: ILLM-601 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

ILLM-612 Surgical Illustration (3 Credits)
Students observe and sketch live surgical procedures at a local hospital. After further background research, students translate their sketches into finished illustrations that are used in medical training, patient education, and litigation. Demonstrations of sketching and rendering techniques are supplemented with lectures on general surgical principles and common procedures.
Prerequisites: ILLM-601 and ILLM-607 or equivalent courses.
Contact Hours: Studio 6
Typically Offered: Fall

ILLM-615 Interactive Media I (3 Credits)
This course is an introduction to two dimensional computer illustration, animation, and interactive media as they apply to contemporary methods of instruction in medicine and allied health. Students will research a current topic in health care and develop interactive lessons that match the instructional objectives of their topic. Students will organize these lessons as a web site.
Prerequisites: ILLM-607 or equivalent course.
Contact Hours: Lecture/Lab 6
Typically Offered: Fall

ILLM-616 Interactive Media II (3 Credits)
This course continues the development of student web sites designed for allied health instruction. Advanced topics in two dimensional computer illustration, animation, and interactive media will be presented. Students will research current topics in health care and continue the development of the interactive lesson begun in the previous class.
Prerequisites: ILLM-615 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

ILLM-617 Portfolio and Business Practices (3 Credits)
This course helps prepare students to enter the workforce in full-time positions or as freelance illustrators. Students create a traditional portfolio, personal identity package, and marketing materials. The course also introduces important business concepts such as copyright, licensing, pricing, contracts, taxation, and formation of a proper business.
Prerequisites: ILLM-612 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

ILLM-618 Eye Ear and Nose Prosthetics (3 Credits)
This course provides an introduction to the field of anaplastology, a branch of medicine dealing with the prosthetic replacement or correction of an absent, disfigured, or malformed anatomic structure, usually on the face or limbs. Focusing on maxillofacial prosthetics and ocular prosthetics (artificial eyes), students learn the basic technical skills needed for an internship or apprenticeship in this field. **Fee: There is a $45 fee for this course**
Prerequisites: This course is restricted to ILLM-MFA students who have successfully completed ILLM-601 or equivalent course.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

ILLM-627 Advanced Digital Technology for Medical Instruction (3 Credits)
Students will work with 3D modeling and animation software along with gaming engines to create interactive learning modules for medical and scientific applications that can be experienced through virtual reality, augmented reality, or mixed reality.
Contact Hours: Studio 6
Typically Offered: Spring

ILLM-628 Medical and Scientific Animation (3 Credits)
Students will work with 2 dimensional, 3 dimensional and editing software in order to develop a complete animation on the topic of their choice.
Contact Hours: Studio 6
Typically Offered: Fall

ILLM-689 Special Topics (1-4 Credits)
This course is an upper division course on a topic of special interest that is not part of a formal curriculum. The course design may differ by topic or faculty member but will include prerequisites, contact hours, and examination/assessment procedures. The level of study is appropriate for students in their final two years of study.
This course is restricted to ILLM-MFA Major students.
Typically Offered: Fall, Spring

ILLM-699 Medical Illustration Graduate Co-op (0 Credits)
The Medical Illustration Grad Co-op will provide students with the opportunity to work with established Medical Illustrators or related businesses to gain on-the-job experience in the profession. Co-ops are typically paid work experiences and can be either part-time (10-15 hrs/wk) or full-time (min. 35 hrs/wk). All co-ops must fall within an RIT term (Fall, Spring, Summer).
Typically Offered: Fall, Spring, Summer

ILLM-799 Independent Study (1-6 Credits)
Medical Illustration Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty advisor will propose a course of study. Medical Illustration Independent Study students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll.
Typically Offered: Fall, Spring, Summer

ILLM-890 Thesis (1-6 Credits)
This course serves a culminating experience in which students apply knowledge and skills gained from their graduate experience to a complex visual communication problem. Working with a subject matter expert, students produce a body of artwork to communicate a complex medical topic. The work may be static two-dimensional illustration, three-dimensional illustration, 2D or 3D animation, an interactive or virtual experience, or some combination thereof. In the Spring semester of Year 1, students select a topic and identify a subject matter expert. In Fall and Spring of Year 2, they produce the bulk of the work. Students present their completed projects at the end of Spring semester of Year 2. The thesis culminates with the production of a written thesis paper that documents the process of creating the work.
This course is restricted to ILLM-MFA Major students.
Typically Offered: Fall, Spring

ILLM-891 Continuation of Thesis (0 Credits)
The Continuation of Thesis course provides students additional semester(s) to complete their thesis research, project, and thesis document
Typically Offered: Fall, Spring, Summer

ILLM-897 Graduate Capstone (1-6 Credits)
This course serves a culminating experience in which students apply knowledge and skills gained from their graduate experience to a complex visual communication problem. Working with a subject matter expert, students produce a body of artwork to communicate a complex medical topic. The work may be static two-dimensional illustration, three-dimensional illustration, 2D or 3D animation, an interactive or virtual experience, or some combination thereof. In the Spring semester of Year 1, students select a topic and identify a subject matter expert. In Fall and Spring of Year 2, they produce the bulk of the work. Students present their completed projects at the end of Spring semester of Year 2.
This course is restricted to ILLM-MFA Major students.
Typically Offered: Fall, Spring

Medical Informatics (MEDI)

MEDI-610 Scripting Fundamentals (3 Credits)
This course is an introductory scripting course. Students will learn to design software solutions using the procedural approach, to implement software solutions using a contemporary programming language, and to test these software solutions. Topics include problem definitions, designing solutions, implementing solutions using a contemporary programming language, implementing a contemporary library/framework, and testing software solutions. Programming projects will be required.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

MEDI-701 Introduction to Health Informatics (3 Credits)
This course provides a rigorous introduction to the principles of medical informatics. The focus of this course is on the study of the nature of medical information and its use in clinical practice and clinical quality improvement. Key topics include: the electronic medical record (EMR) and its impact on health care delivery, the Internet and mobile computing as sources of medical information, Health care information systems, the software development lifecycle, the importance of the informatics specialists in medicine and the various roles they can play, and government economic incentives and policy issues in healthcare such as privacy, confidentiality, including health care regulatory and accreditation issues and the Health Insurance Portability and Accountability Act (HIPAA). Students will participate in online discussion of medical informatics. They will also investigate several topics of interest in the field and provide presentations.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-702 Perspectives of Health Informatics (3 Credits)
The health care industry is composed of many different disciplines, specialties, and professions. Designing and developing informatics solutions requires an understanding of the roles, approaches and information needs of the many diverse user groups in delivering health care services for patients and health populations. This course will focus on the overlapping and divergent requirements of a comprehensive electronic health record from the perspectives of patients, health care providers (physicians, nurses, pharmacists, etc), health care payers, public health structures, biotechnology firms and researchers. Group projects will be required.
Prerequisites: MEDI-701 or equivalent course and graduate standing in the MEDINFO-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-704 Practice of Health Care (3 Credits)
This seven-week course is an introduction to clinical practice for graduate students in Medical Informatics. It consists of the study of medical specialties including shadowing of clinicians in these areas. Students in this course will be part of a team of health care professionals in the selected specialties. They will make rounds with providers, attend key IT and HI meetings, assist with information gathering and dissemination, and observe specialty specific disease process, diagnosis, and treatment. They will observe and note clinical workflow and technology usage. They will interact with team members and assist with the acquisition of reference knowledge as appropriate.
Prerequisites: MEDI-701 or equivalent course and graduate student standing.
Contact Hours: Clinical 1, Lecture 6
Typically Offered: Spring, Summer

MEDI-705 Medical Knowledge Structures (3 Credits)
This course presents concepts related to organization and retrieval of knowledge-based information in the health sciences. It includes a study of classification schemes, controlled vocabularies and thesauri, metadata, and ontologies. Major schemes and systems examined, for example, include MeSH, UMLS, and PubMed. Also covered are the topics of knowledge retrieval at the point of care, and knowledge discovery.
Prerequisites: MEDI-701 or equivalent course and graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-707 Clinical Decision Support (3 Credits)
This course provides a rigorous introduction to the principles of modeling and implementing decision support systems. It begins with an overview of how to frame a clinical or health care management question, develop a decision support model, and find appropriate evidence for model calibration. The major decision categories covered in the course for clinical practice include those regarding treatment, diagnosis, harm (etiology), and prognosis. The major decision categories covered in the course for health care management include service provision, resource allocation, and cost-effectiveness. The course will identify the best types of evidence to answer questions, and how to find and apply that evidence. The decision support modeling techniques include game theory, Bayesian theory, decision trees, planning models, systems dynamics models, and queuing models. The course concludes with a section on summarizing evidence (e.g., through systematic reviews and meta-analysis), putting evidence into practice (e.g., implementing clinical practice guidelines), and the limitations of the approaches covered in the course. Students will apply decision support techniques in addressing real world problems using appropriate software and participate in online discussion of decision analysis in the medical literature.
Prerequisites: MEDI-701 or equivalent course and graduate standing in the MEDINFO-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-710 American Health Policy & Politics (3 Credits)
This course examines the formation and evolution of American Health policy from an historical perspective. Concentrating on developments from the early twentieth century to the present, the focus will be political forces and institutions and historical and cultural contexts. Among the topics covered are periodic campaigns for national health insurance, the creation of Medicare and Medicaid and the further evolution of these programs, the rise to dominance of economists in the shaping of health policy, incremental and state-based vs. universal and federal initiatives, the formation and failure of the Clinton administration's health reform agenda, and national health reform during the Obama administration.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-711 Introduction to US Health Care System (3 Credits)
In this course, we examine the organization, financing, delivery, and performance of the U.S. health care system. The inherent tradeoffs between access to care, cost, quality, and outcomes are considered from the perspective of the main actors in the system, i.e. patients, providers (physicians, hospitals, etc.), health plans, insurers and payers. Topics include: need and access to care; health care insurance and financing; Medicare and Medicaid; managed care; service delivery; long-term care; public health; quality of care, and others. The aim of the course is to help students deepen their understanding of the health care system, strengthen their ability to synthesize the literature and assess key current policy issues, and to further develop their critical thinking skills.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-730 Medical Application Integration (3 Credits)
A typical hospital information system architecture contains a variety of best of breed applications running on different hardware and software platforms. Exchange of information between these applications can be a significant problem. In this course, students will learn how to leverage the loose coupling of service-oriented architectures and message oriented middleware to address the issues of data integration between these types of computer programs when executing across domains. Programming projects will be required. (Students will need a database theory course, and one year of object-oriented programming to be successful in this course)
Prerequisites: MEDI-701 and ISTE-608 and ISTE-200 or equivalent courses and graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDI-731 System Integration Concepts (3 Credits)
This course will provide students with an understanding of application integration concepts in healthcare. Students will also learn medical business processes and how they impact data integration within a healthcare setting. Middleware message brokers will be examined along with the use of the HL7 messaging standard. Web services and other forms of data integration will be studied. Students will develop integration solutions to support healthcare information systems exchange and validation procedures and solutions to ensure the quality of information exchanged between healthcare systems.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

MEDI-735 Clinical Information Systems (3 Credits)
A study of the component approach to clinical information systems. Students will learn about the evolution of Health Information Systems, and the variety of systems offered by vendors at the present time. The importance of the Electronic Health Record (EHR), the Computerized Physician Order Entry (CPOE) and Clinical Decision Support will be stressed as they become the focal points in clinical information systems. The following components will be studied in detail: patient, activity, health record, knowledge, and security components. The role of imaging management and integration will also be reviewed.
Prerequisites: MEDI-701 or equivalent course and graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Spring

MEDI-766 Building the Electronic Health Record (3 Credits)
This course explores the acquisition, storage, and use of information in the electronic health record (EHR) through hands-on development and programming. Students will learn about the types of information used in clinical care: text, structured data, images, and sounds. Other topics covered include: clinical vocabularies (existing schemes and their limitations); how clinical information is generated and utilized; methods of information storage and retrieval; departmental systems (laboratory, radiology, and hospital information systems); organizational systems (including scheduling, registration and financial systems); and the legal, social and regulatory problems of EHRs including security and confidentiality.
Prerequisites: HCIN-610 and MEDI-705 or equivalent courses and graduate student standing.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

MEDI-788 Capstone In Health Informatics (3 Credits)
This team-based course provides students with the opportunity to apply the knowledge and skills learned in coursework to design, develop, and implement a solution to a real problem in the medical informatics domain. Project teams also will be responsible for submitting a final project report, and for making a final presentation to project stakeholders. (Completion of first year courses)
Prerequisite: MEDI-701 and MEDI-705 and MEDI-735 and MEDI-704 and HCIN-610 and Graduate standing.
Contact Hours: Lecture 3
Typically Offered: Summer

MEDI-909 Proposal Development (0 Credits)
This course is part of a capstone experience for graduate students who are beginning the capstone experience. Students will submit an accepted proposal as a prerequisite for the formal thesis. Permission of the graduate adviser is required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Medical Sciences (MEDS)

MEDS-601 Medical Terminology and Structured Medical Information (3 Credits)
An understanding and proper use of medical terminology is critical in the field of health care. Of equal importance is an understanding of how medical information is organized and retrieved. This course is designed for graduate level students interested in expanding their knowledge of medical terminology, related pathophysiology, and the origins of structured medical information. Emphasis is placed on etymology, definition, pronunciation, and correct utilization of terms. The course also includes putting the terminology into practice with the concepts of the organization and retrieval of information through structured medical information systems, e.g. MeSH, PubMed, and the Cochrane Library.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDS-615 Medical Pathophysiology (3 Credits)
This course is designed as a graduate-level course in pathophysiology, the study of disease and its consequences to human health. It covers mechanisms of cell injury, the homeostatic responses of cells and tissues, and the clinical manifestations of disease, concentrating on the disease states that are most frequently encountered in clinical practice, including infection, cancer, heart disease, and diabetes. The course follows a medical school model by using a clinical case-based approach that promotes active, team-based learning and professional written communication. Students will conduct independent research to create and illustrate a clinical case study.
This course is restricted to ILLM-MFA Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

MEDS-620 Histology and Histopathology (4 Credits)
This graduate course in the Medical Illustration (MFA) program combines lecture and laboratory sessions to introduce students to the microscopic anatomy of both normal and pathologic human tissues and organs, with special emphasis given to the relationships between cellular architecture and normal versus altered physiologic function. Students will created illustrations and annotated digital images, and complete a final project designed to teach the etiology and pathogenesis of a chosen disease state to students at a graduate level. (One year of General Biology with lab)
This course is restricted to ILLM-MFA Major students.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

MEDS-630 Human Immunology (3 Credits)
This graduate course in the Medical Illustration (MFA) program will provide an introduction to the fundamental facts and concepts on immunology to include: innate and adaptive immunity; cells, molecules, tissues and organs of the immune "system"; cell communication and interaction; antibody structure and function; and the application of these concepts to infectious diseases, vaccine design, autoimmune diseases, cancer, transplantation, regulation of the immune response, allergic reactions and immunosuppression. Students will gain an understanding of immunological principles and techniques, and their application to contemporary research, with results from instructor’s research laboratory.
This course is restricted to ILLM-MFA Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MEDS-689 Special Topics (1-4 Credits)
This course is an upper division course on a topic of special interest that is not part of a formal curriculum. The course design may differ by topic or faculty member but will include prerequisites, contact hours, and examination/assessment procedures. The level of study is appropriate for students in their final two years of study.
Typically Offered: Fall, Spring, Summer

MEDS-799 Independent Study (1-6 Credits)
Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty advisor will propose a course of study. Independent Study students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll.
Typically Offered: Fall, Spring, Summer

Metal & Jewelry Design (CMTJ)

CMTJ-601 Metals and Jewelry Design Graduate Studio (6 Credits)
This course covers the advanced aesthetics and techniques in metals and culminating in the Master's of Fine Arts Thesis. The course is structured on the individual student's needs, interests and background preparation as they may be determined through faculty counseling. There will be a strengthening of metals techniques, design fundamentals and encouragement of personal expression. The student will be encouraged to evaluate new techniques, materials and concepts. This course is repeatable and leads to the master's thesis, proposed by the student and approved by the faculty. Lab fee is required.
This class is restricted to students in the METAL-MFA program.
Contact Hours: Studio 12
Typically Offered: Fall, Spring

CMTJ-630 Form and Fabrication: Metals and Jewelry Design (3 Credits)
This is an elective course providing graduate-level students an opportunity for introductory study in metals: either hollowware or jewelry. Students will gain an understanding of the history of metals. Development of metals techniques, design fundamentals and encouragement of personal expression are encouraged. The student will learn to evaluate new techniques, materials and concepts. Slide lectures, technical demonstrations, field trips, hands-on experience and critiques used. **Fee: There is a lab fee required for this course**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Studio 6
Typically Offered: Fall, Spring, Summer

CMTJ-698 Metals and Jewelry Design Graduate Internship (1-6 Credits)
This course is open to all Metals graduate students with a minimum of a 3.0 GPA. Metals and Jewelry Design students should first procure an internship opportunity within our industry. Students must submit a completed permission form identifying the firm and what they have been told will be their duties and responsibilities. Metals and Jewelry Design Internships must be approved by the student's Graduate Director or School Director. Students are required to submit a minimum 10-page paper about their experience and obtain a letter of review from their job site supervisor. 90 hours of work earns 1 semester credit.
Prerequisites: This class is restricted to students in METAL-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CMTJ-699 Metals and Jewelry Design Co-op (0 Credits)
Cooperative Education will provide Metals and Jewelry Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in METAL-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CMTJ-790 Metals and Jewelry Design Thesis Initiation (6 Credits)
This is the first of a two-semester thesis course sequence covering the advanced aesthetics and techniques in metals. This is a culmination, prior to the thesis studio course, of the program developed on the basis of the individual student's needs, interests and background preparation as they may be determined through faculty counseling. The student will seriously pursue issues and themes that are relevant to their final thesis topic. The student will be encouraged to utilize new techniques, materials and concepts. This sequence leads to the master's thesis, proposed by the student and approved by the faculty. **Fee: There is a lab fee required for this course**
Prerequisites: CMTJ-702 or equivalent course and student standing in the METAL-MFA program.
Contact Hours: Studio 12
Typically Offered: Fall

CMTJ-799 Metals and Jewelry Design Independent Study (1-6 Credits)
Metals and Jewelry Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser will propose a course of study to pursue over the course of the semester. Goals and objectives will be outlined by the student in conjunction with their faculty adviser. Metals and Jewelry Independent Study students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll. **NOTE: Student must have a minimum 3.0 GPA **
Prerequisites: This class is restricted to students in CCER-MFA, GLASS-MFA, METAL-MFAor WOOD-MFA with instructor permission.
Typically Offered: Fall, Spring

CMTJ-887 Metals and Jewelry Design Part-Time Co-op (0 Credits)
Cooperative Education will provide Metals and Jewelry Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in METAL-MFA with department permission.
Typically Offered: Fall, Spring, Summer

CMTJ-890 Metals and Jewelry Design Thesis Resolution (9 Credits)
This is course will focus on the development of an acceptable thesis project initiated by the student and approved by the student's thesis committee and chairperson of the school. Primarily a creative production resulting in a body of work, the thesis will include a written report which addresses the body of work. The work will be exhibited in the graduate thesis show. **There is a lab fee required for this course**
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Studio 12
Typically Offered: Spring

Microelectronic Engineering (MCEE)

MCEE-601 Microelectronic Fabrication (3 Credits)
This course introduces the beginning graduate student to the fabrication of solid-state devices and integrated circuits. The course presents an introduction to basic electronic components and devices, lay outs, unit processes common to all IC technologies such as substrate preparation, oxidation, diffusion and ion implantation. The course will focus on basic silicon processing. The students will be introduced to process modeling using a simulation tool such as SUPREM. The lab consists of conducting a basic metal gate PMOS process in the RIT clean room facility to fabricate and test a PMOS integrated circuit test ship. Laboratory work also provides an introduction to basic IC fabrication processes and safety.
Prerequisites: Graduate standing in the MCEE-MS or MCEMANU-ME program or permission of instructor.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

MCEE-602 Semiconductor Process Integration (3 Credits)
This is an advanced level course in Integrated Circuit Devices and process technology. A detailed study of processing modules in modern semiconductor fabrication sequences will be done through simulation. Device engineering challenges such as shallow-junction formation, fin FETs, ultra-thin gate dielectrics, and replacement metal gates are covered. Particular emphasis will be placed on non-equilibrium effects. Silvaco Athena and Atlas will be used extensively for process simulation. Graduate paper required.
Prerequisites: MCEE-601 or equivalent course.
Contact Hours: Laboratory 2, Lecture 3
Typically Offered: Spring

MCEE-603 Thin Films (3 Credits)
This course focuses on the deposition and etching of thin films of conductive and insulating materials for IC fabrication. A thorough overview of vacuum technology is presented to familiarize the student with the challenges of creating and operating in a controlled environment. Physical and Chemical Vapor Deposition (PVD & CVD) are discussed as methods of film deposition. Plasma etching and Chemical Mechanical Planarization (CMP) are studied as methods for selective removal of materials. Applications of these fundamental thin film processes to IC manufacturing are presented. Graduate paper required.
Prerequisites: Graduate standing in the MCEE-MS or MCEMANU-ME program or permission of instructor.
Contact Hours: Laboratory 3, Lecture 2
It may be used to fulfill one of the following: Writing Intensive: Program
Typically Offered: Fall

MCEE-605 Lithography Materials and Processes (3 Credits)
Microlithography Materials and Processes covers the chemical aspects of microlithography and resist processes. Fundamentals of polymer technology will be addressed and the chemistry of various resist platforms including novolac, styrene, and acrylate systems will be covered. Double patterning materials will also be studied. Topics include the principles of photoresist materials, including polymer synthesis, photochemistry, processing technologies and methods of process optimization. Also advanced lithographic techniques and materials, including multi-layer techniques for BARC, double patterning, TARC, and next generation materials and processes are applied to optical lithography. Graduate paper required.
Prerequisites: Graduate standing in the MCEE-MS or MCEMANU-ME program or permission of instructor.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall, Spring

MCEE-615 Nanolithography Systems (3 Credits)
An advanced course covering the physical aspects of micro- and nano-lithography. Image formation in projection and proximity systems are studied. Makes use of optical concepts as applied to lithographic systems. Fresnel diffraction, Fraunhofer diffraction, and Fourier optics are utilized to understand diffraction-limited imaging processes and optimization. Topics include illumination, lens parameters, image assessment, resolution, phase-shift masking, and resist interactions as well as non-optical systems such as EUV, maskless, e-beam, and nanoimprint. Lithographic systems are designed and optimized through use of modeling and simulation packages. Graduate paper required.
Prerequisites: MCEE-605 or equivalent course.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall, Spring

MCEE-620 Photovoltaic Science and Engineering (3 Credits)
This course focuses on the principle and engineering fundamentals of photovoltaic (PV) energy conversion. The course covers modern silicon PV devices, including the basic physics, ideal and non-ideal models, device parameters and design, and device fabrication. The course discusses crystalline, multi-crystalline, amorphous thin films solar cells and their manufacturing. Students will become familiar with basic semiconductor processes and how they are employed in solar cells manufacturing. The course further introduces third generation advanced photovoltaic concepts including compound semiconductors, spectral conversion, and organic and polymeric devices. PV applications, environmental, sustainability and economic issues will also be discussed. Evaluations include assignments and exams, a research/term paper on a current PV topic.
This course requires permission of the Instructor to enroll.
Contact Hours: Lecture 3
Typically Offered: Spring

MCEE-699 Graduate Co-op (0 Credits)
Up to six months of full-time, paid employment in the microelectronic engineering field. See the graduate program coordinator or RIT's Office of Cooperative Education for further details.
Typically Offered: Fall, Spring, Summer

MCEE-704 Physical Modeling of Semiconductor Devices (3 Credits)
A senior or graduate level course on the application of simulation tools for physical design and verification of the operation of semiconductor devices. The goal of the course is to provide a more in-depth understanding of device physics through the use of simulation tools. Technology CAD tools include Silvaco (Athena/Atlas) for device simulation. The lecture will explore the various models that are used for device simulation, emphasizing the importance of complex interactions and 2-D effects as devices are scaled deep-submicron. Laboratory work involves the simulation of various device structures. Investigations will explore how changes in the device structure can influence device operation.
This course requires permission of the Instructor to enroll.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Fall

MCEE-706 SiGe and SOI Devices and Technologies (3 Credits)
This course introduces students to the fundamentals of III-V, SiGe and Silicon on Insulator (SOI) devices and fabrication technologies. The course will first discuss the band structure of the SiGe material system, and how its properties of band structure and enhanced mobility may be utilized to improve traditional Si devices. Basic heterojunciton theory is introduced to students. Some specific applications that are introduced include heterojunction bipolar transistors (HBTs), SiGe-channel MOS devices, high-electron mobility transistors (HEMTs) and tunnel FETs. Fabrication technologies for realizing SOI substrates that include SIMOX and SMART CUT technologies are described. The physics of transistors built on SOI substrates will be discussed. At the completion of the course, students will write a review paper on a topic related to the course.
This course requires permission of the Instructor to enroll.
Contact Hours: Lecture 3
Typically Offered: Spring

MCEE-713 Quantum and Solid-State Physics for Nanostructures (3 Credits)
This course describes the key elements of quantum mechanics and solid state physics that are necessary in understanding the modern semiconductor devices. Quantum mechanical topics include solution of Schrodinger equation solution for potential wells and barriers, subsequently applied to tunneling and carrier confinement. Solid state topics include electronic structure of atoms, crystal structures, direct and reciprocal lattices. Detailed discussion is devoted to energy band theory, effective mass theory, energy-momentum relations in direct and indirect band gap semiconductors, intrinsic and extrinsic semiconductors, statistical physics applied to carriers in semiconductors, scattering and generation and recombination processes.
Prerequisites: Graduate standing in the MCEE-MS or MCEMANU-ME program or permission of instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MCEE-717 Memory Systems (3 Credits)
This course targets the overlapping areas of device physics, VLSI Design, advanced processes, electrical characterization and circuit architecture as it applies to modern memory systems. While there are no specific set of pre-requisite courses, students should be willing to work on problems involving the previously mentioned topics. Course work will trace the design, development, fabrication, packaging and testing of SRAM, DRAM and Flash Memory, and then branch off into MRAM, FRAM and PRAM technology. The course wraps up with an exploration of future memory system candidates such as quantum, molecular and optical memory systems. Students will write a term paper on an aspect of memory systems of particular interest to them (proposed topic must still be approved by the instructor).
Prerequisites: Graduate standing in the MCEE-MS or MCEMANU-ME program or permission of instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MCEE-730 Metrology for Failure Analysis and Yield of ICs (3 Credits)
Successful IC manufacturing must detect defects (the non-idealities) that occur in a process), eliminate those defects that preclude functional devices (yield enhancement), and functionality for up to ten years of use in the field (reliability). Course surveys current CMOS manufacturing to compile a list of critical parameters and steps to monitor during manufacturing. This survey is followed with an in depth look at the theory and instrumentation of the tools utilized to monitor these parameters. Tool set includes optical instrumentation, electron microscopy, surface analysis techniques, and electrical measurements. Case studies from industry and prior students are reviewed. Students are required to perform a project either exploring a technique not covered in class, or to apply their course knowledge to a practical problem.
Prerequisites: MCEE-201 or MCEE-360 or graduate student standing in the MCEE-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

MCEE-732 Microelectronics Manufacturing (3 Credits)
This course focuses on CMOS manufacturing. Topics include CMOS process technology, work in progress tracking, CMOS calculations, process technology, long channel and short channel MOSFET, isolation technologies, back-end processing and packaging. Associated is a lab for on-campus section (01) and a graduate paper/case study for distance learning section (90). The laboratory for this course is the student-run factory. Topics include Lot tracking, query processing, data collection, lot history, cycle time, turns, CPK and statistical process control, measuring factory performance, factory modeling and scheduling, cycle time management, cost of ownership, defect reduction and yield enhancement, reliability, process modeling and RIT's advanced CMOS process. Silicon wafers are processed through an entire CMOS process and tested. Students design unit processes and integrate them into a complete process. Students evaluate the process steps with calculations, simulations and lot history, and test completed devices.
Prerequisites: MCEE-601 or equivalent course.
Contact Hours: Lecture 8
Typically Offered: Spring

MCEE-770 Microelectromechanical Systems (3 Credits)
This course will provide an opportunity for the student to become familiar with the design, fabrication technology and applications of Microelectromechanical systems. This is one of the fastest growing areas in the semiconductor business. Today's MEMS devices include accelerometers, pressure sensors, flow sensors, chemical sensors, energy harvesting and more. These devices have wide variety of applications including automotive, consumer, military, scientific, and biomedical. Students will select a MEMS device/project to be made and then design, fabricate, test, prepare a project presentation and final paper. This course is restricted to graduate students in the EEEE-MS or MCEE-MS programs.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

MCEE-777 Master of Engineering Internship (1-4 Credits)
This course number is used to fulfill the internship requirement for the master of engineering degree program. The student must obtain the approval of the department head before registering for this course.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MCEE-789 Special Topics (1-3 Credits)
This is a variable credit, variable special topics course that can be in the form of a course that is not offered on a regular basis.
This course requires permission of the Instructor to enroll.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MCEE-790 MS Thesis (1-6 Credits)
The master's thesis in microelectronic engineering requires the student to prepare a written thesis proposal for approval by the faculty; select a thesis topic, adviser and committee; present and defend thesis before a thesis committee; prepare a written paper in a short format suitable for submission for publication in a journal.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring

MCEE-792 Graduate Research Project (3 Credits)
This course number is used to fulfill the graduate project requirement under the non-thesis option for the MS degree in Microelectronic Engineering. During this course, the student will be required to perform a literature survey, and conduct a limited scope investigation. Appropriate topics for this project may include: (i) development/characterization/documentation of semiconductor fabrication processes, (ii) characterization/measurement/documentation of semiconductor devices, or (iii) detailed simulation/design/documentation of semiconductor devices or processes. Alternative topics may be pursued with approval of the faculty advisor. The student must obtain the approval of an appropriate faculty member to supervise the paper before registering for this course.
This course is restricted to MCEE-MS Major students.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

MCEE-795 Graduate Seminar (0 Credits)
Weekly seminar series intended to present the state of the art in microelectronics research. Other research-related topics will be presented such as library search techniques, contemporary issues, ethics, patent considerations, small business opportunities, technical writing, technical reviews, effective presentations, etc.
Prerequisites: Graduate standing in the MCEE-MS or MCEMANU-ME program or permission of instructor.
Contact Hours: Seminar 1
Typically Offered: Fall

MCEE-799 Graduate Independent Study (1-3 Credits)
This course number should be used by students who plan to study a topic on an independent basis under the guidance of a faculty member. A written proposal with an independent study form is to be submitted to the sponsoring faculty member and approved by the department head prior to the commencement of work.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Microsystems Engineering (MCSE)

MCSE-610 Applied Biofluid Mechanics and Microcirculation (3 Credits)
This is a one-semester introductory graduate course that introduces and develops fundamental understanding of the flow dynamics of blood. The course includes a discussion of basic fluid mechanics, blood rheology, and biological regulation of blood flow. Emphasis will be placed on developing a physical understanding of each of the fundamental ideas and how it is applied to microcirculation and cutting-edge biomedical research. Applications of state-of-art micro/nanotechnologies such as microfluidics in the study of microcirculation, tissue engineering, and blood diagnostic will be also discussed in the class. The course is also open to undergraduate students who have taken courses in fluid dynamics, e.g., MECE (210)-Fluid Mechanics I, BIME (320)- Fluid Mechanics or equivalent, and are interested in blood flow and related biomedical engineering technologies.
Contact Hours: Lecture 3
Typically Offered: Fall

MCSE-702 Introduction to Nanotechnology and Microsystems (3 Credits)
This course will introduce first year Microsystems Engineering students to microsystems and nanotechnology. Topics include, micro and nano systems; MEMS, bioMEMS, MOEMS, and NEMS; nanomaterials; nanopatterning; characterization and analytical techniques; self-assembly approaches; nanoelectronics and nanophotonics; nanomagnetics; organic electronics; and microfluidics. The course will be taught by faculty in the individual fields of nanotechnology and microsystems.
This course is restricted to students in the MCSE-PHD program or those with permission of instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

MCSE-703 Material Science for Microsystems Engineering (3 Credits)
The intent of this course is to provide a comprehensive review of the fundamental concepts of materials science and engineering with applications to nano- and microsystems. Topics include crystallography, diffusion, phase diagrams, fluids, and thermal, elastic, electrical, optical and magnetic properties. This course provides students in the engineering or science fields of nano- and microsystems with the background for future coursework and research in materials engineering and applications.
This course is restricted to students in the MCSE-PHD program or those with permission of instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

MCSE-705 Epitaxial Crystal Growth and Thin Film Science (3 Credits)
This graduate course focuses on the epitaxial crystal growth and thin film science widely applicable in the electronics and semiconductor industry. This course provides a combination of fundamental and practical knowledge regarding deposition and characterization of metallic and semiconductor thin film materials. Topics include, but are not limited to, thermodynamics of thin film deposition, crystal structures and defects in thin films, the basic nucleation and growth mechanisms of thin films (growth models, lattice matching epitaxy and domain matching epitaxy), thin film processing techniques (physics vapor deposition, chemical vapor deposition, vapor phase epitaxy, molecular beam epitaxy, pulsed laser deposition), thin film growth instrumentation (energy source, chamber configurations, vacuum systems and growth controllers), and several advanced topics related to defect and dislocation control during the growth of thin films for electrical and optical devices.
Contact Hours: Lecture 3
Typically Offered: Spring

MCSE-707 Advanced Nanomaterials Characterization Methods (3 Credits)
This course provides a comprehensive overview of theoretical principles, instrumentation, applications, and practical concepts related to advanced techniques for characterization of nanoscale materials and systems. Topics include: diffraction theory, low-energy and reflection high-energy electron diffraction, X-ray diffraction, X-ray reflectivity; analytical scanning electron microscopy techniques including electron beam-induced current, energy-/wavelength-dispersive X-ray spectrometry, and electron backscatter diffraction; analytical transmission electron microscopy techniques including selected-area and convergent-beam electron diffraction, electron energy-loss spectroscopy, energy-filtered imaging, and electron holography; focused ion beam-based characterization and patterning; spectroscopic techniques including photo-, electro-, and cathodo-luminescence spectroscopy, Raman spectroscopy, and Auger electron spectroscopy; scan probe microscopy techniques including atomic force, magnetic force, photo-induced force, Kelvin probe force, scanning tunneling, scanning near-field optical, and scanning microwave impedance microscopy; and ion beam techniques including secondary ion mass spectrometry and local electrode atom probe tomography. The above techniques will be explored with the aid of case studies from the current literature. Lecture content will be reinforced by active demonstrations conducted in various labs at RIT and University of Rochester.
Prerequisite: MCSE-703 and MTSE-601 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

MCSE-712 Nonlinear Optics (3 Credits)
This course introduces nonlinear concepts applied to the field of optics. Students learn how materials respond to high intensity electric fields and how the materials response: enables the generation of other frequencies, can focus light to the point of breakdown or create waves that do not disperse in time or space solitons, and how atoms can be cooled to absolute zero using a(laser. Students will be exposed to many applications of nonlinear concepts and to some current research subjects, especially at the nanoscale. Students will also observe several nonlinear-optical experiments in a state-of-the-art photonics laboratory.
Prerequisites: EEEE-374 or equivalent course or graduate student standing in the MCSE-PHD program.
Contact Hours: Lecture 3
Typically Offered: Spring

MCSE-713 Lasers (3 Credits)
This course introduces students to the design, operation and (applications of lasers (Light Amplification by Stimulated Emission of (Radiation). Topics: Ray tracing, Gaussian beams, Optical cavities, (Atomic radiation, Laser oscillation and amplification, Mode locking and Q switching, and Applications of lasers.
Prerequisites: EEEE-374 or equivalent course or graduate student standing in the MCSE-PHD program.
Contact Hours: Lecture 3
Typically Offered: Fall

MCSE-714 Quantum Mechanics for Engineers (3 Credits)
This course will give students comprehensive understanding of the foundations of quantum mechanics. The course will also provide practical solution techniques which can be applied to a variety of nanoscale problems. Topics include: Waves and Schrodinger's equation; Time-dependent Schrodinger equation; Operator approach to quantum mechanics; Dirac Notation; Solution approaches and approximation methods; Time-dependent perturbation theory with applications to absorption and Fermi's golden rule; Angular momentum and the Hydrogen Atom; If time allows: Spin; Identical Particles.
Prerequisites: EEEE-353 and MATH-231 or equivalent courses or graduate student standing in the MCSE-PHD program.
Contact Hours: Lecture 3
Typically Offered: Fall

MCSE-715 Photonic Integrated Circuits (3 Credits)
This course focuses on photonic integrated circuits (PICs) - an emerging technology where photonic chips (consisting of waveguides, lasers, detectors, modulators and more) are manufactured using integrated circuit technology and closely integrated with microelectronics. The circuits are finding applications in high performance communication, computing and sensing systems. The technology is rapidly growing in complexity and demand, and as the advantages of using photons are realized and the manufacturing hurdles are overcome, photonic circuits will become ubiquitous in future microsystems. Course topics include, fundamental concepts (waveguides, interference, light-matter interaction), PIC component modeling, schematic and layout driven design, PIC fabrication techniques, and PIC testing to round out the students understanding of integrated photonics.
Prerequisite: EEEE-374 or MCEE-320 or equivalent course or graduate standing in MCSE-PHD or ENGR-PHD or EEEE-MS or CMPE-MS or MCEE-MS.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring

MCSE-731 Integrated Optical Devices & Systems (3 Credits)
This course discusses basic goals, principles and techniques of integrated optical devices and systems, and explains how the various optoelectronic devices of an integrated optical system operate and how they are integrated into a system. Emphasis in this course will be on planar passive optical devices. Topics include optical waveguides, optical couplers, micro-optical resonators, surface plasmons, photonic crystals, modulators, design tools and fabrication techniques, and the applications of optical integrated circuits. Some of the current state-of-the-art devices and systems will be investigated by reference to journal articles.
Contact Hours: Lecture 3
Typically Offered: Fall

MCSE-771 Optoelectronics (3 Credits)
To provide an introduction to the operating principles of optoelectronic devices used in various current and future information processing and transmission systems. Emphasis in this course will be on the active optoelectronic devices used in optical fiber communication systems. Topics include pulse propagation in dispersive media, polarization devices, optical fiber, quantum states of light, fundamental of lasers, semiconductor optics, light-emitting diodes, laser diodes, semiconductor photon detectors, optical modulators, quantum wells, and optical fiber communication systems.
Prerequisite: This class is restricted to degree-seeking graduate students, 4th or 5th year status or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

MCSE-795 Microsystems Ph.D. Seminar (1 Credit)
In this seminar course students will present their latest research and learn about the research taking place in the program. All Microsystems Ph.D. students enrolled full time are required to attend each semester they are on campus.
This course is restricted to students in the MCSE-PHD program or those with permission of instructor.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

MCSE-799 Independent Study (1-3 Credits)
This course allows graduate students an opportunity to independently investigate, under faculty supervision, topics related to microsystems engineering. Proposals for independent study activities and assessment are subject to approval by both the supervising faculty member and the department head.
Typically Offered: Fall, Spring, Summer

MCSE-877 Internship (0 Credits)
Internship is designed to enhance the educational experience of PhD students through full-time employment.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Spring

MCSE-889 Special Topics (3 Credits)
Topics and subject areas that are not regularly offered are provided under this course. Such courses are offered in a normal format; that is, regularly scheduled class sessions with an instructor.
This course is restricted to students in the MCSE-PHD program or those with permission of instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

MCSE-890 MCSE-Dissertation (1-27 Credits)
Research in an appropriate topic as arranged by doctoral candidate and dissertation adviser in fulfillment of the dissertation requirement.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

MCSE-892 Graduate Research (1-8 Credits)
Doctoral-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor. Students may count a maximum of 9 credits towards degree requirements. If the student enrolls cumulatively in more than 9 credits, the additional credits above 9 will not be counted towards the degree.
Contact Hours: Research 40
Typically Offered: Fall, Spring, Summer

Networking, Security & Systems Administration (NSSA)

NSSA-602 Enterprise Computing (3 Credits)
This course explores enterprise systems (clouds, server farms, mainframes, and clusters/grids) from the environment, networking, storage, security, and system administration perspectives. Students in this course gain an understanding of the knowledge and concepts needed to manage, perform research in, and administrate those architectures.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

NSSA-605 Principles of System Admin (3 Credits)
Students are introduced to fundamental system administration topics and technologies that serve as the basis for later course work in system administration. Topics covered include: ethics and system administration, the law and system administration, and the role of the system administrator in organizations. Technologies covered include: computing resource management, the TCP/IP protocol suite, the Domain Name Service (DNS), the Dynamic Host Configuration Protocol (DHCP), and web services hosting.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

NSSA-606 Wired and Wireless Networking (3 Credits)
This course is a bridge course focused on an introduction to wired and wireless network infrastructures, topologies, technologies and protocols required for effective end-to-end communication. Basic security concepts are also introduced at the local area network communication level. Networking layers 1, 2 and 3 are examined in-depth using the International Standards Organization's Open Systems Interconnection and TCP/IP models. Topics focus on the TCP/IP protocol suite, the Ethernet LAN protocol, IEEE 802.11 Wireless LAN protocol, and routed and routing protocols common in local area networks. Labs will cover the various aspects of communication, management and security on equipment found in industry.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall, Spring

NSSA-607 Network Systems and Services (3 Credits)
This course will introduce students to LAN and routed network infrastructures, topologies, technologies and protocols required for effective end-to-end communication. Using the Open Systems Interconnection model as defined by the International Organization of Standards and the TCP/IP model as a guide, network functionality at layers 1, 2, 3, and 4 are examined in-depth. This includes the IEEE 802.3 Ethernet LAN protocol, routed and routing protocols common data networks, the TCP/IP Version 4 and Version 6 protocol suite, as well as network services such as DHCP, DNS, and SSH. The conceptual and theoretical content of the course will be reinforced through hands-on or simulated lab exercises that will include deployment in both Linux and Windows internetworking environments. Construction of virtual networks, observation and analysis of the implemented data communications protocols, and basic security techniques will be included. Students completing this course will have a strong understanding of the TCP/IP protocol suite and experience in administering, monitoring, securing and troubleshooting an internetwork of TCP/IP based systems.
Contact Hours: Lecture/Lab 4
Typically Offered: Fall, Spring

NSSA-610 Advanced Wired Networking Concepts (3 Credits)
This course covers advanced networking technologies available to enterprises. Protocol options and their evolutions over the years, the growth in complexity and its impacts are explored in depth. Topics include: VLANs and VLAN Hierarchies, Loop- Avoidance in customer, provider and provider backbone networks such as RSTP and Shortest Path Bridging, IPv4 and IPv6 coexistence issues, Routing protocols with IPv4 and IPv6 for inter and intra-AS routing, MobileIP, queuing and Quality of service routing and congestion control in the Internet, MultiProtocol Label Switching, Routing and Switching in wireless networks
Prerequisite: NSSA-606 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

NSSA-611 Advanced Topics in Wireless Networks and Technologies (3 Credits)
The course is designed to provide comprehensive exposition to the challenges faced in wireless networks and technologies in the different protocol layers. Leading work conducted to address the challenges faced in the new techniques such as cross layered and integrated approaches will be covered. From the challenges perspective, case studies based on several upcoming wireless technologies and networks will be presented. In most cases, the standards efforts follow the deployment, which lags the research effort. Some of the standardization efforts and their impacts in industry deployment and the effect of research on standardization will be covered. This study will be based on case studies. Students will need one statistics course to be successful in this class.
This course is restricted to NETSYS-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

NSSA-612 Network Modeling and Analysis (3 Credits)
The course provides comprehensive exposition of the core concepts in network modeling and simulation. It will cover both graph theoretical and statistical models of complex networks such as the Internet and social networks. It also introduces different types of modeling techniques and simulation tools. The course also systematically addresses some practical and theoretical considerations for developing complex modeling. It offers real world examples to illustrate the process of modeling to address specific problems.
Prerequisites: NSSA-606 and DECS-782 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

NSSA-613 Wireless Access and IoT Technologies (3 Credits)
The networking industry has experienced phenomenal changes in the areas of wireless access networks, including the Internet of Things (IoT) that leverages sensors, wireless communication, mobile devices, networking and cloud technologies to provide intelligent services for energy management, logistics, retail, agriculture and many other domains. This course explores the various types of wireless access networks, including related applications, architecture, technologies, and performance topologies. Additionally, students will learn about IoT protocols, platforms, physical devices and security. Both wireless access networks and IoT will be explored through a series of lab assignments either hands-on or simulated and a course project.
Prerequisites: NSSA-607 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

NSSA-615 Advanced OOP for Networking and Systems Admins (3 Credits)
This is a course in Object Oriented Programming. Students must have completed one year of OO programming prerequisite, as the course will presume that level of knowledge and will build from there. Multiple languages will be studied in this course. The languages chosen will have direct and immediate applicability to the field of Networking and Systems Administration program and will be chosen for their use in the topic areas of that degree program. Students will be quickly led through the primitive types and control structures of each language and immersed in significant projects using advanced language features. Note: Student must have one year of programming in an object oriented programming language.
Prerequisite: ISTE-200 or equivalent course.
Contact Hours: Lecture/Lab 4
Typically Offered: Fall, Spring

NSSA-616 Task Automation Techniques (3 Credits)
In this course, students will use programming and scripting techniques to automate tasks and solve problems. The course will explore scripting concepts including but not limited to process substitution, list constructs, functions, and arrays. The student will explore the techniques and methods used to analyze and address network and system problems by writing complex scripts and programs. The scripts will be used to analyze network traces, configure routers and switches, monitor network activity, troubleshoot problems, implement security processes, and address other operational requirements. Requires at least one year programming experience.
Contact Hours: Lecture 4
Typically Offered: Fall, Spring

NSSA-620 Emerging Computing and Networking Technologies (3 Credits)
Computer networking and computer system technologies have dramatically changed the way that businesses operate and how they accomplish their organizational goals. Most of the current technologies used today have their roots in the early days of the internet and computing. The changes that have occurred since then have been largely at the margins, rather than developed in a wholesale fashion. As our discipline moves forward there are a substantial number of emerging technologies in development to address the inadequacies of the currently deployed technologies. If widely adopted, these technologies will change how technologies support organizations and individuals creating a whole new paradigm for computing, networking, and the security of our computing environment. Students will be researching the current state of several of the most significant emerging technologies. The course will consist of a combination of lectures where technologies will be presented and explained; independent labs, modeling and simulation exercises that will reinforce the students' understanding of the technologies by allowing them to work with them in a hands-on fashion; and independent literature research do serve as a foundation for future work in this degree program.
Prerequisite: NSSA-606 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

NSSA-621 Design and Deployment of Wireless Networks (3 Credits)
This course will take students through large scale wireless systems. It will also cover the significant access wireless networks. Important areas of concern will be contemporary and emerging Wireless Local Area Network (WLAN) standards, cellular communication and other forms of wireless access such as wireless INTERNET service provision. Focal points for these areas will be protocol operation, network architecture, and security issues and solutions.
Prerequisites: NSSA-606 and DECS-782 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

NSSA-622 Carrier Networking (3 Credits)
This course is primarily concerned with the issues associated with carrier networks in the WAN. Major protocols such as BGP, MPLS, T carriers, Metro Ethernet and SONET will form the backbone of the content. In addition to protocol architecture and operation, the course will also examine the integrated nature of these protocols as they support contemporary communication applications.
This course is restricted to NETSYS-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

NSSA-710 Network Management (3 Credits)
This course provides an introduction to network management concepts with hands-on laboratory sessions in developing network management applications and using it to study and analyze the performance of networks, data communications hardware and software, and use of these components in computer networks. Topics include but are not limited to introduction to network management concepts, the five basic network management functions namely fault management, configuration management, performance management, accounting management and security management, introduction to Simple Network Management Protocol (SNMP) and its versions, Remote monitoring and different network management architectures.
Prerequisite: NSSA-606 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

NSSA-711 Advanced Routing Protocols (3 Credits)
Managing complex network environments requires an understanding of the sophisticated routing protocols necessary for controlling information flow. This course will examine the routing protocols in standard use and their application in typical enterprise and large internet service provider (ISP) environments. The advantages and disadvantages of each protocol will be investigated. In addition, emerging wired and wireless routing protocols will also be discussed. Knowledge of networking, systems, and security technologies is necessary.
This course is restricted to NETSYS-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

NSSA-712 Advanced Storage Technologies (3 Credits)
Data storage is an integral and essential component of every computer system and controlling access to storage resources is the basis for many security efforts. This course explores the spectrum of storage technologies and file and record management systems ranging from Direct Access Storage to Storage Area Networks (SAN) and cloud based object and record storage. We will also explore the impact of software defined storage on organization's storage plans and implementation strategies. All storage systems present an abstracted version of the data blocks that reside on spinning disks and SSD cards. In this course we will look at the ways that abstraction can be used to create storage systems that meet the needs of modern organizations for resilient large scale storage systems.
Prerequisite: NSSA-605 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

NSSA-713 Enterprise Service Provisioning (3 Credits)
The distributed architectures used to support the highly variable workloads typical of web scale applications can only be maintained by converting configuration of those architectures to software. This course will explore some of the architectures, technologies and theories of service provision used to support software defined infrastructure and modern web scale applications. Some of the technologies discussed include containers, content versioning systems, and software testing as applied to configuration management and security as reflected in more reliable availability. The course will also include a discussion of promise theory and its application to large scale architectures. The course is a combination of hands-on labs and lectures.
Prerequisites: NSSA-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

NSSA-714 Advanced Large-Scale Computing (3 Credits)
Large organizations are dependent on the availability and reliability of computing services. The provisioning challenge is to cost-effectively manage the deployment of different kinds of software services in enterprise scale environments. This course explores systems architectures and deployment strategies for large-scale systems. Technologies discussed include public and private clouds, hybrid architectures, service oriented architectures, configuration management, virtualization, service discovery, load balancing, and system elasticity. The course is a combination of hands-on labs and lectures.
Prerequisite: NSSA-605 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

NSSA-715 Network Design and Performance (3 Credits)
This course will examine the design and performance of networks based on the top down approach. Students will learn to design networks based on identified business needs through a phased approach starting with requirements gathering and analysis, technical goals study, logical design, physical design followed by simulating the network and assessing the performance and optimizing the design. The designs include site, campus, and enterprise networks. Wide Area Network (WAN) technologies will be combined with Local Area Network (LAN) technologies in the design of enterprise networks. Students will learn to assess the business goals and their application to the network goals. Given the serious security threat faced in networks today, this course will provide a modular approach to designing security strategies for the network ground up in the design. The significance of network management to a design of a secure and manageable network will be discussed.
Prerequisites: NSSA-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

NSSA-716 Enterprise Mobile Computing (3 Credits)
This course will cover technologies for web-based mobile cloud computing especially for business solutions. The course covers enterprise mobile computing architecture, emerging mobile computing technologies, operating system, and security. Also, the course discusses different applications of mobile computing in mobile ad hoc and sensor networks.
Prerequisites: NSSA-605 and NSSA-606 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

NSSA-720 Virtual Systems Architecture and Deployment (3 Credits)
This class will take the students through the evolution of virtualization including various host-based virtualization, bare metal hypervisors and server virtualization. Elements of software defined networking and cloud computing will also be discussed. This course also explores the architectures and operational techniques that support the operation of web scale applications including service oriented architectures, micro-service architectures and hybrid public/private cloud architectures. The course also deals with modern storage architectures as they support web scale applications.
Prerequisite: NSSA-605 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

NSSA-789 GraduateSeminarInNetworkingandSystemAdministration (3 Credits)
This IST seminar course provides an opportunity for special one-time offerings of graduate topics or allows faculty to pilot possible new graduate offerings. Specific course details (such as the course topics, format, resource needs, and credit hours) will be determined by the faculty member(s) who propose a given seminar offering.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

NSSA-790 MS Thesis (1-6 Credits)
This course is a capstone course in the MS in computing decurity program. It offers students the opportunity to investigate a selected topic and make an original contribution which extends knowledge within the computing security domain. As part of their original work students will write and submit for publication an article to a peer reviewed journal or conference. Students must submit an acceptable proposal to a thesis committee (chair, reader, and observer) before they may be registered by the department for the MS Thesis. Students must defend their work in an open thesis defense and complete a written report of their work before a pass/fail grade is awarded.
Contact Hours: Thesis 6
Typically Offered: Fall, Spring, Summer

NSSA-791 MS NSSA Project (1-4 Credits)
This course is a capstone course in the MS NSA and MS IAF (Information Assurance and Forensics) programs. It offers students the opportunity to investigate a selected topic within the NSSA domain. The student will do this using and an applied laboratory approach. Students must submit an acceptable proposal to a project committee (chair, and reader) before they may be registered by the department for the MS NSSA Project. Students must defend their work in an open project defense and complete a written report of their work before a letter grade is awarded.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

NSSA-900 Continuation of Thesis (0 Credits)
Typically Offered: Fall, Spring, Summer

NSSA-901 Continuation of Project (0 Credits)
Typically Offered: Fall, Spring, Summer

NSSA-909 Proposal Development (0 Credits)
This course is part of a capstone experience for graduate students who are beginning the capstone experience. Students will submit an accepted proposal as a prerequisite for the formal thesis. (Permission of the graduate advisor.)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

NTID MS in Secondary Education (MSSE)

MSSE-700 History of Deaf Educational Thought and Practice (3 Credits)
A historical analysis of change and continuity in educational history from colonial through contemporary America. Special emphasis will be given to the development of the field of Deaf education in the United States. Lectures, seminar discussions, and readings offer comprehensive coverage of the salient intellectual themes.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-701 Psychology and Human Development (3 Credits)
The purpose of this course is to examine the psychological and social development of deaf and hard-of-hearing students in childhood and adolescence. The ways that family, school, and community affect the student's development, including effects on cognitive processes, identity formation, and peer relationships, are considered. Psychological and sociological perspectives on students' experience in general are used to provide a framework for understanding the development of deaf and hard-of-hearing students. Educational implications of the theories and research presented are discussed.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-702 Educational and Cultural Diversity (3 Credits)
This course focuses upon knowledge and understanding of existing diversities within the Deaf and Hard-of-Hearing communities, and ways in which teaching can most effectively meet the needs and interests of these students for effective learning. Readings and discussions will explore the educational needs of Deaf and Hard-of-Hearing students with variations of experience related to culture, race/ethnicity, language, educational and socio-economic backgrounds and settings, communication skills, and learning styles. These concepts will be applied to effective teaching and curriculum development.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-703 Special Education in the Social Context (3 Credits)
This course takes a sociological approach to disability and the historical foundations of special education. Three models of disability are introduced: medical, social, and political. These three models provide a foundation for the course, and guide study of three major aspects of disability and special education. First, the class will explore how each of these models has historically guided and, in some cases, continues to guide services and social institutions for persons with disabilities, including educational and rehabilitation services. Second, the course will examine the process through which people with disabilities are so labeled and the interaction between these individuals and others (family, peers, school, community). Third, the course will analyze the changing role of the human service professional (including teachers) and the ways in which professional preparation programs reflect the various models of disability. The course will draw heavily on a variety of philosophical, theoretical, conceptual and methodological perspectives, including phenomenology, symbolic interaction, and human ecology.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-704 Teaching Deaf and Hard of Hearing Learners with Special Educational Needs (3 Credits)
This course focuses on providing students with basic information regarding the needs of deaf and hard of hearing learners with special educational needs, including (1) developmental disability, (2) emotional or behavioral disorder (3) learning disability, attention deficit disorder or attention deficit hyperactivity disorder, or (4) visual impairment. Topics include incidence, identification, assessment, teaching strategies, and working with parents. The goal is to enable students to see students in a holistic fashion, and thus will include the perspectives of parents, teachers and deaf and hard of hearing learners with special educational needs. Learning strategies may include site visits, presentations, films, and interactive workshop style classes offered by experienced teachers, psychologists, counselors, disability advocates, and parents of learners with special educational needs. The course will regularly incorporate guest lecturers who have specialized expertise in teaching or research in one or more of the topic areas covered in the course.
Prerequisites: MSSE-703 or equivalent course and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

MSSE-710 General Instructional Methods (3 Credits)
This introductory course provides an overview of the current theories of assessment, curriculum, instruction, and learning across diverse educational settings in the field of deaf education. The course covers the use of educational technologies to enhance the learning experiences of deaf students and options for classroom management, learning environment appropriate to K-12 classrooms, and methods for assessment. Reflection and application of effective instructional practices are demonstrated through microteaching and field-based experiences. To progress to MSSE-714 Practicum, student must obtain a grade of at least B in this course.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-712 Practicum (2 Credits)
As required by the New York State Education Department, each MSSE student is required to complete 100 hours of practicum experience during their first year in the program. This practicum experience provides students with opportunities to observe and reflect on their content, professional, pedagogical knowledge, skills and disposition in classroom settings at both schools for the deaf and mainstreamed programs. There will also be course-related observations. Students will also be required to attend selected Deaf culture events. After completion of all of the required observations, the students are required to submit a practicum experience portfolio. Guidelines will be provided to the student. The practicum experience must be completed with a grade of least a B before the first student teaching assignment.
Prerequisites: MSSE-710 or equivalent course with a minimum grade of B and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 2
Typically Offered: Spring

MSSE-713 Assessment Principles and Practices (3 Credits)
This course addresses assessment as educational decision-making, involving the selection and interpretation of assessment tools as applied to classroom-based student learning. The course focuses on students who are deaf and hard of hearing; including students with diverse learning needs. Assessment and educational planning for students are discussed as part of a cooperative model, including the relevant stakeholders in the decision-making process. This course also addresses the development and interpretation of both formative and summative assessment strategies in light of acceptable criteria of validity and reliability, and the absence of assessment bias. Criteria for evaluating the appropriateness of standardized tests, with emphasis on deaf and hard-of-hearing students, are discussed and practiced. Collection and interpretation of assessment information are applied to the development and revision of Individualized Education Plans (IEPs).
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

MSSE-714 Curriculum Content and Methods of Instruction (3 Credits)
Note: There are five discipline-specific courses here, designated by section: 01 (English), 02 (Mathematics), 03 (Science), 04 (Social Studies) and 05 (American Sign Language). Students will take only the section focusing on the content area in which they will be certified. Section 01 English. This course examines issues and methods related to teaching English in the secondary level to students who are Deaf or Hard-of-Hearing. Students investigate and analyze current approaches to curriculum, instruction and materials in the area of English instruction through readings, observations, and seminars. Students design content area projects to demonstrate a variety of methodological philosophies. Section 02 Mathematics. This course examines issues and methods related to teaching mathematics at the secondary level to students who are Deaf or Hard-of-Hearing. Current instructional methods, curriculum and professional resources in mathematics are studied through seminars, readings, special projects, observations and work with content-area specialists and teachers in secondary-level mathematics courses. Section 03 Science. This course examines issues and methods in teaching secondary-level science to Deaf or Hard-of-Hearing students, including the selection, modifications, and use of curriculum materials in science. Discussions will be concerned with instructional strategies, classroom managements, cognitive development, testing and evaluation, lab report writing and theories of science teaching. Students will be required to observe teachers in secondary level science courses. Section 04 Social Studies. This course examines issues and methods related to teaching social studies at the secondary level to students who are Deaf or Hard-of-Hearing. Through seminars, readings, special projects, and work with content area specialists/teachers, current instructional methods, curriculum and professional resources in social studies are examined. Students will be required to observe teachers of secondary level social studies courses at public schools, residential schools for Deaf students or in mainstream programs. Section 05 American Sign Language. This course examines issues and methods related to teaching American Sign Language at the secondary level. Students investigate and analyze current approaches to ASL curriculum, instruction, and materials through readings, observations, and seminars. Students design content area projects to demonstrate their understanding of teaching theories and methods, curriculum design, and evaluation techniques. To progress to MSSE-760, students must obtain a minimum grade of B in this course.
Prerequisites: MSSE-710 and MSSE-712 or equivalent course with a minimum grade of B and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-715 Issues in Mainstreamed Education (3 Credits)
This course will prepare students to work with Deaf and Hard of Hearing children and youth with a broad range of disabilities and educational needs in mainstreamed school settings. The course is designed to foster acceptance of diversity among individuals as well as to develop skills in writing appropriate Individualized Education Programs (IEPs), including behavior modification methods, communication strategies, and psycho-educational approaches.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-722 Educational Audiology and Spoken Language Development (3 Credits)
This course provides a basic understanding of the mechanisms of hearing and speech and causes of hearing loss. Emphasis is placed on development of a functional understanding of speech perception, speech development, hearing aids, cochlear implants, and assistive listening devices. Procedures for audiological and speech/language assessment are examined, together with strategies for supporting use and development of spoken language in the classroom.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-725 Structures of American Sign Language and English (3 Credits)
This course concentrates on the linguistic structures of American Sign Language (ASL) and English. This course introduces students to the structural description of ASL and English languages at various levels (phonology, morphology, syntax, semantics, and discourse/pragmatics). Issues related to language change and variation, language use in contact situations (for example, code-mode switching), and language use in education will be discussed.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-726 Language Acquisition and Learning (3 Credits)
This course introduces students to current theories of language acquisition and learning in educational settings. The stages of acquisition and learning, and variables that influence these processes will be included. Bilingual and second language acquisition and learning will also be addressed. Implications for instruction with Deaf students will be discussed.
Prerequisites: MSSE-725 or equivalent course and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

MSSE-727 Sign Language in Instructional Delivery (3 Credits)
This course is designed to improve the sign language proficiencies of classroom teachers. It provides students strategies and skill building to teach content areas in and through sign language. Students will enhance their sign language skills for the purpose of conveying concepts to Deaf students clearly and accurately. Topics include signed instructional strategies, curriculum development in sign language, assessment modifications, student products in sign language, and vocabulary/phrases for effective communication and instructional delivery.
Prerequisites: MSSE-725 or equivalent course and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

MSSE-728 Literacy and the Deaf Adolescent (3 Credits)
This course is designed to familiarize students with the process involved in English literacy development. Particular emphasis is placed on the literacy development of deaf and hard-of-hearing students in grades 7-12. Students learn about various language and literacy instructional methods and how to incorporate literacy instruction into all secondary content area classrooms.
Prerequisites: MSSE-726 or equivalent course and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

MSSE-760 Student Teaching I (6 Credits)
This first assignment consists of 8 weeks (40 days or 250 hours) of teaching and observation. Teacher candidates are placed with cooperating teachers in residential schools for the Deaf or mainstreamed programs. They develop lesson and unit plans and teach in the content area in which they plan to receive New York State certification. To progress to MSSE-761, students must pass this student teaching assignment with a minimum grade of B and submit a student teaching portfolio.
Prerequisites: MSSE-714 or equivalent course with a minimum grade of B and MLAS-202 or equivalent course with a minimum grade of C- and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture/Lab 6
Typically Offered: Spring

MSSE-761 Student Teaching II (6 Credits)
This second assignment consists of 8 weeks (40 days or 250 hours) of teaching and observation. Student teachers are placed with cooperating teachers in residential schools for the Deaf or mainstreamed program. They develop lesson and unit plans and teach in the content area in which they plan to receive New York State certification. Students must pass this student teaching assignment with a minimum grade of B and submit a student teaching portfolio.
Prerequisites: MSSE-760 or equivalent course with a minimum grade of B and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture/Lab 6
Typically Offered: Spring

MSSE-780 Global Education Seminar (1-6 Credits)
Global Education Seminar provides graduate students with the opportunity to conduct research on the unique historical, geographical, economic, social, and/or political circumstances of a country other than the United States, and consider those factors that shaped the relationship between the country being studied and its Deaf community. The students will research perspectives on and issues related to people who are deaf in the field of their interest (e.g., medicine, accessibility, technology, STEM, sign language, education, history, business, arts, among others). The students will exit the course with basic practitioner knowledge, especially in the area of research. The students will learn and use some basic language skills in the written and signed languages of the selected country as well as to interact with members of the Deaf community in the country. The country to be studied and the specific course topics for that country will vary by instructor. Specific knowledge and skills required for this experience and/or research project abroad will also be taught. This course is required for graduate students who travel in the NTID faculty-led experience and/or research project abroad. Students who do not participate in the study abroad experience may be allowed to enroll with the permission of the instructor.
Typically Offered: Fall, Spring, Summer

MSSE-785 Foundations of Educational Research (3 Credits)
This course is an introduction to research and inquiry in education. The course includes the evaluation of selected Deaf education research studies, including methodologies, data collection and analyses, and implications of the studies to teaching and learning. Action research in the classroom is examined in depth. Students will prepare a review of literature and an action research plan related to a specific curriculum topic or problem in the learning/teaching of their content areas. The focus of the course is upon the student as a consumer rather than a practitioner of research, however the student will exit the course with basic practitioner knowledge, especially in the area of teacher research.
This class is restricted to SEDDEAF-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

MSSE-789 Special Topics: MSSE (1-3 Credits)
Special topics courses will be developed based on student interest and demand as well as faculty interest and availability. These courses are usually taken on an elective basis.
This class is restricted to SEDDEAF-MS Major students.
Typically Offered: Fall, Spring, Summer

MSSE-790 Professional Portfolio (3 Credits)
The professional portfolio presents a clear picture of pre-service professional growth and accomplishments in the complex teaching field. It demonstrates a teacher candidate's reflective and constructive professional performance. The performance includes, but is not limited to, the teacher candidate's actual teaching, reflecting on learning and teaching, developing and implementing lessons, conducting qualitative and quantitative research projects, and applying theory and research to practice. The portfolio includes extensive evidence of teaching and learning experience, including teaching philosophy, pedagogy, classroom management, and the integration of research and teaching. Professional portfolios will be reviewed by a committee of program faculty for approval.
Prerequisites: MSSE-714 and MSSE-785 or equivalent course with a minimum grade of B and graduate standing in SEDDEAF-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

MSSE-794 Inquiry in Teaching (3 Credits)
This is an elective enrichment course that facilitates development of scholarship skills in conjunction with the completion of an independent project on an important educational topic. The project may be an experimental study that creates new knowledge, curriculum development that results in a novel and tangible product, a comprehensive review and analysis of a body of literature, or a grant proposal suitable for submission to funding sources. Students will seek a project mentor by the end of their first semester and will work independently under the guidance of that mentor. A committee of program faculty will evaluate the final written report for level of critical thinking, integration of concepts, clarity of expression, and adherence to the principles of scientific inquiry.
Prerequisites: MSSE-785 or equivalent course and graduate standing in SEDDEAF-MS.
Contact Hours: Independent Study 3
Typically Offered: Spring

MSSE-799 Independent Study: MSSE (1-3 Credits)
Independent study courses will be developed based on student interest and demand as well as faculty interest and availability. These courses are usually taken on an elective basis.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Nutrition (NUTR)

NUTR-610 Integrative Approaches to Health (1 Credit)
This one credit class offers an overview of controversial and accepted integrative health therapies, diet therapies, basic herbal medicine guidelines, and vitamin/mineral supplementation.
Contact Hours: Lecture 1
Typically Offered: Fall

NUTR-625 Medical Nutrition Therapy I (3 Credits)
This course is the first of a two-course series concerned with the review and application of biological metabolism and the interrelationships of nutrients, hormones, enzymes, and other biochemical substances in humans. Modification of nutritional intake to meet nutritional needs altered by diseases and stress as well as the use of alternate methods of feeding (enteral/parenteral) to meet nutritional needs is discussed in depth. This course emphasizes the practical applications of medical nutritional therapy for use with patients/clients.
Contact Hours: Lecture 3
Typically Offered: Fall

NUTR-626 Medical Nutrition Therapy II (3 Credits)
This course is the second of a two-course series concerned with the review and application of biological metabolism and the interrelationships of nutrients, hormones, enzymes, and other biochemical substances in humans. Modification of nutritional intake to meet nutritional needs altered by diseases and stress as well as the use of alternate methods of feeding (enteral/parenteral) to meet nutritional needs is discussed in depth. This course emphasizes the practical applications of medical nutritional therapy for use with patients/clients.
Prerequisite: NUTR-625 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

NUTR-650 Community Nutrition (3 Credits)
Study of current nutrition issues and delivery of food and nutrition services in the community. The course is designed to allow senior level and graduate students to acquire skills necessary to deliver services in the public health and private sector markets. Individual practicum in community facility is required and arranged by the instructor.
Prerequisite: NUTR-625 or equivalent course.
Contact Hours: Laboratory 4, Lecture 2
Typically Offered: Spring

NUTR-654 Life Cycle Nutrition (4 Credits)
An applied course for the Nutrition Management major regarding the nutritional needs throughout the life cycle. Emphasis is given to nutrition during pregnancy, infancy, early childhood, adolescence, young and middle adulthood, and the elderly. Practicum in facilities delivering nutrition services to these age groups is required. Practicum hours by arrangement.
Contact Hours: Laboratory 1, Lecture 3
Typically Offered: Spring

NUTR-655 Nutrition Throughout the Lifecycle (3 Credits)
This course emphasizes the interrelationships of social, psychological, physiological, and biochemical factors and their impact on nutrient requirements and recommendations for food intake during specific stages of the life cycle. Emphasis is given to nutrition during pregnancy, infancy, early childhood, adolescence, young and middle adulthood, and the elderly.
Contact Hours: Lecture 3
Typically Offered: Spring

NUTR-660 Health and Nutrition Research Foundations (3 Credits)
This course offers graduate students with limited research experience the opportunity to learn basic research principles and integrate with skills and knowledge from other courses to conduct research in an area of professional interest. The research project includes gathering primary data, assessing and summarizing the data, and sense-making or drawing conclusions from the data. Students will complete activities to gain skills in project management, secondary research development, and Human Subject Research (HSRO) submission.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

NUTR-680 Global Food and Nutrition Perspectives (3 Credits)
This course provides an overview of global food and nutrition concepts and issues from both developed and developing country perspectives. Topics include breastfeeding, macronutrients and micronutrient problems, food security and access, food emergencies, maternal and child health and the impacts of socio-economic disparities on nutrition status. Also addressed are challenges in food and nutrition policy development, program design and implementation that are unique to global efforts and sustainable development goals (SDGs). Students apply course content and analytical thinking skills to a unique self-selected country and develop dissemination skills by informing others of the unique food, nutrition and health issues.
Co-requisite: NUTR-654 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

Occupational Therapy (OCTH)

OCTH-603 Occupational Sciences and Occupational Therapy (3 Credits)
This course overviews occupational science and occupational therapy. Students will acquire a thorough understanding of the core concept of occupation and the profession of occupational therapy. The history and philosophical base of the profession, the domains and process of occupational therapy, current state and future trends of the profession will be highlighted. Organizations of the profession such as American Occupational Therapy Association (AOTA), World Federation of Occupational Therapists (WFOT) and World Health Organization (WHO) and official occupational therapy documents will be presented and discussed.
Contact Hours: Lecture 3
Typically Offered: Summer

OCTH-604 Clinical Human Anatomy (4 Credits)
This course provides an overview of clinical human gross anatomy with a focus on the function and impact of anatomical structure on occupational performance. Through a thorough understanding of the anatomy of the human body, students are expected to apply such an understanding to aid assessing occupational performance and designing effective interventions to enhance occupational engagement of clients with occupational therapy service needs. This course includes a laboratory component in which students apply didactic learning to human cadavers.
Contact Hours: Laboratory 1, Lecture 3
Typically Offered: Summer

OCTH-613 Clinical Neuroanatomy (3 Credits)
This course will introduce students the major structural and functional features of the nervous system with an emphasis on the brain and spinal cord. Students are expected to acquire a thorough understanding of the function of neuro system and apply such in-depth understanding to occupational therapy practice and the concept of occupation.
Contact Hours: Lecture 3
Typically Offered: Fall

OCTH-622 Research Inquiry in Occupational Therapy (2 Credits)
This course is the first of a series of research courses. Emphasis of this course will be placed on building a solid foundation in professional inquiry. Both quantitative and qualitative research methodologies and designs will be examined. Students are expected to develop critical knowledge and skills in professional inquiry such as seeking, examining, and interpreting research literature; understanding and articulating different research designs; and examining ethical issues in the research process. Gaining an understanding of research process is expected at the end of the course.
Contact Hours: Lecture 2
Typically Offered: Fall

OCTH-623 Occupational Therapy Practice with Older Adults (3 Credits)
This course will examine unique characteristics and occupational needs of older adults and develop occupational therapy services to address such needs. Students are expected to explore various service delivery models and resources to meet the needs of older adults and their caregivers, with an emphasis on evaluation and intervention, to promote safety and occupational engagement of older adults at home and in the community. This course includes a laboratory component.
Contact Hours: Laboratory 1, Lecture 2
Typically Offered: Spring

OCTH-633 Occupational Therapy Practice in Pediatrics I (3 Credits)
This course is the first course in a two-course series that focuses on occupational therapy practice with children and youth, with an emphasis on childhood development and the evaluation phase of occupational therapy process. Students will acquire clinical observation skills and interpersonal skills needed for interprofessional collaborations and effectively working with families and communities. Principles of assessment, intervention, and frames of reference commonly used in pediatric occupational therapy practice are highlighted. This course includes a laboratory component.
Contact Hours: Laboratory 1, Lecture 3
Typically Offered: Spring

OCTH-643 Health Conditions and Occupational Therapy Performance (3 Credits)
This course is designed to provide an overview of common health conditions encountered in occupational therapy practice across the lifespan with a focus on the impact of health conditions on occupational performance.
Contact Hours: Lecture 3
Typically Offered: Fall

OCTH-663 Applied Kinesiology and Movement Analysis (3 Credits)
In this course students will be introduced to the fundamental biomechanical and kinesiological principles for assessing and intervening movement to maximize occupational performance and engagement in occupation. Students are expected to acquire and apply knowledge and skills in performing and interpreting assessments for clients with various health conditions and designing therapeutic interventions. This course includes a laboratory component.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

OCTH-683 Occupational Therapy Practice in Mental Health (3 Credits)
This course examines occupational therapy in mental health practice, as well as the influence of psychosocial factors on occupational performance. Theory-driven practice is valued with the introduction of selected psychosocial frames of reference and/or conceptual practice models of mental health practice to guide the evaluation process, the selection of assessment tools, and the design of therapeutic interventions. Use of self as a therapeutic agent and group process skills will be emphasized. This course includes a laboratory component.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

OCTH-703 Professional Practice and Formation I (3 Credits)
This is the first course of a three-course series on professional practice and formation. The focus of the course is for students to acquire fundamental occupational therapy practice concepts, knowledge, and skills and integrate such competency with ethical principles to facilitate their professional development and formation. This includes a laboratory component.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

OCTH-711 Research Implementation I (1 Credit)
This is the third course in a series of research courses designed to develop research skills for the occupational therapy practitioner. Students will gain knowledge and skills through the implementation of their research proposal, including initiating participant recruitment, data collection, and data analysis. Students will critically analyze and solve problems encountered during project implementation. The process will be closely monitored by the instructor of record and faculty research mentor. Prerequisites: OCTH-622 and WSHN-700 or equivalent courses.
Contact Hours: Lecture 1
Typically Offered: Fall

OCTH-722 Research Implementation II (2 Credits)
This is the fourth course in a series of research courses designed to develop research skills for the occupational therapy practitioner. Students will gain knowledge and skills through the implementation of their research proposal, including initiating participant recruitment, data collection, and data analysis. Students will critically analyze and solve problems encountered during project implementation. The process will be closely monitored by the instructor of record and faculty research mentor. Prerequisites: OCTH-711 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

OCTH-723 Occupational Therapy Evaluation in Physical Rehabilitation (3 Credits)
This is the first course in a three-course series focusing on occupational therapy in physical rehabilitation. Emphasis of the course is to acquire an in-depth understanding, knowledge and skills in physical rehab evaluation. Students are expected to apply clinical reasoning to examine physical rehabilitation frames of reference, models of occupational therapy practice, choose evidence-based evaluation tools, and design occupation-based intervention plans. This course includes a laboratory component.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

OCTH-733 Occupational Therapy Practice in Pediatrics II (3 Credits)
This course is the second course in a two-course series focused on the occupational therapy process with children and youth with an emphasis on designing occupation-based interventions through occupational performance analysis. Interprofessional practice, coordination of occupational therapy practice in various settings and service delivery models will be critically examined. Students are expected to apply knowledge and skills in frames of reference and models of practice to develop strategies for achieving developed international goals. This course includes a laboratory component.
Prerequisites: OCTH-633 or equivalent course.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Summer

OCTH-743 Occupations, Wellness and Population Health (3 Credits)
This course centers on the intertwined relationships between occupation and health. The role of occupation in wellness and promotion of health in populations will be explored. Emphasis will be centered on the core concepts of population health such as needs assessment, wellness, health behaviors, prevention of illness and health promotion. Students are expected to integrate and apply these core concepts in developing population based approaches to promote health.
Contact Hours: Lecture 3
Typically Offered: Spring

OCTH-753 Professional Practice and Formation II (3 Credits)
Building on the Professional Practice and Formation I, this course continues to facilitate students' professional practice and formation through acquiring, integrating, and applying fundamental occupational therapy practice concepts, knowledge, and skills. Advancement of clinical and ethical reasoning in occupational therapy practice is expected.
Prerequisites: OCTH-703 or equivalent course.
Contact Hours: Laboratory 3
Typically Offered: Fall

OCTH-761 Professional Practice and Formation III (1 Credit)
This is the last of a three-course series on professional practice and formation. The course will be offered online as the students will be engaging in their last Level II fieldwork. The focus of the course is for students to reflect and integrate all of their didactic education and fieldwork experiences to continue facilitating their professional practice and formation. Students will engage in reflective, critical, and ethical reasoning to synthesize their knowledge and skills for transition to entry level practice. Students will finalize all capstone documentation in preparation for graduation.
Prerequisites: OCTH-753 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Fall

OCTH-762 Introduction to Innovative Technology in Rehabilitation (2 Credits)
This is the first course in a two-course series focusing on innovative technology in rehabilitation related to occupational therapy. The course provides students with an introductory exposure and fundamental understanding of the Top Ten Rehabilitation Technology Trends: 1) Immersive Technologies, 2) Telerehabilitation, 3) Rehabilitation Wearables, 4) Rehabilitation Robotics, 5) Personalized Pre-rehab Diagnostics, 6) Photo- and Electro-therapy, 7) Artificial Intelligence, 8) Neurofeedback, 9) Lightweight Technology, and 10) Bid Data and Analysis. Students are also expected to identify clinical problems and challenges in occupational therapy and rehabilitation.
Contact Hours: Lecture 2
Typically Offered: Summer

OCTH-772 Clinical Seminar Capstone Planning (2 Credits)
The focus of this seminar is to prepare students for their capstone project. Students will be instructed and mentored by the capstone coordinator and clinical advisors to identify learning objectives and design a capstone project that will be implemented during their 14 week-long capstone course.
Contact Hours: Lecture 2
Typically Offered: Spring

OCTH-773 OT Program Development and Grant Writing (3 Credits)
In this course students will acquire and apply the techniques of OT program development from design to market that are necessary to meet the needs of clients, groups, or populations. Key concepts and the process of program development will be examined. Topics include but are not limited to: needs assessment, program goals/objectives, budgeting, quality assurance and program evaluation. Locating, applying and securing funding related to a business plan of program development will be addressed through the grant writing component of the course. Students are expected to gain an in-depth understanding of grant writing and submission process.
Contact Hours: Lecture 3
Typically Offered: Spring

OCTH-783 Physical Agent and Mechanical Modalities I (3 Credits)
This is the first course in a two-course series that focuses on the occupational therapy services for persons with upper extremity conditions across the lifespan. Focus of the course will be on knowledge and skills in selecting and fabricating orthotics to address the occupational therapy service needs and enhance the occupational engagement of the clients. This course includes a laboratory component.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

OCTH-801 Clinical Seminar and Level I Fieldwork A: Mental Health (1 Credit)
The focus of this one-week course is to prepare students and enable them to execute level I fieldwork successfully in the area of mental health through observations and participation in occupational therapy services. This level I fieldwork experience is provided in accordance with occupational therapy accreditation standards.
Contact Hours: Clinical 3
Typically Offered: Fall

OCTH-811 Clinical Seminar & Level I Fieldwork B: Pediatrics (1 Credit)
The focus of this one-week course is to prepare students and enable them to execute level I fieldwork successfully in the area of pediatrics through observations and participation in occupational therapy services. This level I fieldwork experience is provided in accordance with occupational therapy accreditation standards.
Prerequisites: OCTH-801 or equivalent course.
Contact Hours: Clinical 3
Typically Offered: Spring

OCTH-821 Clinical Seminar & Level I Fieldwork C: Physical Rehab (1 Credit)
The focus of this one-week course is to prepare students and enable them to execute level I fieldwork successfully in the area of physical rehabilitation through observations and participation in occupational therapy services. This level I fieldwork experience is provided in accordance with occupational therapy accreditation standards.
Prerequisites: OCTH-811 or equivalent course.
Contact Hours: Clinical 3
Typically Offered: Summer

OCTH-823 Occupational Therapy Intervention in Physical Rehabilitation (3 Credits)
This is the second course in a three-course series focusing on occupational therapy in physical rehabilitation. The course is centered on the intervention of occupational therapy process. Students are expected to articulate clinical reasoning and apply evidence-based practice to design occupation-based intervention to address the service needs of clients with cardiac, pulmonary, orthopedic, and other health conditions. Preparatory methods, assistive technology and adjunctive therapeutic strategies that will enhance occupational performance will be examined.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Summer

OCTH-831 Clinical Seminar & Level I Fieldwork D: Emerging Practice (1 Credit)
The focus of this one-week course is to prepare students and enable them to execute level I fieldwork successfully in the area of emerging practice through observations and participation in occupational therapy services. This level I fieldwork experience is provided in accordance with occupational therapy accreditation standards.
Prerequisites: OCTH-821 or equivalent course.
Contact Hours: Clinical 3
Typically Offered: Fall

OCTH-843 Occupational Therapy Practice Application in Physical Rehabilitation (3 Credits)
This is the third course in a three-course series focusing on occupational therapy physical rehabilitation. The course is centered on the intervention of occupational therapy process. Students are expected to articulate clinical reasoning and apply evidence-based practice to design occupation based interventions to address the service needs of clients with neurologic conditions. Preparatory methods, assistive technology and adjunctive therapeutic strategies that will enhance occupational performance will be examined. This course includes a laboratory component.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

OCTH-853 Health Care Management and Leadership (3 Credits)
This course will focus on the theory, key concepts, knowledge, and skills in health care management and leadership. With thorough understanding, students are expected to be prepared to manage and lead occupational therapy services across all practice settings and environments. Health care regulations, strategic planning, budgetary planning and financial management, program evaluation and improvement will be critically examined.
Contact Hours: Lecture 3
Typically Offered: Spring

OCTH-862 Innovative Technology in Rehabilitation II: Implementation (2 Credits)
This is the second course in a two-course series focusing on Innovative Technology in rehabilitation related to occupational therapy. The course addresses implementation of the innovative technologies which students learned from the first course, OCTH 762, and targets the clinical problems and challenges in occupational therapy and rehabilitation. Specifically, students are expect to apply the innovative rehabilitation technologies, such as augmented reality/virtual reality (AR/VR) and artificial intelligence (AI) to AR/VR and AI driven rehabilitation solutions in occupational therapy.
Prerequisites: OCTH-762 or equivalent course.
Contact Hours: Lecture 2
Typically Offered: Spring

OCTH-863 Physical Agent and Mechanical Modalities II (3 Credits)
This is the second course in a two-course series that focuses on the occupational therapy services for persons with physical conditions across the lifespan. Students will apply clinical reasoning in selecting and implementing assessments and interventions to safely administer physical agent modalities and other preparatory methods to address the occupational therapy service needs and enhance the occupational engagement of the clients.
Prerequisites: OCTH-783 or equivalent course.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

OCTH-872 Clinical Level II A Fieldwork (12 Credits)
This is one of the two required Level II fieldwork experiences. Students will integrate, synthesize and apply acquired knowledge and skills from didactic and level I fieldworks in this 12-week full time fieldwork placement under the mentorship and supervision of site clinical instructors and OT faculty advisors in the OTD program. It is expected that students will develop entry-level competency as a generalist practitioner at their site by the conclusion of this experience.
Prerequisites: OCTH-831 or equivalent course.
Contact Hours: Clinical 40
Typically Offered: Summer

OCTH-882 Clinical Level II B Fieldwork (12 Credits)
This is the second of the two required Level II fieldwork experiences. Students will integrate, synthesize, and apply acquired knowledge and skills from didactic and level I fieldworks in this 12-week full time fieldwork placement under the mentorship and supervision of site clinical instructors and OT faculty advisors in the OTD program. It is expected that students will develop entry-level competency as a generalist practitioner at their site by the conclusion of this experience.
Prerequisites: OCTH-872 or equivalent course.
Contact Hours: Clinical 40
Typically Offered: Fall

OCTH-884 Capstone Project (14 Credits)
As required by ACOTE standards, the focus of the capstone is for students to integrate and synthesize knowledge, skills and experiences from their entry level OTD education to design an accumulative project in one or more of the following areas: clinical practice, scholarship, program development, administration, and advocacy. Students will be closely mentored by project mentors throughout the capstone project.
Contact Hours: Project 40
Typically Offered: Spring

Organic Chemistry (CHMO)

CHMO-621 Chemical Development and Scale-Up (3 Credits)
An investigative approach to chemical process and development for scaling up chemical synthesis. The course will provide a step-by-step guide for a practical understanding on how to scale-up reactions in the pharmaceutical and fine chemical industries. A breakdown of the fundamental route optimization to develop a robust procedure (i.e. reagent and solvent selection). Guidelines to predict possible hazards, implementing a scale-up route, and troubleshooting processes are to be discussed and evaluated using real world examples.
Prerequisites: CHMO-232 or CHMO-332 or equivalent course or Graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Spring

CHMO-636 Spectrometric Identification of Organic Compounds (3 Credits)
This course covers the theory and application of proton, carbon-13, and correlation nuclear magnetic resonance, infrared, and mass spectrometry for organic structure determination.
Prerequisites: CHMO-332 with a grade of C- or better or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMO-637 Advanced Organic Chemistry (3 Credits)
This course will revisit many of the reactions covered in the first year of organic chemistry with an emphasis on stereochemical control. Students will be introduced to the technique of retrosynthesis. The course will introduce more reactions with an emphasis on current topics from the literature. Students will hone their skills in writing electron pushing mechanisms and the use of protecting groups while practicing the art of designing synthetic strategies for making natural products.
Prerequisites: Graduate standing or CHMO-332 or CHMO-232 with a grade of B or better or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMO-640 Mechanisms of Drug Interactions (3 Credits)
Drugs are naturally occurring or synthetic substances that upon exposure to a living organism form complexes with biological targets. These complexes result in a characteristic pharmacological effect which alter physiological functions or counteract environmental insults. The goal of this course is to systematically study drug discovery, lead optimization, drug-receptor interactions, and bioavailability. Historically important drug classes and their mechanism of action will receive special consideration.
Prerequisites: CHMB-402 or equivalent course or graduate standing.
Contact Hours: Lecture 3
Typically Offered: Spring

CHMO-710 Literature Exploration of Organic Synthesis (1 Credit)
This course will be a survey of the recent literature in organic chemistry with a focus on the chemistry concerning the synthesis of natural products and/or methodology towards synthesizing natural products. During each week of the course a student is selected to lead a discussion based on an article from a premier journal. This course may be repeated for credit.
Prerequisites: CHMO-637 or equivalent course.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring

CHMO-739 Advanced Physical Organic Chemistry (3 Credits)
This course covers topics in physical organic chemistry including: techniques for elucidation of mechanism (kinetic, and linear free energy relationships); isotope effects; molecular orbital theory; and electrocyclic reactions.
Prerequisites: CHMO-332 and CHMP-441 or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

CHMO-750 Survey of Organic Named Reactions (3 Credits)
The course will explore a litany of named organic reactions with an emphasis on the reaction mechanisms. Learning the mechanism to the named reactions is a classical way to teach organic chemistry students the rules of mechanism writing. Having a dictionary type recall of the named reactions is a fundamental tool for success in organic chemistry. This course will introduce the students to new reagents and reactions by surveying named organic reactions with an emphasis on the reaction mechanisms. The goal of the course is to generate an understanding of the reaction mechanism and use that understanding to predict the reactivity of substrates in organic chemical reactions.
Prerequisites: Graduate standing or CHMO-332 or CHMO-232 with a grade of B or better or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

Packaging Science (PACK)

PACK-660 Converting and Flexible Packaging (3 Credits)
The course develops knowledge and techniques in converting and flexible packaging. Topics covered are converting materials, quality control practice in converting, evaluation of packaging film and converting and applications in flexible packaging. This course is co-listed with PACK-660; students may receive credit for PACK-560 or PACK-660, not both. Students may not take and receive credit for PACK-560 and PACK-660. If you have earned credit for PACK-560 or you are currently enrolled in PACK-560 you will not be permitted to enroll in PACK-660.
Contact Hours: Lecture/Lab 4
Typically Offered: Spring

PACK-699 Graduate Co-op (0 Credits)
Work experience in packaging science position appropriate to selected major in graduate program. Position to be obtained through interviewing process with the assistance of Cooperative Education and Career Services Office. Department permission is required.

PACK-701 Research Methods (3 Credits)
Discussion of the procedures, methods and requirements for carrying out the research project. Students pursue advanced study and research in the following areas: distribution packaging, package systems development, product and/or package damage in the transport environment, materials, quality preservation, sustainability, mechanical properties of packaging materials and systems. A research paper is required.
Contact Hours: Lecture 3
Typically Offered: Fall

PACK-702 Graduate Writing Strategies (3 Credits)
Taught in conjunction with Research Methods students will become articulate in a variety of business and research communication methodologies. These methods will include writing a research proposal, a white paper, and a grant proposal. A search of the literature for a defined research proposal will include an annotated bibliography to support the references used in the research proposal. In addition students will research the requirements for submission of a professional journal in their field and write a research article which could be submitted for publication to the identified journal.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PACK-730 Packaging and the Environment (3 Credits)
Consideration of packaging in a social context. Factors that enhance secondary use, recycling, recovery of resources, and proper disposal are discussed. Package design in relation to solid waste disposal and materials and energy shortages are considered. Other topics of interest are discussed. Primarily a discussion class for graduate students. Open to graduate non-majors.
Contact Hours: Lecture 3
Typically Offered: Spring

PACK-742 Distribution Systems (3 Credits)
The course develops knowledges and application skills of the distribution packaging. Topics covered are packaging used in distribution systems, integrated packaging supply chain, modeling and analysis of the distribution systems, and score card in packaging supply chain. Emphasises are given to estimate and predict the packaging protection and to optimize the packaging distribution using various tools. The lab focuses on development and evaluation of a distribution packaging. The projects are designed to assess the packaging performance in distribution systems.
This course is restricted to students in the PACK-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

PACK-750 Packaging Materials, Processes and Applications (3 Credits)
This graduate level course is designed to present the theory, foundation principles and practices which form the basis of packaging science.
Contact Hours: Lecture 4
Typically Offered: Fall

PACK-751 Advanced Packaging Design (3 Credits)
The course develops knowledge of packaging design graphics and skills of package structure design. Topics covered are basics of engineering design graphics, technical sketch, project plan, design matrix, computer aided design (CAD), and rapid prototyping. Emphasis is given to use SolidWorks – CAD software to design typical packaging structures. The design project focuses on developing a packaging structure from an idea to an actual prototype.
Contact Hours: Lecture/Lab 4
Typically Offered: Spring

PACK-752 Advanced Computer Applications (3 Credits)
The course develops knowledge and skills in applying two computer software packages for packaging design: Artios CAD and Adobe Illustrator. Topics covered are builder and rebuilder, solid modeling and drawing, animation, coloring, and painting. Emphasis is given to create a typical paperboard based carton with a proper structure and color usage.
Contact Hours: Lecture/Lab 4
Typically Offered: Spring

PACK-763 Packaging for End Use (3 Credits)
An intensive study of package design requirements specific to use of a product at specified end points. Individual design and development of a package system and its specifications, appropriate to the needs of the product and the consumer/end user and meets the demands of the supply chain.
Prerequisites: PACK-451 or equivalent course or graduate student standing in the PACK-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

PACK-783 Advanced Packaging Dynamics (3 Credits)
The study of instrumentation systems for analysis, evaluation and application of shock and vibration test methods to develop protective package designs and effective product/package interaction. A research paper is required.
This course is restricted to students in the PACK-MS program.
Contact Hours: Lecture 3, Recitation 1
Typically Offered: Spring

PACK-789 PS Special Topics (1-3 Credits)
Packaging science special topics.
Typically Offered: Fall, Spring, Summer

PACK-790 Research Thesis (1-6 Credits)
A thesis is based on experimental evidence obtained by the candidate in an appropriate topic demonstrating the extension of theory into practice. A written proposal which is defended and authorized by the faculty advisor/committee followed by a formal written thesis and oral presentation of findings are required. Typically the candidate will have completed research methods, data analysis and graduate writing strategies prior to enrolling in this course and will start the thesis process as soon as they have completed these courses to allow them to finish the thesis when they have finished their coursework. The candidate must obtain the approval of their graduate adviser who will guide the thesis before registering for this course.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

PACK-791 Continuation of Thesis (0 Credits)
Continuation of Thesis
Enrollment in this course requires permission from the department offering the course.

PACK-795 Comprehensive Examination (0 Credits)
A written comprehensive exam is one of the non-thesis methodologies for completion of the MS degree. Students will demonstrate a fundamental knowledge of the theories and foundation principles. This course will include a review of the main concepts of each of the core subjects and at the conclusion of the course the student will take a written examination and must receive a passing grade of at least 80 percent to be successful. Students will have one additional opportunity to pass this examination if their initial attempt results in a failing grade. (Faculty adviser approval required).
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Summer

PACK-797 Graduate Project (1-3 Credits)
The purpose of this course is to provide students the opportunity to conduct research, develop a plan and evaluation components and submit the project as a demonstration of final proficiency in the program. The topic selected by the student will be guided by the faculty teaching the class and it will require the student to coalesce and incorporate into the final project a culmination of all their course work in the program to date.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Spring

PACK-798 Continuation of Grad Project (0 Credits)
Continuation of Graduate Project
Enrollment in this course requires permission from the department offering the course.

Painting (PAIT)

PAIT-601 Painting (3 Credits)
This course engages students in a personal exploration of techniques in painting to advance their understanding and practice of visual art. Individual approaches to painting from the representational through the abstract present a cross-section of current art issues which students must address as they build their portfolio. Course may be retaken. ** Fee: A materials fee is required for this course**.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

PAIT-661 Painting the Natural World (3 Credits)
This class will examine the natural world in our current culture in combination with technical aspects of oil paint. Course content will cover the transition from direct observation to conceptual work. Students will create a body of artwork referencing assigned readings and personally driven research relating to contemporary themes such as identity, the body, time, memory, place, language, science, spirituality, and how they connect to nature. At the completion of this course, students will be able to use the skills from a technical overview of observational painting to create a body of work exploring developed ideas based on individual research. **Course fee via student account**
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall

PAIT-671 Painting the Figure (3 Credits)
This course will explore materials and techniques used in painting the human form. Theory and practice of color and drawing will be used to develop an understanding of how to portray the figure. Traditional and contemporary approaches to figurative painting will be explored. There is a lab fee required for this course.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall

PAIT-760 Watercolor (3 Credits)
This course focuses on the exploration of watercolor techniques and concepts to enhance skills and personal expression of the individual student.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring, Summer

Philosophy (PHIL)

PHIL-604 Philosophy of Mind (3 Credits)
Philosophy of mind is the philosophical discipline that explores what a mind is and how it fits in the natural world. In doing this, philosophy of mind raises further questions such as: What do we mean by mind? How do we attribute mentality? How are mental and physical properties related? What is consciousness? Can computers think? How is rationality connected to mental states like beliefs and desires? In this course we discuss and critically assess answers to these and related philosophical questions. This course is designed for both undergraduate and graduate students. Graduate students will fulfill additional requirements beyond those expected for undergraduate students.
Prerequisites: Graduate standing and one (1) prior course in philosophy.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PHIL-703 Seminar in Art and Aesthetics (3 Credits)
What is the relationship between art and knowledge, art and truth, art and politics, art and philosophical theory? What role is played in criticism by art theory, by considerations of the artists' intentions, by ethics and other forms of cultural criticism? What makes an interpretation of an artwork valid or invalid? How is aesthetic value related to other values? The questions discussed are philosophical questions about art and aesthetic experience. The meetings in this course are not lectures but discussions, and participation is required of all students. Since the theories and examples discussed are mostly from the Western canon, familiarity with the history of Western art is recommended. Graduate level elective.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

PHIL-790 Philosophy of Action (3 Credits)
This course explores the three central philosophical issues of action theory: what is an action, what is an agent, and what is metaphysical freedom. The first part of the course examines the most significant theories of action and the different ways in which they characterize intentional behavior. The second part of this course explores the nature of agency. The third part of this course focuses on the classical problem of free will and its relation to moral responsibility.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHIL-799 Independent Study (1-6 Credits)
A program of study executed by an individual graduate student with assistance and guidance by an instructor, outside a regular classroom setting. Guidelines for designing and gaining approval for an independent study are provided in College of Liberal Arts Policy I.D.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring

Photo Media Science (PHMS)

PHMS-611 Media Foundations: The Digital File (3 Credits)
This course will investigate the creation, workflow and output of digital media files, using a variety of capture devices including digital cameras, smartphones, 2D/3D scanners, audio and video recording devices. Course content will focus on device preferences, file attributes, workflow, output, compression with consideration of data management using different media. Hands-on exercises reinforce concepts such as: file types, data compression, color management, media delivery, and distribution. Students will evaluate the influences of operator choices at each stage along the image chain. Special attention will be given to identifying and cultivating industry best practices. At the conclusion of the course, students will be able to create optimized files using a variety of devices that include metadata construction.
Contact Hours: Lecture 3
Typically Offered: Fall

PHMS-623 Leadership in Creative Spaces (3 Credits)
This course is designed for students from a variety of educational backgrounds, and will explore leadership skills required in collaborative, contemporary, and dynamic professional environments. Course content will cover the intersection and divergence of management and leadership concepts using large group discussions, small group activities, and self-reflective exercises. Students will identify their own personal leadership strengths and goals and develop management strategies used in modern business environments. Students will also incorporate ways to succeed in progressively challenging roles and learn methods for fostering inclusive environments. At the completion of this course, students will be able to leverage their personal and professional networks to create a diverse community of peers and collaborative partnerships that will lead to innovative work.
This course is restricted to MEDART-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

PHMS-711 Industry Issues, Trends, and Opportunities (3 Credits)
This course will present a detailed overview of critical trends and issues related to the graphic communications and imaging industries. It will provide an in-depth analysis of key technologies with a special emphasis on emerging, disruptive innovations as well as business, environmental and regulatory issues. The course content will emphasize cultural, economic, and technological trends and is intended to provide students with industry accepted methods used to identify changes in the industry. By tracing historical roots, analyzing present issues and detailing future trends, students will be prepared to develop insights into the nature and scope of the challenges and opportunities facing industry leaders and how to manage these challenges. As a part of the experience, students will develop sharply focused analytical skills and the ability to summarize findings based on industry normals.
Contact Hours: Lecture 3
Typically Offered: Fall

PHMS-721 Implementing Imaging Business Change (3 Credits)
This course will provide students with the knowledge required to improve an imaging or graphic communications business. Students will gain an understanding of the business assessment process and decision-making skills required for implementing change in the graphic communications and imaging industries. At the completion of this course, students will learn how to evaluate a firm's economic, operational, and market positions and apply practical solutions that improve business practices.
This course is restricted to MEDART-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

PHMS-731 Digital Content Management (3 Credits)
This course will explore the subject of digital asset and content management. Course exercises will investigate the organization of digital media and optimized architecture of storage systems. Students will learn how to manage and optimize digital content efficiently in various traditional and emerging applications. At the completion of this course, students will be able to articulate, analyze, and apply digital content solutions in various business and workflow models in media organizations.
This course is restricted to MEDART-MS Major students.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

PHMS-743 Contemporary Media and Communications (3 Credits)
This course will examine how media has evolved and how it has responded to changes in technology and social habits. Course content will cover various forms of media communication using both historical and contemporary perspectives. Topics include: trend recognition, monetization in media communications, materials, processes, audience, usability, accessibility, aesthetics, content, typography, copyright issues, and innovations in publishing. At the completion of this course, students will gain an understanding of various media structures and communication types through the analysis of audience and content.
This course is restricted to MEDART-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

PHMS-746 Capstone I (3 Credits)
This is the first of two courses designed to advance a student towards completion of their capstone. This course will guide students from their capstone proposal toward the completion of a capstone project. Students will learn project management skills required to successfully propose and begin a meaningful, relevant and feasible capstone project.
Contact Hours: Lecture 3
Typically Offered: Fall

PHMS-747 Capstone II (3 Credits)
This is the second of two courses designed to advance a student towards completion of their capstone. This course will guide students from their capstone proposal through the completion of a meaningful and significant capstone project. Projects can either be research oriented or developmental and must include implementation and dissemination of the project using appropriate distribution technology.
Prerequisites: PHMS-746 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

PHMS-748 Continuation of Capstone (0 Credits)
The course provides a student additional semester(s) to complete their capstone research, project, and documentation.
Prerequisite: PHMS-747 or equivalent course.
Typically Offered: Fall, Spring, Summer

PHMS-799 MS Media Arts Independent Study (1-6 Credits)
This course will allow graduate students in the Media Arts and Technology program the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser, will propose a course of study or project with clearly defined goals and outcomes. Students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll. **NOTE: Student must have a minimum 3.0 GPA *
Typically Offered: Fall or Spring or Summer

Photography - Graduate (PHGR)

PHGR-601 Studio Topics in Fine Art Photography (3 Credits)
This workshop will allow students to participate in small classes discussing and experimenting with various media, techniques, and practices in the studio. Topics may include experimentation with specialized technology, analog historical processes, installation, or refining a body of work in print, moving image, or book form. The content of the workshop will vary depending on the instructor. This course can be taken multiple times, but individual topics must be different.
This course is restricted to IMGART-MFA Major students.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall or Spring

PHGR-602 Advanced Analog (3 Credits)
Graduate students will engage with advanced analog photographic and alternative processes through demonstrations, group assignments, and personal projects. As students become familiar with these processes, they will create new work exploring various processes and techniques still relevant to photography today. Techniques explored include advanced black and white (toning, bleaching, reduction), gelatin emulsions, non-toxic plant-based processes, collodion chloride processes, and more.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring

PHGR-603 Wet-Plate Collodion (3 Credits)
The Wet-Plate Collodion process was invented in the 1850s and is a hand-applied process whereby an emulsion is poured onto a plate (of glass or tin), sensitized, exposed and developed before the emulsion dries. This course will introduce the basic principles of the collodion process including historical research and safety issues. Contemporary applications will also be discussed. At the completion of this course, students will gain an understanding of the differences between studio versus field photography.
This course is restricted to IMGART-MFA Major students.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring

PHGR-611 Contemporary Issues (3 Credits)
This course will study current issues relevant to imaging-based fine art photography and related media; how they relate to broader historical/cultural issues, and how they might suggest future directions. Emphasis is placed on the integration of critical theoretical discourse and studio practice. This course is a touchstone to current and future fine art practices through its engagement with a variety of subjects. This course may be repeated with different topics. Topic is determined by the instructor.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PHGR-631 New York City Photography (3 Credits)
This course will offer students the unique opportunity to participate in a one-week intensive workshop in New York City. Students will meet with photographers, art gallery directors, museum personnel, artists, studio assistants, and RIT alumni in NYC. There will be accompanying lectures and studio/museum/gallery visits. Students will gain an immersive exposure to the field of fine art, applied photography, and related industries. Course work includes researching: professional photography studios, art magazines, galleries, photo/art museums, and universities. Permission to enroll is required. Travel fees will be required.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 1
Typically Offered: Fall or Spring

PHGR-656 The Moving Image and Contemporary Practices (3 Credits)
This course will explore the history and evolution of the moving image in visual art. Students will use digital and analog technology to create new work expanding on the disciplines of photography and video. Throughout this course, students will explore time-based media, production techniques with editing and compositing software, and projection technologies to create and display video installations. Using a wide range of video, digital imaging, projection, and photographic artists and methods, students will have an opportunity to integrate the moving image into their individual discipline and portfolio of work. Students will also read and discuss published writings and work by established artists.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall or Spring

PHGR-660 Photography In Cuba (3 Credits)
This course will offer students an immersive educational experience while traveling and photographing in Cuba. Through photographic assignments, related field trips, and lectures, this course will introduce students to a new culture and environment, and critically engage with the concept of travel photography. Students will be exposed to challenges found in available light situations where they will photograph environments, architecture, and the people of Cuba. A final portfolio and exhibition will illustrate effective visual documentation of Cuban culture. Permission to enroll is required. Travel fees will be required.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

PHGR-661 Digital Bootcamp (1 Credit)
This course introduces graduate students to file management and non-destructive editing of photographs. Course content will cover best practices working with appropriate digital imaging software. At the completion of the course, students will understand how to create their own digital asset management library and prepare files for output for print.
Co-requisites: PHGR-662 or equivalent course.
Contact Hours: Laboratory 2
Typically Offered: Fall or Spring

PHGR-662 Fine Print Workflow (3 Credits)
This course will discuss the latest advances in digital workflow, best practices and output technology. Course content will emphasize the creation of an optimal and efficient fine art print workflow with repeatable results through the integration of various software and technological tools. Lectures will cover various substrate options along with archival issues and finishing. At the completion of this course, students will build optimized files and produce exhibition quality prints.
Co-requisites: PHGR-661 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring

PHGR-663 Forensic Photography (3 Credits)
This course will provide hands-on experience documenting crime scenes and related evidence and preparing those images for presentation in court. Topics covered will include crime scene management, evidence handling, crime scene documentation, general evidence documentation, photographic techniques for the enhancement of evidence, and court display preparation. At the conclusion of this course, students will be able to utilize forensic photography in their studio practice.
Contact Hours: Laboratory 1, Lecture 2
Typically Offered: Spring

PHGR-665 Color Photography Seminar (3 Credits)
This course is a study of color photography, exploring the hybrid technology between traditional film-based color photography and digital imaging. Students will learn how to properly expose color film and how to make analog contact sheets and photographic prints from their film. Current scanning practices and procedures for digital image editing will be outlined. Additionally, students will learn how to make digital negatives. Various methods of output and substrates will be discussed and explored. Students will conceive and design their own photographic project, producing a portfolio of prints.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring

PHGR-676 Preservation and Care of Photographs (3 Credits)
This course will explore the field of photographic conservation and professional practices. The class will introduce students to photographic conservation, organization in conservation and preservation, leading experts in the field as well as possible career opportunities.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

PHGR-698 MFA Photography Internship (1-3 Credits)
The Photography Internship will provide students with the option to work in the photographic field. Students may apply for internships to businesses based on the availability of positions and business needs. Students must obtain permission of an instructor.
Prerequisites: This class is restricted to students in IMGART-MFA with department permission.
Typically Offered: Fall, Spring, Summer

PHGR-699 MFA Photography Co-op (0 Credits)
Cooperative Education will provide photography students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in IMGART-MFA with department permission.
Typically Offered: Fall, Spring, Summer

PHGR-701 Histories and Aesthetics of Photography I (3 Credits)
This course, the first in a two-semester sequence, will present an overview of the multiple and intersecting aesthetics, applications, perceptions, and philosophies of photography. Readings and discussions will examine the emergence and establishment of fine art photography, documentary and photojournalism, photography in the sciences, commercial and pop-cultural photographic applications, photography in the political arena, and photography as a mode of social interaction and identity formation. The class will also study the evolving technical history of photographic processes and the proliferation of critical theoretical perspectives on the medium during its first 100 years.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall

PHGR-702 Histories and Aesthetics of Photography II (3 Credits)
This course, the second in the two-semester sequence, will offer an in-depth study of key historical, critical, and theoretical issues in photographic visual culture in the modern, postmodern, and contemporary periods. The course will explore aesthetic trajectories in modern and contemporary photography from the emergence of the modernist Avant Garde at the beginning of the 20th century to such contemporary phenomena as the deadpan aesthetic, performance documentation, fictive photography, and photographic appropriation. This course will also examine the evolving language of commercial photography, stylistic and ethical approaches to photojournalism, photography and the politics of the museum, vernacular photographies, and the presence of digital technologies and social media networks in the contemporary global media age.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

PHGR-703 Studio Core I (6 Credits)
This critique course, the first in a two semester sequence, will establish a working methodology, critically engage with peers, and develop a body of new artwork. At the conclusion of the semester, all students will participate in a work share event.
This course is restricted to IMGART-MFA Major students.
Contact Hours: Studio 9
Typically Offered: Fall

PHGR-704 Studio Core II (6 Credits)
This critique course is the second in a two semester sequence. Having established a working methodology in Studio Core I, students will continue to experiment and produce a significant body of work through critical engagement with their peers and their own research and experimentation. Successful completion of the course will result in advancement to half-candidacy via a formal review by MFA faculty.
Prerequisites: PHGR-703 or equivalent course.
Contact Hours: Studio 9
Typically Offered: Spring

PHGR-716 Integrated Practices I (3 Credits)
In this course students will integrate writing, research methods, and experimental problem solving skills to further develop studio practices through integrated project based assignments and projects. Students will hone their skills in art practices, critical analysis, strategies for making, and writing about artwork through developing expanded practices within studio experimentation and artistic thinking. Throughout the semester, the students will become familiar with multiple research facilities throughout the University and the region.
This course is restricted to IMGART-MFA Major students.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

PHGR-717 Integrated Practices II (3 Credits)
This course builds off Integrated Practices I, through projects and assignments designed to encourage experimentation and problem-solving in art making. The content will explore expanded forms of studio practice—including, but not limited to: installation art, book-making, video, performance, public art, and collaborative work. This course will also emphasize writing as a creative process integral to a successful studio practice.
Prerequisites: PHGR-716 or equivalent course.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

PHGR-721 Research Core I (3 Credits)
This course, following successful completion of half-candidacy, will outline the policies and procedures required for the MFA thesis defense and thesis publication for this program of study. Throughout the course, students will refine their research, presentation, and writing skills. Through assignments and in-class discussion and critique, students will begin developing their thesis defense presentations, conduct research relevant to their work, and begin drafting their thesis publication.
Prerequisites: This class is restricted to students in IMGART-MFA with department permission.
Contact Hours: Studio 6
Typically Offered: Fall

PHGR-723 Research Core II (3 Credits)
This course is the second in a sequence of two courses focusing on the completion of the thesis publication and thesis defense. Supported by the research tools and resources outlined in Research Core I, students will conduct mock defenses and complete all components of the thesis publication. At the conclusion of the course, students will successfully submit their thesis publication to ProQuest.
Prerequisite: PHGR-721 or equivalent course.
Contact Hours: Studio 6
Typically Offered: Spring

PHGR-724 Professional Development for the Emerging Artist (3 Credits)
This course prepares students for entering a career in the arts. Course content covers practical information related to professional practice such as crafting a CV, grant writing, writing an artist's statement, creating a professional application packet and researching exhibition spaces and other opportunities for artists.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

PHGR-776 Artist as Teacher (3 Credits)
This graduate seminar course will introduce students to practices and processes used for teaching art in higher education. The course will focus on the development of teaching methods and introduce graduate students to the scholarship of teaching. This course explores a range of perspectives on pedagogical practice, curriculum development, and the assessment of learning from the perspective of the visual arts will be covered. Course components include: readings, research, discussions, project assignments, lectures, and peer presentations. The final outcome will be a teaching portfolio including a teaching philosophy, course proposals, a detailed syllabus, sample class assignments, and evaluation and assessment guides. Blended learning will support classroom instruction, in addition to lectures and other forms of media.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PHGR-799 MFA Photography Independent Study (1-4 Credits)
An independent study allows graduate students in the Photography and Related Media program the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser, should propose a course of study or project with clearly defined goals and outcomes. Students must obtain permission of an instructor and complete the Independent Study Permission Form to enroll. **NOTE: Student must have a minimum 3.0 GPA *
Prerequisites: This class is restricted to students in IMGART-MFA with instructor permission.
Typically Offered: Fall, Spring, Summer

PHGR-887 Photography MFA Part-time Co-op (0 Credits)
Cooperative Education will provide photography students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in IMGART-MFA with department permission.
Typically Offered: Fall, Spring, Summer

PHGR-890 Thesis (6 Credits)
Students produce a thesis as a component of the MFA degree in Photography and Related Media. The completion of the thesis exhibition, from artwork to the installation, is the focus of this course.
Co-requisites: PHGR-721 or equivalent course.
Contact Hours: Thesis 6
Typically Offered: Fall, Spring

PHGR-892 Continuation of Thesis Imaging Arts (0 Credits)
The Continuation of Thesis Imaging Arts course provides students additional semester(s) to complete their thesis research, project, and thesis document.
Prerequisite: PHGR-890 or equivalent course.
Typically Offered: Fall, Spring

Physical Chemistry (CHMP)

CHMP-747 Principles of Magnetic Resonance (3 Credits)
This course is designed to present the theory of magnetic resonance from a physical chemistry perspective. Students will learn about isotropic and anisotropic proton-electron hyperfine, proton-electron dipolar, and proton-proton dipolar interactions; choosing basis functions and eigenfunctions for energy states; setting up the Hamiltonian; and solving for the energies of the states in both the rigid (solid) and rapidly tumbling (liquid) states. The dynamic nature of magnetic resonance will be developed from a kinetic perspective and focus on relaxation times, observable phenomena on the magnetic resonance timescale, and line broadening. Pulsed NMR will be presented from a classical perspective emphasizing spin packets, net magnetization, and rotation matrices through the Bloch equations.
Prerequisites: CHMP-442 or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMP-751 Colloid & Interface Science (3 Credits)
The parallel growth of nanotechnology and a molecular perspective in the medical and life sciences has focused attention on the colloidal domain structures of dimension 1 nm to 1 mm. This course will introduce colloid and interface science that will allow for an appreciation of the role of colloids in biological systems, industrial processes and commercial products.
Prerequisites: CHMP-441 or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

CHMP-752 Molecular Photophysics and Photochemistry (3 Credits)
This course provides a comprehensive and clear description of the concepts and principles of molecular photophysical processes and photochemistry. The practical methods required for associated photophysical characterization and measurement are presented along with important applications of molecular photonics in cutting-edge research. A review of quantum mechanics is given with the photochemist in mind such that the student is encouraged to make more use of quantum mechanical terms, quantities and concepts. The course covers the interaction of light with molecular orbitals to form an excited state, and its subsequent de-activation. Applications such as lasers, spectroscopy, photoinduced charge transfer in modern organic photovoltaics and photosynthesis are described.
Prerequisites: CHMP-442 or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

CHMP-753 Computational Chemistry (3 Credits)
This course will introduce students to an in-depth investigation into the computational theories and applications used to model complex physical and chemical phenomena. Computational methods are used to provide synergy linking experiment with theory involving such chemical processes as reaction mechanisms, docking, energy transfer and conformational conversions. Predicting spectral and thermodynamic properties of molecular systems and ensembles will also be treated.
Prerequisites: CHMP-442 or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Lecture 3
Typically Offered: Fall

Physician Assistant (PHYA)

PHYA-710 Graduate Project I (2 Credits)
This is the first of a two-course sequence which will provide the physician assistant student with opportunities to prepare a formal graduate capstone project/paper. Projects may be in the form of: clinical practice essay, PA curriculum development, medically-related community service project, in-depth medical case review, meta-analysis of specific disease / syndrome, or original medical research. This capstone project/paper will build on clinical training and enable students to build skills for life-long learning as problem solvers and critical evaluators of medical and scientific literature.
This course is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Independent Study 2
It may be used to fulfill one of the following: Writing Intensive: Program
Typically Offered: Summer

PHYA-720 Graduate Project II (2 Credits)
This course will provide the physician assistant student with continued preparation of a formal graduate project for the PA Program. Projects may be in the form of: clinical practice essay, PA curriculum development, medically-related community service project, in-depth medical case review, meta-analysis of specific disease/syndrome, or original medical research. This course will culminate with the completion of the capstone project/paper which is founded in clinical experience and enables students to build skills for life-long learning as problem solvers and critical evaluators of medical and scientific literature.
This course is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Independent Study 2
Typically Offered: Fall

PHYA-729 Clinical Epidemiology (3 Credits)
This course provides students with a foundation in epidemiological concepts from which infectious and non-infectious diseases manifest in acute and chronic settings. Course focuses on descriptive and analytical research designs, conditions associated with their use, and subsequent strengths and weaknesses. Principles of clinical epidemiology are applied to real-world clinical applications in addressing acute and chronic disease characteristics.
This course is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYA-750 Pediatrics (4 Credits)
This mandatory rotation in the field of pediatric medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-751 Internal Medicine (4 Credits)
This mandatory rotation in the field of general medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-752 Women's Health (4 Credits)
This mandatory rotation in the field of obstetrics and gynecologic medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-753 Emergency Medicine (4 Credits)
This mandatory rotation in the field of emergency medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-754 Surgery (4 Credits)
This mandatory rotation in the field of surgery provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-755 Orthopedics (4 Credits)
This mandatory rotation in the field of orthopedic medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-756 Geriatrics (4 Credits)
This mandatory rotation in the field of geriatric medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-757 Behavioral Health (4 Credits)
This mandatory rotation in the field of psychiatric medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework. (Matriculation into the fifth year of the PA Program)
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-758 Family Medicine (4 Credits)
This mandatory rotation in the field of family medicine provides hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-759 Elective Rotation (4 Credits)
This mandatory rotation in an elective field of medicine provides additional hands-on clinical exposure and experiences. This builds on solid basic medical knowledge and competencies acquired in the didactic, pre-clinical coursework.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Clinical 15
Typically Offered: Fall, Spring, Summer

PHYA-761 Professional Practice I (2 Credits)
This is the first in a sequence of courses designed for the physician assistant student in the clinical setting. The course will cover discipline specific areas including a pulmonary workshop and lectures on topics such as working with a pharmaceutical company, professionalism, and rehabilitative medicine. The course will also include an ongoing Evidence-Based Medicine (EBM) series and physician assistant national certification exam board review.
This class is restricted to students in PHYA-BS with at least 4th year standing or those students with graduate standing in PHYA-MS.
Contact Hours: Lecture 3
Typically Offered: Summer

PHYA-762 Professional Practice II (2 Credits)
This is the second in a sequence of courses designed for the physician assistant student in the clinical setting. The course will cover discipline specific areas including complementary medicine lectures and professionalism. The course will also include an ongoing Evidence-Based Medicine (EBM) series and physician assistant national certification exam board review.
Prerequisites: PHYA-761 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

PHYA-763 Professional Practice III (2 Credits)
This is the last in a sequence of courses designed for the physician assistant student in the clinical setting. The course will cover discipline specific areas including lectures regarding PA workforce issues, coding and billing, social service work and a resume writing workshop. The course will also include an ongoing Evidence-Based Medicine (EBM) series and physician assistant national certification exam board review.
Prerequisites: PHYA-762 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

Physics (PHYS)

PHYS-601 Graduate Physics Seminar I (1 Credit)
This course is the first in a two-semester sequence intended to familiarize students with research activities, practices, and ethics in university, government, industry, and other professional research environments and to introduce students to research tools and skill sets important in various professional environments. As part of the course, students are expected to attend research seminars sponsored by the School of Physics and Astronomy and participate in regular journal club offerings. The course also provides training in scientific writing and presentation skills. Credits earned in this course apply to research requirements.
Contact Hours: Seminar 2
Typically Offered: Fall

PHYS-602 Graduate Physics Seminar II (1 Credit)
This course is the second in a two-semester sequence intended to familiarize students with research activities, practices, ethics in university, government, industry, and other professional research environments and to introduce students to research tools and skill sets important in various professional environments. The course is intended to help students develop a broad awareness of current professional and funding opportunities. As part of the course, students are expected to attend research seminars sponsored by the School of Physics and Astronomy, to participate in regular journal club offerings, to engage in outreach activities, and to participate in visits to regional laboratories and companies. The course provides training in proposal writing and presentation skills. Credits earned in this course apply to research requirements.
Contact Hours: Seminar 2
Typically Offered: Spring

PHYS-610 Mathematical Methods for Physics (3 Credits)
This graduate-level course in mathematical physics covers partial differential equations, Bessel, Legendre and related functions, Fourier series and transforms.
Contact Hours: Lecture 3
Typically Offered: Fall

PHYS-611 Classical Electrodynamics I (3 Credits)
This course is a systematic treatment of electro- and magneto-statics, charges, currents, fields and potentials, dielectrics and magnetic materials, Maxwell's equations and electromagnetic waves. Field theory is treated in terms of scalar and vector potentials. Wave solutions of Maxwell's equations, the behavior of electromagnetic waves at interfaces, guided electromagnetic waves, and simple radiating systems will be covered.
Prerequisites: PHYS-412 or equivalent course or Graduate standing.
Contact Hours: Lecture 3
Typically Offered: Fall

PHYS-612 Classical Electrodynamics II (3 Credits)
This course is an advanced treatment of electrodynamics and radiation. Classical scattering theory including Mie scattering, Rayleigh scattering, and the Born approximation will be covered. Relativistic electrodynamics will be applied to charged particles in electromagnetic fields and magnetohydrodynamics.
Prerequisites: PHYS-611 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYS-614 Quantum Theory (3 Credits)
This course is a graduate level introduction to the modern formulation of quantum mechanics. Topics include Hilbert space, Dirac notation, quantum dynamics, Feynman's formulation, representation theory, angular momentum, identical particles, approximation methods including time-independent and time-dependent perturbation theory. The course will emphasize the underlying algebraic structure of the theory with an emphasis on current applications.
Prerequisites: This course is restricted to students in the PHYS-MS, ASTP-MS and ASTP-PHD programs.
Contact Hours: Lecture 3
Typically Offered: Fall

PHYS-616 Data Analysis for the Physical Sciences (3 Credits)
This course is an introductory graduate-level overview of techniques in and applications of data analysis in physics and related fields. Topics examined include noise and probability, model fitting and hypothesis testing, signal processing, Fourier methods, and advanced computation and simulation techniques. Applications are drawn from across the contemporary physical sciences, including soft matter, solid state, biophysics, and materials science. The subjects covered also have applications for students of astronomy, signal processing, scientific computation, and others.
Prerequisites: PHYS-316 or equivalent course or Graduate standing.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-630 Classical Mechanics (3 Credits)
This course is a systematic presentation of advanced topics in Newtonian kinematics and dynamics. Topics include Lagrangian and Hamiltonian formulations of dynamics, central force problems, rigid body kinematics and dynamics, theory of small oscillations, canonical transformations, and Hamilton-Jacobi theory.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYS-635 Emerging and Low-Dimensional Materials and Applications (3 Credits)
The purpose of this course is to introduce students to the fundamental physics of emerging nanomaterials, including graphene, transition metal dichalcogenides, and more for their applications in next generation nanoelectronics and optoelectronics. The course covers 2D materials physics, monolayer materials preparation and synthesis, transfer, optical spectroscopy and microscopy, and device fabrication and applications. In addition to lectures, the course includes hands on laboratory modules on basic fabrication, processing, and characterization of two-dimensional (2D) materials and devices.
Prerequisites: PHYS-532 or equivalent course or graduate student standing.
Contact Hours: Laboratory 2, Lecture 1
Typically Offered: Spring

PHYS-640 Statistical Physics (3 Credits)
This course is a graduate-level study of the concepts and mathematical structure of statistical physics. Topics include the microcanonical, canonical, and grand-canonical ensembles and their relationships to thermodynamics, including classical, Fermi, and Bose-Einstein statistics. The course includes illustrations and applications from the theories of phase transitions, solids, liquids, gases, radiation, soft condensed matter, and chemical and electrochemical equilibria. The course also treats non-equilibrium topics including the kinetic theory of transport processes, the theory of Brownian motion, and the fluctuation-dissipation theorem.
This course is restricted to students with graduate standing in PHYS or ASTP programs.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYS-667 Quantum Optics (3 Credits)
This course explores the fundamental nature of electromagnetic radiation. This course will introduce the student to the second quantized description of light with special attention to its role in a modern understanding of and far reaching utility in emerging technologies. Starting with an appropriate formulation for the quantum mechanical electromagnetic radiation field, we will study quantum mechanical models for interactions with matter, and we will test these models through a series of experiments.
Prerequisites: PHYS-411 and PHYS-414 or equivalent course or Graduate standing.
Contact Hours: Laboratory 3, Lecture 3
Typically Offered: Spring

PHYS-670 Teaching and Learning Physics (3 Credits)
This course covers the fundamentals of how students learn and understand key ideas in physics and how theory can inform effective pedagogical practice. Through examination of physics content, pedagogy and problems, through teaching, and through research in physics education, students will explore the meaning and means of teaching physics. Topics include: misconceptions, resources and phenomenological primitives, theoretical foundations for active-learning, constructivism, epistemological, affective, and social-cultural issues that affect learning, guided and unguided reflection strategies, design-oriented curricula, and effective uses of educational labs and technology. Useful for all students, especially for those in interested in physics, teaching and education research.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYS-689 Graduate Special Topics (1-3 Credits)
This is a graduate course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

PHYS-715 Advanced Quantum Theory (3 Credits)
This course is a graduate-level introduction to quantum mechanics that is a continuation of COS-PHYS-614. Topics include review and expansion of approximation methods, mixed states and density operators, identical particles, scattering theory, quantization of the nonrelativistic string, quantization of the electromagnetic field, interaction of radiation with matter, the Klein-Gordon and Dirac equations, and second quantization. Prerequisite: PHYS-614 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYS-720 Computational Methods for Physics (3 Credits)
This hands-on course introduces students to the different ways that scientists use computers to address problems in physics. The course covers root finding, interpolation, numerical differentiation and integration, numerical linear algebra, the solution of ordinary and partial differential equations, fast Fourier transforms, numerical statistics, and optional topics drawn from areas of current physics research. In each of these areas, students will write their own codes in an appropriate language.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-732 Advanced Solid State Physics (3 Credits)
This is an advanced graduate course in the physics of the solid state. Topics include crystal structure and scattering, models involving non-interacting and interacting electrons, solid-state physics of electronic components, cohesion and elasticity of solids, theory of phonons, and magnetic properties of solids.
Contact Hours: Lecture 3
Typically Offered: Spring

PHYS-751 Soft Matter Physics (3 Credits)
This course is a graduate-level study of the physics of soft matter systems. Topics include the forces between molecules and surfaces, statistical models of soft matter solutions, self-assembly, elasticity, and viscoelasticity. The course includes illustrations and applications to polymers, colloids, surfactants, liquid crystals, and gels.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-752 Biological Physics (3 Credits)
This graduate-level course in biological physics provides an introductory survey of biological physics, followed by the topics of (i) forces between atoms, molecules, particles, and surfaces important for living systems; (ii) equilibrium statistical physics solution models relevant for biological systems; (iii) self-assembling systems in living cells and organisms; (iv) elasticity and viscoelasticity in cells and organisms; and (v) examples of active matter.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-760 Radiation Interactions & Scattering Probes of Matter (3 Credits)
This course is a graduate-level study of the radiation-matter interactions with a particular focus on scattering as a probe of materials and condensed-matter systems. Topics include a classical treatment of electromagnetic radiation and scattering, quantum aspects of electromagnetic interactions, a survey of various types of photon and neutron scattering experiments, the physical basis of double-differential scattering cross-sections, and scattering as a probe of structure and dynamics.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-767 Optical Coherence and Light-Matter Interactions (3 Credits)
This graduate-level introduction to optics helps prepare students for research in cutting-edge optics laboratories and theoretical groups at RIT. Topics include diffraction, nature and propagation of temporal and spatial classical coherence, polarimetry, applications of second-order coherence, two-level systems, classical and semi-classical treatments of light-matter interaction, and selected topics from nonlinear optics.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-770 Advanced Methods in Physics Education Research (3 Credits)
This course provides an understanding of advanced quantitative and qualitative methods in physics education research, including statistical analysis of quantitative data, developing and conducting surveys and interviews in various formats analysis approaches for qualitative data, needs assessments, and program evaluation. The course is designed to prepare researchers to conduct high quality physics education research using various approaches; including case study, ethnography, mixed methods, and outcome-based research. Attention will also be paid to developing a research question that matches one's access to data and methodology, progressive hypothesis refinement, and crafting sound interpretations from rigorous data analysis. Students will also be introduced to institutional requirements, including Institutional Review Board (IRB) procedures and commonly used ethical trainings.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Biennially

PHYS-780 Graduate Physics Project (1-4 Credits)
This course is a graduate capstone project for students enrolled in the Professional Master's track of the MS Physics Program.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

PHYS-789 Graduate Special Topics (1-4 Credits)
This is a graduate-level course on a topic that is not part of the formal graduate physics curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
Typically Offered: Fall, Spring, Summer

PHYS-790 Graduate Research & Thesis (1-4 Credits)
Graduate-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

PHYS-791 Continuation of Thesis (0 Credits)
Graduate-level research by the candidate on an appropriate topic as arranged between the candidate and the research advisor.
Typically Offered: Fall, Spring, Summer

PHYS-799 Physics Independent Study (1-4 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for a graduate-level student.
Typically Offered: Fall, Spring, Summer

PHYS-889 PHYS Advanced Special Topics (1-3 Credits)
This is a PhD-level course on a topic that is not part of the formal curriculum. This course is structured as an ordinary course and has specific prerequisites, contact hours, and examination procedures.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

PHYS-890 Research & Thesis (1-6 Credits)
Dissertation research by the candidate for an appropriate topic as arranged between the candidate and the research advisor.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

PHYS-891 Continuation of Thesis (0 Credits)
Continuation of dissertation research.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

PHYS-899 Independent Study (1-3 Credits)
This course is a faculty-directed tutorial of appropriate topics that are not part of the formal curriculum. The level of study is appropriate for a PhD-level student.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring, Summer

Political Science (POLS)

POLS-616 Experiential Learning: Political Science (3 Credits)
The purpose of the Experiential Learning: Political Science option is to give students first-hand experience in an appropriate organization or study abroad program that meets the needs of the student's career objectives. Students are closely supervised at the host organization, developing their pre-professional skills while learning the organizations programs, agenda and methods.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

POLS-641 Peacekeeping and Conflict Transformation (3 Credits)
This course will provide an introduction to the dynamics of stabilization & reconstruction, and will address the complexities of the transformation from war to peace where the political, security, rule of law and economic elements are complex and interdependent. Students will discuss these patterns in the cases in Eurasia, the Middle East and Africa. M.Sc students will practice the type of analysis, planning, operations, and reporting used in national and multilateral agencies.
Contact Hours: Lecture 3
Typically Offered: Summer

POLS-642 War, Diplomacy, and State-Building (3 Credits)
This course will explore the process by which states disintegrate and fail, the armed conflicts that follow, and international peacekeeping and subsequent efforts to build institutions at the end of armed conflicts. It will consider cases in Eurasia, the Middle East and Africa. Students will consider the role of domestic and international actors, such as NATO, the US Government, the UN. They will explore these efforts in readings, class discussion, debates, presentation of research, and role-playing exercises. M.Sc. students will also practice the type of analysis, assessment and reporting used in national and multilateral agencies about these conflicts.
Contact Hours: Lecture 3
Typically Offered: Summer

Polymer Chemistry (CHPO)

CHPO-706 Polymer Synthesis (3 Credits)
This course is mainly about the chemistry applied to synthesize polymers. It includes initially the introduction on the naming and classification and some relevant properties of polymers. We will then discuss the two main methods of synthesizing polymers, namely step-growth polymerization and chain-addition polymerization. Among the step-growth polymerizations, syntheses of different types of polyesters, polyamides, polyurethanes etc. including the reaction mechanisms will be covered. Under chain-addition polymerizations, those by four different initiators (radical, cationic, anionic or coordinative) will be explained. The mechanisms of these types of reactions will be discussed in more detail and, where feasible, effects of stereochemistry or regiochemistry will be included. In addition to the commodity polymers in each category, also the syntheses of some specialty step-growth and chain addition polymers will be included. A few examples of reactions to obtain more reactive monomers will be mentioned. Some specialty type of polymerizations, such as living free radical types, or ring-opening and cyclization polymerizations, will also be discussed. We will include examples of post-polymerization reactions. Finally, we will discuss methods to resolve environmental issues with polymers by developing more sustainable polymers.
Prerequisite: CHMG-201 or MTSE-602 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

CHPO-707 Polymer Chemistry II (3 Credits)
This course further investigates the contemporary chemistry of high molecular weight polymers and macromolecules and the relationships between their structure, functionality, and utility. The course focuses on fundamental principles that govern swollen gels and soft matter. Mechanisms of the formation of polymers containing heteroatoms in their chains are examined in detail. Specific attention is given to the synthesis of polymers of controlled architecture and self-assembly, and of polymers and macromolecules. Dendrimers, hyper-branched polymers, functional polymers, polymeric reagents, polyelectrolytes, and biopolymers are also discussed.
Prerequisites: CHPO-706 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

CHPO-708 Polymer Synthesis & Characterization Lab (3 Credits)
Students will synthesize about eight polymers and characterize them carry by specific methods. In about half of those experiments step-growth polymerizations and in the other half chain-addition polymerizations will be performed. Among the polymers produced will be Nylon 6-10, Nylon 11, polystyrene, high-density polyethylene, linear low density polyethylene, copolymer of styrene and methyl methacrylate and polyurethane. The most specific types of polymerizations and reactions introduced will be cross-linking polymer, interfacial and bulk step-growth polymerizations, cyclopolymerization, radical, ionic and coordinative chain polymerizations. The methods of characterization which will be applied are infrared (IR) and nuclear magnetic resonance (NMR) spectroscopy, titrations, thermal gravimetric analysis (TGA), differential scanning calorimetry (DSC), measurement of swelling, and viscometry.
Prerequisites: CHMO-336 or equivalent course or Graduate Standing in CHEM-MS.
Contact Hours: Laboratory 8
Typically Offered: Fall

Print Media (PPRT)

PPRT-600 Graduate Seminar (0 Credits)
This course provides students that are new to the PPRT program an opportunity to develop an understanding of the school's research activities. The students will become more knowledgeable about the Print Media program, career options, and exit strategies including thesis, capstone and culminating experience. Relevant topics including finding an advisor, required documentation, and policies regarding program completion and Co-op, as well as school policies and procedures relating to the successful completion of the PPRT program.
Contact Hours: Seminar 1
Typically Offered: Fall

PPRT-601 Materials and Processes in Printing (3 Credits)
This course offers a survey of the materials and processes used in print reproduction. Students will learn the basic theory of image reproduction embodied in the available analog and digital printing processes, and learn to identify the process origins of print samples. Additionally, students will learn the chemical and physical properties associated with consumables in order to obtain an understanding necessary to make informed decisions about use and application.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

PPRT-602 Tone and Color Analysis (3 Credits)
This course covers fundamentals of color measurement, color management system, and color reproduction technology for color matching and color image reproduction. Emphases are placed on CIE colorimetry, device calibration and characterization, and color management systems.
Students cannot take and receive credit for this course if they have taken MAAT-544.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall

PPRT-603 Operations Management in the Graphic Arts (3 Credits)
An in-depth study of the factors affecting the efficiencies and effectiveness of print media organizations and ultimately their profitability. Includes consideration of both internal factors, such as quality level goals, training, scheduling, plant layout, and financial management, and external factors, such as environmental and legal issues and safety enforcement.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-618 TypoItalia: Typography Research in Northern Italy (3 Credits)
This course is designed to give students intensive educational experiences involving travel abroad to northern Italy. Cities visited in the class may include Venice, Parma, Treviso. The course will explore the history of typography while providing students with a cross-cultural outlook important to understanding the future of typography. Students will examine typography's rich history and modernization through travel abroad and investigate how research of the past can inspire innovation in the future. The course will include visits to typographic museums, lectures, guest speakers, hands-on experiences and activities as students conduct typographic research inspired as they travel. Travel expenses will be incurred for this course.
This course requires permission of the Instructor to enroll.
Typically Offered: Summer

PPRT-641 Digital Printing and Publishing (3 Credits)
This course provides students with the opportunity to learn the concepts and applications of digital printing. The course examines the technology of several major digital print engines and compares digital printing to conventional print processes. The economics and application of specific digital printing processes are examined from a workflow perspective. This course is cross-listed with MAAT-541; students may receive credit for MAAT-541 or PPRT-641, not both.
Students may not take and receive credit for PPRT-641 and MAAT-541. If you have earned credit for PPRT-641 or you are currently enrolled in MAAT-541 you will not be permitted to enroll in PPRT-641.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

PPRT-642 Industry Issues and Trends (3 Credits)
Industry Issues and Trends presents a detailed analysis of the critical trends and issues related to the Graphic Communications industry. It provides an in-depth analysis of key technologies with a special emphasis on emerging, disruptive innovations as well as business, environmental and regulatory issues. This course emphasizes technological trends and is intended to provide students with a fuller understanding of changes in Graphic Communication constituencies and their role within the industry. By tracing historical roots, analyzing present issues and detailing future trends, students are prepared to develop insights into the nature and scope of the major challenges facing industry leaders and how to manage these challenges. This course is cross-listed with MAAT-561; students may receive credit for MAAT-561 or PPRT-642, not both.
Students may not take and receive credit for PPRT-642 and MAAT-561. If you have earned credit for PPRT-642 or you are currently enrolled in MAAT-561 you will not be permitted to enroll in PPRT-642.
Contact Hours: Lecture 3
Typically Offered: Fall

PPRT-644 Advanced Color Management (3 Credits)
This course embraces ICC-based color management practices by assessing color reproduction quality quantitatively and psychometrically. It also examines state-of-the-art tools, procedures, and techniques for device calibration and color control. Students are expected to work in a team environment, to plan, conduct experiments, and to publish a technical publication.
Prerequisites: PPRT-602 or equivalent course.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

PPRT-650 Top Media Sci: TOPIC (3 Credits)
Topics in Media Sciences provides a platform for students to explore the most contemporary issues in the rapidly evolving fields of media arts, media sciences, and media technologies. A subtopic course description will be published each term the course is offered and may have limited repeatability. This course can be repeated.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PPRT-651 Lab Topics in Media Sciences (3 Credits)
Lab Topics in Media Sciences provides a lab-based platform for students to explore the most contemporary issues in the rapidly evolving fields of media arts, media sciences, and media technologies. A subtopic course description will be published each term and may have limited repeatability. This course can be repeated.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Fall, Spring

PPRT-653 Building Profit into Media Projects (3 Credits)
This course familiarizes students with costing and pricing practices in website development, print media, mobile media, and social media. It highlights areas of similarity in these media but more importantly focuses on those practices and customs that are unique to a specific medium. The course provides the necessary background for developing accurate media proposals that become contractual legal obligations and result in sustained profitability. This course is cross-listed with MAAT-563; students may receive credit for MAAT-563 or PPRT-653, not both.
Students may not take and receive credit for PPRT-653 and MAAT-563. If you have earned credit for PPRT-653 or you are currently enrolled in MAAT-563 you will not be permitted to enroll in PPRT-653.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-654 Conventional Graphic Processes (3 Credits)
This survey course covers a comprehensive review of conventional print production technologies, with emphasis on offset lithography, flexography, screen, and gravure printing methods. Hands-on laboratory experiences underscore the technical strengths and limitations of commercial applications of the various processes, including the materials such as substrates, inks and appropriate metrologies. Quality assurance and process control procedures specific to each process are featured, and appropriate industry standards and specifications are reviewed.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

PPRT-663 Technical Writing (3 Credits)
This course prepares a student to engage in a variety of written and oral communications necessary in academic, professional, and technical environments. Students are expected to produce appropriate audience-centered written materials based on techniques, organization, format, and style that are helpful for generating graduate-level writing. Students engage in peer-review of written documents.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-666 Typography Research (3 Credits)
The course builds on fundamentals and skills taught in introductory and advanced typography courses by developing methods of investigation, research, and analysis, with the goal of enabling students to conduct independent research. Students will choose individual typographic topics to research (e.g. technology, psychology, history, aesthetics, imaging, writing systems, culture, and society). Course lectures will survey these topics. Students each give presentations on their topics and prepare a written a report. The course emphasizes individual initiative and seminar participation.
This course is restricted to PRNTMED-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-671 Advanced Digital Asset Management (3 Credits)
In this course students will research the current and future trends associated with content management as well as digital asset management. This course includes archiving and retrieving practices for image and content repurposing. Students will understand the role of metadata in the automation of asset creation, storage, and retrieval. Best practices for digital asset management implementation strategies are emphasized.
Contact Hours: Lecture 3
Typically Offered: Fall

PPRT-678 Printing Process Control (3 Credits)
Students will gain a deeper understanding of the role of printing process control for repeatable color printing and predictable color image reproduction. Students will learn (1) how to use spectrophotometers to collect color measurement data from printed test targets, (2) how to use software to analyze color printing characteristics, including color gamut, tone value increase and gray balance. (3) press calibration methods, and (4) how to simulate the appearance of color image reproduction in various color-managed workflows. This course also covers relevant Committee for Graphic Arts Technology Standards (CGATS) and ISO printing standards, printing certification, and case studies for problem-solving in color-managed workflows.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

PPRT-688 Package Printing (3 Credits)
This course introduces students to the package printing industry. Printing processes, materials, production workflows and quality control systems used in package printing are introduced. Students will oversee the workflows relevant to package production, from concept to design to finished product. This course is cross-listed with MAAT-558; students may receive credit for MAAT-558 or PPRT-688, not both.
Students may not take and receive credit for PPRT-688 and MAAT-558. If you have earned credit for PPRT-688 or you are currently enrolled in MAAT-558 you will not be permitted to enroll in PPRT-688.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

PPRT-699 Print Media Grad Coop (0 Credits)
The co-op will provide students with the opportunity to work in the graphic communication field. Co-ops are typically paid work experiences and can be either part-time (10-15 hrs/wk) or full-time (min 35 hrs/wk). All co-ops must fall within an RIT term (fall, spring, summer). Department permission required.
Typically Offered: Fall, Spring, Summer

PPRT-703 Cross Media Workflow (3 Credits)
This course is designed to expose students to all the elements needed to execute media projects across platforms. Students will learn concepts in project management as it applies to leading cross media projects and teams. Concepts and tools necessary for the implementation of a cross media workflow will be discussed and reinforced with hands-on exercises. Additionally, content management and industry standards and practices such as color management, asset management, and image optimization for output will be studied and applied through the context of cross media workflows.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

PPRT-704 Research Methods and Trends in Graphic Media (3 Credits)
This course provides a foundation for conducting scientific research in the graphic communications industry. Students will learn the scientific methods, how to generate hypotheses and research questions, conduct secondary research, select the best research design to answer a research question, and how to analyze basic survey data. This course will also introduce students to the current issues in the industry in preparation for them to identify a thesis or capstone project problem.
Contact Hours: Lecture 3
Typically Offered: Fall

PPRT-705 Graphic Standards and Specifications (3 Credits)
Students will evaluate the differences between standards and specifications, and comprehend their respective roles in various graphic production processes. Governing bodies and the processes involved in standards creation are addressed. Relevant information and metrics are reviewed, and students will analyze and prescribe the standard(s) most relevant to particular production or research settings, as well as discuss the interrelationships and dependences of standards and process-specific specifications.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-706 Commercial Graphic Trends and Processes (3 Credits)
This course introduces students to the materials, technological processes and trends in conventional, digital, and functional print production. Theoretical models of innovation and change are covered and applied providing students with a robust comprehension of graphic communication constituencies and their role in various industry sectors.
Contact Hours: Lecture 3
Typically Offered: Fall

PPRT-748 Continuation of Capstone (0 Credits)
The course provides a student additional semester(s) to complete their capstone research, project, and documentation.
Prerequisites: PPRT-747 or equivalent course.
Typically Offered: Fall, Spring, Summer

PPRT-751 Advanced Materials in Graphic Communication (3 Credits)
This course offers an in depth study of the materials used in graphic communication. Students will learn the chemical and physical properties associated with consumables required by processes studied in the course in order to obtain an understanding necessary to make informed decisions about their use and application, with an emphasis on safety concerns.
Contact Hours: Laboratory 2, Lecture 2
Typically Offered: Spring

PPRT-763 Applied Data Analytics (3 Credits)
This course prepares a student to apply data analytics to understand the unmet and undefined content needs of a target audience. Students will learn secure and repeatable data analysis practices in a closed-loop cross media communications value chain.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-780 Thesis Seminar (3 Credits)
This course will guide and monitor the progress of graduate students in the development of their written thesis proposal as defined in the SMS Thesis Manual. Students will review their work regularly throughout the semester, with the Graduate Director, SMS faculty, and their thesis committee. Students will be guided in the refinement of their thesis topic and structuring their methodology. Students will determine their thesis committee and create their thesis timeline, outline, and proposal culminating in a formal thesis proposal defense.
Prerequisites: PPRT-704 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

PPRT-790 Thesis (6 Credits)
To conduct research on a topic relevant to the graphic arts industry. Topic must be approved by a committee comprising graduate faculty and an advisor.
Prerequisite: GRCS-701 or equivalent course.
Typically Offered: Fall, Spring, Summer

PPRT-796 Research Applications and Problem Solving (3 Credits)
The culminating experience provides students the opportunity to combine and incorporate learnings gained in coursework and other experiences and apply this knowledge in a pragmatic undertaking relevant to the graphic communication and allied industries. Topic must be approved course instructor.
Prerequisite: GRCS-701 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

PPRT-797 Capstone (3 Credits)
The capstone course provides students the opportunity to combine and incorporate learnings gained in coursework and other experiences and apply this knowledge in a written capstone project relevant to the graphic communication and allied industries. Topic must be approved course instructor.
Prerequisite: GRCS-701 or equivalent course.
Contact Hours: Project 3
Typically Offered: Fall

PPRT-799 Independent Study (1-6 Credits)
The student will work with a faculty adviser to create a series of readings, writings, or original research that addresses a key concern in the field of graphic communications.**NOTE: Student must have a minimum 3.0 GPA **
This course is restricted to PRNTMED-MS or MEDART-MS Major students.
Typically Offered: Fall, Spring, Summer

PPRT-887 Media Sciences Grad Part-time Coop (0 Credits)
The co-op will provide students with the opportunity to work in the graphic communication field. Co-ops are typically paid work experiences and can be either part-time (10-15 hrs/wk) or full-time (min 35 hrs/wk). Department permission required.
This course is restricted to PRNTMED-MS or MEDART-MS Major students.
Typically Offered: Fall, Spring, Summer

PPRT-892 Continuation of Thesis Print Media (0 Credits)
This course allows the student to continue thesis research on a topic relevant to the graphic arts industry. Topic must be approved by a committee compromising graduate faculty and an adviser.
Prerequisites: PPRT-790 or equivalent course and student standing in PRNTMED-MS.
Typically Offered: Fall, Spring

Printmaking (PRNT)

PRNT-601 Printmaking (3 Credits)
This course is designed to introduce advanced printmaking technical concepts and techniques. The focus will be on intaglio printmaking research and how to creatively apply techniques that will result in sophisticated works of art. Course may be retaken. ** Fee: A materials fee is required for this course**.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

PRNT-602 Photo Print Processes (3 Credits)
This course explores photographic printmaking techniques, including screenprinting on paper and glass surfaces. Course content and discussions will focus on the relationship and relevancy of printmaking processes to photographic imagery. At the completion of this course, students will understand the formal and conceptual implications of media, process and form. **Fee: A materials fee is required for this course, and an additional course fee applied via student account**
Contact Hours: Studio 6
Typically Offered: Fall or Spring

PRNT-607 Printmaking I (6 Credits)
This is part one of a two-part advanced certificate in non-toxic printmaking for highly motivated students who are able to sustain their work independently. This course is designed to introduce basic non-toxic printmaking technical concepts that may also include techniques such as Intaglio-Type, A.R.E., screen, relief, monoprint, digital transfer, halftone, photo, and the art of the master printer. The focus will be on non-toxic intaglio printmaking research and how to creatively apply techniques that will result in works of art.
This course is restricted to NTIPRT-ACT Major students.
Contact Hours: Lecture 2, Studio 4
Typically Offered: Fall

PRNT-608 Printmaking II (6 Credits)
This is part two of a two-part advanced certificate in non-toxic printmaking for highly motivated students who are able to sustain their work independently. This course is designed to introduce advanced level non-toxic printmaking technical concepts that may also include one or more of the following techniques; Intaglio-Type, A.R.E., screen, relief, monoprint, digital transfer, halftone, polyester plate litho, photo, and the art of the master printer. The focus will be on non-toxic intaglio printmaking research and how to creatively apply techniques that will result in more sophisticated works of art.
This course is restricted to NTIPRT-ACT Major students.
Contact Hours: Lecture 2, Studio 4
Typically Offered: Spring

Professional Studies (PROF)

PROF-621 Proposal Writing (3 Credits)
This course focuses on reviewing examples of the elements of proposal responses and practicing creating those elements. Students learn the process of evaluating and responding to RFIs and RFPs with concentration on making bid decisions, organizing teams, identifying strategies, establishing credibility, ensuring technical clarity, taking advantage of technology, applying creativity, and writing persuasively. Topics include the proposal process that is practiced by government, industry, and grant-funding agencies.*Note: co-listed with TCOM-514.*
Contact Hours: Lecture 3
Typically Offered: Spring

PROF-644 Science Writing (3 Credits)
Course introduces students to the writing process for describing scientific and technological subject matter for presentation to general audiences. Students will learn to gather needed source material and organize, write and edit articles that cover developments in the scientific and technological communities. Various article formats used in professional, in-house, trade, and popular publications are presented. *Note: co-listed with TCOM 544. Students cannot receive credit for both.*
Contact Hours: Lecture 3
Typically Offered: Fall

PROF-661 Data Analytics for Smart Cities (3 Credits)
Within the city framework, information technologies are a key for providing new services and applications that contribute to success. This course examines a cross-section of information and computing technologies that can best contribute to city sciences. Students will learn of the concept of the Internet of Things, geographic information systems (GIS), ubiquitous computing, and wearable interfaces as they relate to future cities. Additionally students will look at existing technologies in environmental sensing for monitoring and improving cities. This course is only offered at RIT Dubai campus.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-662 Technology Infrastructure for Smart Cities (3 Credits)
The thinking within modern cities has changed dramatically in the past decade with the emergence of information and communication technologies (ICT). Previously, the existence of useful infrastructure was considered to be a beneficial but not essential factor in influencing development. Presently, a modern, flexible infrastructure is considered to be a requirement for any modern city. Its absence is a sign of underdevelopment. This course presents current and future ICT development along with techno-economic deployment scenarios and provides breadth in understanding the limits and potential of information and communication technologies. This course is only offered at RIT Dubai campus.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-705 Context and Trends (3 Credits)
The gateway course for students enrolled in the MS in professional studies degree program. Course provides students with opportunities to interact about controversial issues while discovering foundational knowledge about interdisciplinary history, theory, along with applied problem-solving, research methods and professional ethics. Students use this course as a means of designing and receiving approval for individualized plans of study. (Department permission required). Students should consult their adviser before registering.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-709 Graduate Salon: Disciplines on the Boundary (1 Credit)
To address complex problems, it is essential to explore how different disciplines talk to each other. By engaging in acts of "translation," disciplinary boundaries can be crossed to collaboratively and responsibly connect the ways disciplines frame and engage problems. The Salon will provide a venue for exploring how to think, talk, and work successfully across disciplinary boundaries. In our global society, graduates must think critically and ethically to assess complex interconnected systems and processes, perform in a variety of situations, and continually adapt within rapidly evolving technological and social environments. We will explore different disciplinary cultures and develop the translational skills required to understand how various disciplines converge on a given research problem. Salon themes include: Disciplinary World Making; Nature of Cognition & Consciousness; Conceptions of Science and Technology; Roles of Religion and Culture; Constructions & Interpretations of Time, Space & other Fundamentals; Chaos Theory; Disruption and the Creation of New Knowledge; Nature of Translation; and others.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Seminar 2
Typically Offered: Spring

PROF-710 Project Management (3 Credits)
This course addresses project management from a multidisciplinary perspective, covering the fundamental nature of and techniques for managing a broad range of projects. Topics cover the Project Management Life Cycle from Planning to Termination. It also addresses the behavioral and quantitative facets of project management, as well as the use of methods, tools and techniques for the initiation, planning, and execution of projects. Introduces the standard framework, processes and knowledge areas of the Project Management Institute. *Note: Bachelors degree or minimum of 5 years of work experience in a project related business environment. Recommended education or work experience in organizational behavior, mathematics and basic accounting.
*Note: BUSI-510 may not be substituted for BUSI-710 in a graduate concentration or the advanced certificate in project management. Additionally, a student may not register for and receive credit for both BUSI-510 and BUSI-710, whether taken as an undergraduate or graduate student.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PROF-711 Advanced Project Management (3 Credits)
Advanced Project Management covers the topics necessary for implementation of and excellence in project management. It deals with turning the principles and theory of project management into practice. The course addresses the best practices for project management in the world; project portfolio management and ROI; the project office and Six Sigma; project risk management and integrated projects; corporate cultures, behavior, and cultural failures; informal, adaptive, and extreme project management; and critical chain project management. Integrates aspects of the framework, processes and knowledge areas of the Project Management Institute. *Note: Advanced Project Management is available in on-campus and online formats.
Prerequisite: (PROF-710 or DECS-744 or ISEE-750) or PROF-714 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PROF-712 International Project Management (3 Credits)
With the increasing frequency of globalization, mergers, and acquisitions, international projects are becoming more prevalent and approaching the norm for many organizations. This course addresses a wide range of international projects—based in different industries and multiple countries. It deals with cultural and social differences within firms; cultural and social differences among countries and within countries; languages and dialect variations; different management practices and structures; religious practices; legal, regulatory, and reporting requirements; technology and infrastructure differences in different regions; and time zone differences. Incorporates aspects of the framework, processes and knowledge areas of the Project Management Institute.
Prerequisite: PROF-710 or PROF-711 or PROF-714 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PROF-713 Program Management for Product and Service Development (3 Credits)
Merely having an idea isn't enough for Organization success. It's the execution of the best possible idea that delivers value to an organization's shareholders. Organizations must have both the ability to choose their opportunities wisely and the ability to execute programs competently. Program Management is the discipline that integrates organizational strategy with activities, skills, tools, and techniques to ensure that organizations are choosing the best opportunities and executing with discipline. We explore the five domains of Program Management from the Project Management Institute (PMI) through a combination of readings, case studies and project work: Program Strategy Alignment, Program Benefits Management, Program Stakeholder Engagement, Program Governance and Program Lifecycle Management. We will explore the role of the Program Manager using product and service development and enhancement/development of organization capabilities as context.
Prerequisite: PROF-711 or PROF-715 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PROF-714 Agile Project Management (3 Credits)
Business agility allows organizations to quickly adapt to new markets. In a fast paced ever changing world of highly competitive products and services, organizations need to be able to deliver solutions to market quickly in an uncertain environment. Agile Project Management provides an iterative and incremental framework to explore and deliver high risk solutions efficiently in a rapid response timeframe. We will explore Agile Project Management practices across multiple industries including Agile project roles following the Project Management Institute® Agile Practice Guide.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-715 Agile Leadership and Self Organizing Teams (3 Credits)
Agile Leaders are able to work effectively in unpredictable and ambiguous situations. Being adaptable, promoting innovation and modeling a learning organization set apart Agile Leaders from their more traditional counterparts. We will explore the servant leadership characteristics of Agile leaders, how they create and lead self organizing teams, how they drive value into everything they do balancing agility with strategy without creating an environment of chaos. Additionally, we will explore the Agile Culture which allows for both dynamic approaches to the business while also ensuring clear strategy and stability for the employee community. We will explore the facets of an Agile Culture across various industries that promote a customer centric approach of value through empowered employees.
Prerequisite: PROF-714 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-716 Agile and Design Thinking (3 Credits)
Finding and implementing solutions to customer problems that are both adaptable and incremental provide for the greatest flexibility and return on investment. Agile and Design Thinking supports project teams working in an environment that requires innovation as well as dealing with uncertainty. Agile encourages a collaborative relationship with customers that promotes flexibility to meet business needs. By focusing on the human element and customer experience, Agile and Design Thinking provide a framework for engaging customers in ensuring prioritization of organization, product and service solutions that deliver frequent value for the business.
Prerequisite: PROF-714 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-717 Agile Project Management in Practice (3 Credits)
The purpose of this course is to provide students the opportunity to identify a business problem and utilizing Agile Project Management, develop a plan and implement two sprints as a demonstration of final proficiency in Agile Project Management. The topic selected by the student will be guided by the faculty teaching the class and it will require the student to coalesce and incorporate into the final project a culmination of all their course work in the Agile Project Management course series.
Prerequisite: BUSI-715 and BUSI-716 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

PROF-719 MSPM Capstone Experience (3 Credits)
This course guides the student through the final experience of the MS in project management degree - the Capstone Project Experience. Students will use a case study-based approach to analyze a business situation and prepare a response using learning from the program. Course requirements involve completing a literature review, engaging in online discussion with faculty adviser and other SOIS capstone students, various kinds of field work and preparing a case study response.
Prerequisites: Completion of three (3) courses in PROF is required, including either PROF-711, PROF-712, PROF-713, PROF-715 or PROF-716 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PROF-720 Individual Leadership Development (3 Credits)
Long-term success and growth as a manager requires more than the requisite technical skills. How can you differentiate yourself from the many other managers in the global job market? Strong leadership skills enable you to stand out in the crowd and demonstrate your unique value to your team and the organization. A manager with a combination of effective technical skills and strong leadership skills will find him/herself in a position of strength within their team and organization. Are you one of these managers? If not, this course is designed for you and will help you create a personal plan for continued development. Topics include leadership styles, being a leader your team wants to follow, communication styles that resonate with others, the reality of office politics, and operating with mutual understanding and responsibility.
Contact Hours: Lecture 3
Typically Offered: Spring

PROF-721 Building High Performance Teams (3 Credits)
High-performing teams (HPT) are critical to maintaining an organization's competitive advantage. HPTs are critical to the success of an organization, and leaders do much more than manage these teams—they develop their teams with the goal of achieving success for their organization. Teams rely on their leader for guidance and encouragement; they'll respond positively to quality leadership, by building stronger relationships and rising to challenges. This course is designed to provide you with research-based, proven strategies to help develop and foster high-performing teams. Topics include building, fostering and coaching HPTs; leading globally dispersed/remote teams; diversity awareness in HPTs; facilitating group problem solving and decision-making; negotiation and conflict management; and crisis management.
Contact Hours: Lecture 3
Typically Offered: Summer

PROF-730 Introduction to Future Foresight (3 Credits)
This course exposes students to the concepts, tools and techniques necessary to develop an understanding of the challenging area of future foresight, where the focus is on anticipating and initiating future ideas, plans, trends, and issues. The course will cover topics that are relevant and important to today's leaders, decision makers, entrepreneurs, strategists and others Topics include the future foresight approach with analysis of practice and theory, discussion and analysis of pertinent issues raised by future foresight design and application, future foresight developments and relevant issues, and the impact of future foresight on organizational planning and development. The use of future foresight approaches and tools in the UAE will be benchmarked with international, regional and local settings where lessons will be drawn.
Co-requisite: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-731 Systems Thinking (3 Credits)
This course focuses on the introduction and use of leading-edge systems thinking and modelling tools that are necessary to diagnose and solve complex business and social problems. Students will learn how to implement a flexible and powerful approach to structuring managerial problems and visualizing the interconnectedness of business, social and environmental systems. The development of skills to conceptualize and build simulation models of an enterprise, enabling the exploration of the dynamic consequences of different strategy/policy decisions and the identification of key leverage points in the system, is a central goal of this course. Systems thinking in business and public policy as it pertains to firm growth and stagnation, competitive strategy, capability development and human resource policies, environmental sustainability, and the boom and bust dynamics of start-up businesses will be explored. Successful Industrial applications of applied systems thinking and business dynamics will be reviewed.
Co-requisite: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-732 Scenario Development and Analysis (3 Credits)
The development and analysis of realistic future scenarios provides an organization with a useful and pragmatic framework for making better, more flexible decisions concerning its own strategy or longer-term development issues, as well as, in some instances, shorter-range operational or market-oriented questions. While most business organizations carry out some kind of strategic planning, those that include a futures component in the process gain a decided advantage, as they will have considered alternative future landscapes rather than basing their plan on the assumption that one particular future will materialize. This approach involves not only understanding a range of outcomes that might plausibly develop a given strategic environment, but also, using this vision to formulate resilient strategies and bring about organizational alignment and buy-in. In this course, students will learn the methodology for building future scenarios and will apply them to real-life examples in order to develop a portfolio of realistic scenarios for a specific organization or industry.
Co-requisite: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-733 Scenarios for Future Planning (3 Credits)
This course focuses on integrating scenarios into strategy. Strategic planning requires – but sometimes fails to take fully into consideration – identifying and monitoring emerging issues, as well as understanding how current trends, already identified, could intensify, change, or dissipate. All of these changes could have a significant impact on the future business landscape. Scenario planning therefore offers a clear advantage to strategy/policy makers, since it helps them foresee this new landscape, and their plans can accordingly be more realistic, more flexible, and more credible. Working in teams, students will delve deep into the scenarios they have devised in the previous term and elaborate strategic recommendations for each one. They will then assess these strategies in terms of operational and financial planning.
Prerequisite: PROF-732 or equivalent course. Co-requisite: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-734 Analytics and Artificial Intelligence (3 Credits)
Leveraging big data to deliver solutions to complex challenges requires an organizational leadership that is responsible for understanding and directing these approaches to achieve their business goals. Rather, organizational leadership is responsible for understanding and directing these approaches to achieve business goals. Toward this end, this course provides students with the knowledge and confidence needed to imbue organizations with innovative, efficient, and sustainable aspects that will carry them into the future through an understanding and application of business analytics and artificial intelligence (AI). Students will gain a theoretical and working knowledge of data science, enabling the identification of the challenges that analytics, machine learning, and artificial intelligence can address. An introduction to the ethical and social implications of analytics and AI in terms of guiding an organization's strategic assets for the future will also be presented.
Co-requisite: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-736 Strategic Planning (3 Credits)
Drawing on the principles of systems thinking and complex adaptive systems, this course provides students with a complete guide for writing and implementing a strategic plan with special emphasis on the unique requirements of development in the Middle East and North Africa (MENA) region. In particular, the UAE's extensive experience and special focus on long-range planning in various sectors, enabling it to become a competitive leader in the world, will be a highlight of this course. Developing mission and vision statements that communicate values and serve as a guiding force within an organization; framing new and flexible approaches for planning; comparing business, long-term, and strategic plans; and understanding the importance of formal and informal mandates will be addressed. Particular emphasis will be placed on effective strategy development specifically for complex and uncertain policy environments in the public sector.
Co-requisite: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-740 Fundamentals of Data Analytics (3 Credits)
This course introduces students to foundational skills in data analytics, with a focus on mathematical foundations. Students will explore topics that form the backbone of modern data analytics such as machine learning, data mining, artificial intelligence and visualization. Tools for statistics will be introduced to students for how to go from raw data to a deeper understanding of the patterns and structures within the data, to support making predictions and decision making.
Contact Hours: Lecture 3
Typically Offered: Fall

PROF-741 Enterprise Infrastructure for Data Analytics (3 Credits)
This course introduces students to the challenges in large and small organizations related to data analysis and storage. Students will be introduced to economic infrastructure approaches for handling data securely. Platforms which are hosted both on-premises of organizations and in the cloud will be covered in this course.
Contact Hours: Lecture 3
Typically Offered: Fall

PROF-750 Structures of City Systems (3 Credits)
The course provides students with a comparative and analytical view of how different departments within a city are managed and work together. Students will learn about the role of city departments like security and safety, transportation, energy, water, sanitation and waste, how they work together today, and how they will need to interact in a smart city environment. This course will compare and contrast the collaborative nature of city government departments in various regions, including Europe, Asia, India, the Middle East, Africa, and the Americas, and students will analyze how technology can help build a more collaborative structure between these departments in cities of the future. Students will develop a foundational understanding of how urban departments are managed and will be managed in the future.
Prerequisites: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-751 Resource Contexts for Smart City Development (3 Credits)
In the evolution of cities, the use of technology in cities creates value. With the rise of the smart city and the use of IoT instrumentation (i.e. network-connected devices), robots, AI and so on, how do cities purporting to be "smart" evaluate the investment that goes into these new technologies and where do they raise the finances necessary to implement it? What do we know about the economics of the "smart city"? This course provides students the opportunity to understand how the use of technology supports OPEX (operating expenditures) and CAPEX (capital expenditures) optimization in urban projects. Students will understand where the funding to support this implementation comes from – internal city finances, public-private partnerships, or external sources. With recent data, this course describes the financial feasibility of numerous urban projects from buildings, energy, telecommunications, transportation, water and wastewater, public safety security, and health and human services. The cost savings in projects due to integration of systems, IoT instrumentation, connectivity, interoperability, data management, computing resources and analytics will also be examined.
Prerequisites: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PROF-770 Proposal Seminar (0 Credits)
This course guides the student through preparation of the Capstone Proposal that is required for the applied final course of his/her MS in professional studies degree - the Capstone Project. Student will determine a Capstone Project concept, and articulate the methods for implementing the Capstone Project. The course concludes with a paper describing the Capstone Project, including background and description, methodology, anticipated outcomes, and probable Capstone Adviser. Student will meet regularly with the course facilitator. Upon successful completion of this course, student will be registered for the Capstone Project. (Pre-requisites: PROF-705 and core coursework; course restricted to MS in professional studies students)
Contact Hours: Seminar 3
Typically Offered: Fall, Spring, Summer

PROF-775 Capstone Project (3-6 Credits)
The capstone course for students enrolled in the MS in professional studies degree program. With individualized advising from a faculty adviser, students participate in a real world problem solving project carried out in an organizational setting while also relating to a student's professional concentrations. Course requirements involve completing a literature review, writing a project proposal, engaging in online discussion with faculty adviser and other SOIS capstone students, various kinds of field work, writing full draft and final academic report and making a (Powerpoint) presentation. Registration completed on behalf of students following faculty review of acceptable capstone project proposal. (Prof 770; Department approval)
Contact Hours: Project 3
Typically Offered: Fall, Spring

PROF-776 Thesis (3 Credits)
The research and thesis course unfolds over two semesters. Students will receive instruction in standard research methods, as well as the best practices for writing and presenting project findings. The remainder of the course is devoted to students working individually with a faculty supervisor on the research, organization, analysis, and eventual presentation of their project findings. To complete the thesis course, students must successfully defend their work before a committee consisting of a representative sample of the program faculty, the student's supervisor, and the program director. The committee is responsible for determining the student's final grade for the thesis. The course is graded on the (R, U, or I) basis with a successful defense of the completed thesis being the deciding factor. Department approval required for enrollment.
Prerequisites: PROF-770 or equivalent course.
Contact Hours: Thesis 90
Typically Offered: Fall, Spring, Summer

PROF-780 Continuation of Capstone Proj (0 Credits)
Continuation of Capstone Project
Prerequisites: PROF-775 or equivalent course.
Typically Offered: Fall, Spring, Summer

PROF-790 Data Analytics for Emerging Technologies (3 Credits)
This course explores the emerging technologies that are driving the acceleration of applications and the data produced by them Big Data and its 5V characteristics – volume, velocity, veracity, variety and value – across industry, research and academia. Students will be introduced to a range of complemented technology disciplines like cybersecurity, virtual content delivery, artificial intelligence, and smart cities where the uses of real-time analysis on big datasets are applied. Particular focus will be paid to a review of a number of industry verticals and data related to how emerging technologies are used with an emphasis on privacy and ethical considerations.
Prerequisites: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall or Summer

PROF-792 Data Analytics Transformations (3 Credits)
This course allows participants to depict the challenges of data analytics projects and guides them to use the necessary leadership, innovation, entrepreneurial and data analytics skills to develop successful data-driven business models for economic value creation.
Prerequisites: PROF-705 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PROF-798 Independent Study (3 Credits)
Prerequisites: Graduate standing and permission of faculty.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Independent Study 3
Typically Offered: Fall, Spring, Summer

PROF-799 Special Topics (1-4 Credits)
Special topics are experimental courses announced as offered. Variable credit.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

Psychology (PSYC)

PSYC-600 Field Experience I: Professional School Psychology Foundations (3 Credits)
The purpose of the course is to introduce students to the field of school psychology. The student will participate in field and in-class activities enabling them to obtain firsthand knowledge and familiarity with the roles and functions of school psychologists, along with an introduction to the expected competencies required of school psychologists by state and national accrediting bodies. Field experiences will also give students the opportunity to gain firsthand knowledge and familiarity with school systems, collaborative problem solving, micro-skills in counseling, classroom management, and relevant professional and legal issues.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-601 Field Experience II: Professional School Psychology Foundations (3 Credits)
The purpose of the course is to continue to immerse students in the field of school psychology. The student will participate in field and in-class activities enabling them to obtain firsthand knowledge and familiarity with current topics and issues that impact school psychologists. Field experiences will also give students the opportunity to gain firsthand knowledge and familiarity with the necessary competencies required of school psychologists by state and national accrediting bodies. These competencies and topics may include, but are not limited to: collaborative problem solving, bullying, learning disabilities, evidence based interventions, counseling, consultation, classroom management, applied behavioral interventions, curriculum based measurement, and relevant professional and legal issues.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-603 Ethical and Legal Issues (3 Credits)
This course reviews the laws and ethical principles that affect the practice of school psychologists within a school-community systems context.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Typically Offered: Spring

PSYC-620 Interpersonal Intervention Skills (3 Credits)
This course presents counseling theories, techniques and strategies for working with children and adolescents and their families. It is designed to develop basic counseling and crisis intervention skills. Three areas that are given the most attention are developing one's counseling knowledge base, developing one's basic psychotherapeutic communication skills and developing one's self awareness.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-630 Academic Assessment (3 Credits)
Students of this course will study assessment generally, types of tests and their uses, strengths and weaknesses of specific instruments, principles of reliability and validity, scales, and norms. Students will acquire an understanding of the quantitative and qualitative aspects of measurement. Extensive practice will be given in the administration and scoring of standardized assessment procedures. Emphasis will be placed on the use of various academic assessment procedures in schools and other settings.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-631 Cognitive Assessment (3 Credits)
This course concentrates on the development of theory and applied skills in intellectual assessment. Students learn to select and administer individual intelligence tests, to interpret results, to form test-based recommendations for intervention, and to provide written and oral reports. Assessment of persons who are culturally different or disabled is emphasized.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-632 Social-Emotional Assessment (3 Credits)
This course uses interviews, behavioral observations, rating scales, and projective measures for the assessment of child and adolescent personality and adaptive behavior. Students gain experience in administering, interpreting, and reporting results of measures currently used in the practice of psychology in the schools.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-640 Graduate Statistics (3 Credits)
This course reviews descriptive and inferential statistics. Basic and advanced conceptual material will be presented to assist students in their understanding of diverse data analytic methods, their appropriate application, and how to interpret statistical analyses. Topics include one- and two-sample inferential procedures, interval estimation, correlation, nonparametric tests, linear regression, and analysis of variance. Students will learn to integrate concepts with computer applications. Course content will be taught through lectures, discussion, and applied data analysis exercises. Student mastery of the material will be evaluated through small group discussion of data set analyses, written results of the analyses following APA style, and two exams.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PSYC-641 Applied Psychology Methods (3 Credits)
This course explores various types of applied research methods as well as important methodological issues and concepts in areas of applied psychology. Methodologies studied include experimentation, quasi-experimentation, content analysis, surveys, and interviews. Methodological issues cover research ethics, reliability, threats to internal and external validity, demand characteristics, volunteer participant problems, and issues in sampling.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-642 Graduate Research Methods (3 Credits)
This course provides students with sufficient background in the skills and knowledge necessary to be able to conduct psychological research on a wide variety of problems. In addition to introducing students to numerous research methods used in the discipline, the course will also assist students in planning their thesis research proposal. In parallel with covering core topics in research methodology (such as varieties of data, the role of theory and models in science, psychophysiological methods, subjective methods, and experimental design) the course is designed to guide students through the process of creating a feasible research proposal. Students will also use data to test their designs and practice their analyses.
This course is restricted to EXPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

PSYC-650 Applied Behavior Analysis (3 Credits)
This course reviews scientifically-based principles, concepts, and methods of behavior analysis. Topics covered include behavioral assessment, data analysis, and approaches to behavior change. A special focus is on the functional behavioral assessment process within schools. Students will learn to develop assessment-based behavior intervention plans, which are tailored to the unique needs of individual students, through a collaborative problem-solving process involving families and school staff.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-681 Natural Language Processing and Large Language Models I (3 Credits)
This course provides theoretical foundation as well as hands-on (lab-style) practice in computational approaches for processing natural language text, for problems that involve natural language meaning and structure. The course has relevance to cognitive science, artificial intelligence, and science and technology fields. Large language models and machine learning, including standard and deep neural network methods, is a central component of this course. Students will develop natural language processing solutions individually or in teams using Python, and explore additional relevant tools and LLMs or related foundation models. Expected: Programming skills, demonstrated by coursework or instructor approval.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-682 Natural Language Processing and Large Language Models II (3 Credits)
Study of a focus area of increased complexity in natural language processing, including large language models. The focus varies each semester. Students will develop skills in computational linguistics analysis in a laboratory setting, according to professional standards. A research project plays a central role in the course. Students will engage with relevant research literature, research design and methodology, project development, and reporting in various formats.
Prerequisite: PSYC-681 or (IDAI-610 and IDAI-620) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-684 Graduate Speech Processing (3 Credits)
This course introduces students to speech and spoken language processing with a focus on real-world applications including automatic speech recognition, speech synthesis, and spoken dialog systems, as well as tasks such as emotion detection and speaker identification. Students will learn the fundamentals of signal processing for speech and explore the theoretical foundations of how human speech can be processed by computers. Students will then collect data and use existing toolkits to build their own speech recognition or speech synthesis system. This course provides theoretical foundation as well as hands-on laboratory practice. Expected: Programming skills, demonstrated by coursework or instructor approval.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-699 Psychology Co-op (0 Credits)
Co-op in psychology.

PSYC-701 Advanced Practicum I: Issues in Diversity (3 Credits)
The purpose of the course is for students to continue to participate in supervised field experiences in school/clinical settings along with a didactic component emphasizing the development and application of a multicultural and contextual lens within their field experiences. Students will gain knowledge necessary to work effectively with students from a wide variety of contextual, cultural, and linguistic backgrounds. Topics include but not limited to: multicultural theory, culture, cultural identity, social class, race and ethnicity, gender issues, religion and spirituality, and sexual orientation.
Prerequisites: PSYC-600 and PSYC-601 or equivalent courses.
Typically Offered: Fall

PSYC-702 Advanced Practicum II: Issues in Diversity (3 Credits)
The purpose of the course is for students to continue to participate in supervised field experiences in school/clinical settings along with a didactic component emphasizing the development and application of a multicultural and contextual lens within their field experiences. Students will begin to apply their knowledge and available resources to further develop the skills necessary to work effectively with students from a wide variety of contextual, cultural, and linguistic backgrounds. Topics include but not limited to: ecological models, developmental contextualism, oppression, resilience, privilege and power, immigration and acculturation, and multicultural assessment.
Prerequisites: PSYC-600 and PSYC-601 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-710 Developmental Psychopathology (3 Credits)
This course presents a developmental-systems perspective and disorder-specific models of child and adolescent psychopathology. The course emphasizes (a) a conceptual understanding of specific psychological disorders, (b) the current literature on evidence-based assessment and intervention, (c) service delivery systems, and (d) the school psychologist's role in service delivery and in disseminating information to the schools and families.
Prerequisites: PSYC-713 or equivalent course.
Typically Offered: Fall

PSYC-711 Graduate Biopsychology (3 Credits)
A graduate level introduction to the field of behavioral neuroscience, the study of neurobiological basis of cognition and behavior. Topics include neuroanatomy and physiology, localization of function, brain injury, research methods in behavioral neuroscience, and biological basis of learning, language, memory, emotion, conscious states, sexual behavior, etc.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-712 Graduate Cognition (3 Credits)
This course will survey theoretical and empirical approaches to understanding the nature of the mental processes involved in attention, object recognition, learning and memory, reasoning, problem solving, decision-making, and language. The course presents a balance between historically significant findings and current state of-the-art research. Readings that have structured the nature and direction of scientific debate in these fields will be discussed. The course also includes discussions of methodology and practical applications. Students will have opportunities to develop their research skills and critical thinking by designing research studies in cognitive psychology.
Typically Offered: Spring

PSYC-713 Graduate Developmental Psychology (3 Credits)
This course is designed to enhance students' knowledge and skills with regard to infant, child, and adolescent development. We will examine a variety of topics that relate to the physical, cognitive, and social-emotional development of children and adolescents in the context of classic and current theory. We will also explore issues such as attachment, resiliency, and policy issues that pertain to positive child and adolescent development. Students will gain an enhanced knowledge of the sequence of child development and the processes that underlie it by studying child development from a chronological approach. Theories that discuss the various domains of development will be examined through each age period. This course will emphasize the interdependence of all domains of development and contribute to an appreciation of the interrelatedness of theory, research, and applications.
Typically Offered: Fall

PSYC-714 Graduate Engineering Psychology (3 Credits)
In this course the students will learn to recognize the integrated (systems) nature of Engineering Psychology, the centrality of human beings in systems design, and to use the topics covered and the available knowledge base to adapt the environment to people. This course will cover several fundamental models of human information processing in the context of human-system interactions. The models may include but are not limited to Signal Detection Theory, Information Theory, theories of attention, both normative and naturalistic decision-making models, Control Theory, and the Lens Model of Brunswick, as well as models of the human as a physical engine, that is, anthropometry, biomechanics, and work physiology. Most topics include readings in addition to the course text as well as a lab exercise with a detailed lab report.
Typically Offered: Biennially

PSYC-715 Graduate Perception (3 Credits)
The course is designed to provide students with a deeper understanding of topics in perception. This course will be organized such that students will work in groups on various projects as well as covering topics through readings and classroom discussion. The topics may include, but are not limited to: spatial frequency perception; aftereffects, visual illusions and their relationship to cortical function and pattern perception; color perception; depth and motion perception; higher order perception such as face and object recognition; and music and speech perception. The goal is to cover current research and theories in perception, looking at current developments and their antecedents. The course will be divided into various modules. Students will be assigned readings relevant to each section of the course, and will be expected to master the major concepts. Group discussion of the readings will complement lectures where the instructor will present relevant background material. There will also be laboratory time for the students, where they will examine empirical findings in perception, and develop their research skills in the field.
Contact Hours: Lecture 3
Typically Offered: Biennially

PSYC-716 Graduate Social Psychology (3 Credits)
This course explores topics related to understanding individuals in a social context. Topics may include, but are not limited to: Social Perception and Social Cognition; Attitudes; Social Identity; Prejudice and Discrimination; Interpersonal Attraction; Close Relationships; Social Influence; Prosocial Behavior; Aggression; Group Behavior; Artifacts and Methodological Issues in Social Psychology. Course format is seminar focused on reading assigned texts each week, writing reaction papers, and participating in discussion. Students will also conduct a study on the topic of their choice and present their findings both in an oral and written format.
Typically Offered: Biennially

PSYC-717 Advanced Graduate Statistics (3 Credits)
This course introduces students to more advanced inferential parametric and non-parametric data-analysis techniques commonly used in psychological research, but not covered (or not covered in depth) in the Graduate Statistics course. These techniques may include, but are not limited to: Reliability Analysis, Multiple Regression, Discriminant Analysis, Logistic Regression, Factor Analysis, Analysis of Covariance, Multivariate Analysis of Variance, Contrast Analysis, Mediator and Moderator Variable Analysis, Non-Parametric Tests, and Multi-level Modeling. The focus is on the conceptual understanding of these statistics, how different statistical procedures are applied in different research methods, how to perform analyses, how to interpret the results in the context of the research question, and how to communicate these results.
Prerequisites: PSYC-640 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Biennially

PSYC-718 Clinical and Experimental Neuropsychology (3 Credits)
A graduate level introduction to the fields of clinical and experimental neuropsychology. Topics include the historical and theoretical underpinnings of modern neuropsychology and methods used to assess cognitive function including their selection, application, and interpretation. Disorders associated with damage to the brain and how they are assessed and managed will also be covered.
Contact Hours: Seminar 3
Typically Offered: Biennially

PSYC-719 Human Factors in Artificial Intelligence (1-4 Credits)
This course will provide students with fundamental information for human-centered design of applications of artificial intelligence. There are three parts to the course: The first part is about methods of design and evaluation. The second part introduces students to the psychology of sensation and perception, memory, attention, judgment, decision-making, and problem solving, as well as human error and reliability. Finally, students will become familiar with design principles as they apply to displays and controls, human-computer interaction, human-automation interaction, and human-centered automation. Guest lectures and case studies will be examined to illustrate topics covered in it and to provide a survey of the current state of AI research, development, and controversies. Ethics and moral responsibility in technology development, with links to current policy debates, are also discussed in this context.
Contact Hours: Lecture 1
Typically Offered: Fall

PSYC-720 Advanced Consultation (3 Credits)
This course focuses on the development of beginning competencies in consultation that will help students assist school professionals in building capacity to deliver effective services. Contextual influences on school consultation, models of consultation, and the stages of the consultation process within a problem-solving model will be emphasized. Issues relevant to individual case and classroom consultation will be covered.
Prerequisites: PSYC-620 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

PSYC-721 Academic Intervention (3 Credits)
Most referrals to school psychologists involve some sort of learning problem. What variables affect school learning? Are some influences more important than others? Which of these influences are alterable and therefore available as interventions to improve learning? What classroom strategies work best? We will examine theories of school learning and the basic psychological principles that apply to teaching and learning. This will be accomplished through the examination of the role of teachers, which includes their responsibility for teaching curriculum, classroom management, and the social and emotional growth of students. Students will learn to critically evaluate the instruction provided to a particular student in a given content area. In addition, students will learn to assess academic functioning within the learning environment, identify specific target areas for intervention, set appropriate goals and objectives, monitor student progress toward those goals and objectives, and evaluate the effectiveness of the intervention(s) in place as a result of the assessment. Students are expected to leave this course with a cursory understanding of the problem-solving process and the development and monitoring of effective interventions, and basic competence in applying this process.
Prerequisites: PSYC-630 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-722 Advanced Counseling (3 Credits)
This course focuses on the refinement of counseling skills used with children and adolescents in individual and group counseling. Students will integrate theory, research and processes relative to individual and group work within cognitive-behavioral and solution-focused theoretical models. Students will consult with parents and teachers as they develop treatment plans, counseling interventions, progress monitor interventions, and write recommendations. Crisis intervention and group behavior management will also be addressed. This course is offered to second-year students matriculating in the school psychology program.
Prerequisites: PSYC-620 or equivalent course.
Typically Offered: Fall

PSYC-723 Systems and Organizational Interventions (3 Credits)
This course will assist students in building their consultation skills, with an explicit focus on systems-level issues and interventions. Students will learn principles of population-based prevention and intervention services and family-school collaboration. An array of evidence-based schoolwide interventions will be explored in depth with a focus on the role of the school psychologist within the larger system.
Prerequisites: PSYC-620, PSYC-630, PSYC-650 and PSYC-721 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

PSYC-730 Comprehensive Assessment Integration (3 Credits)
This is an applied course in linking the diagnostic assessment of exceptional children and adolescents to recommendations for appropriate interventions. Students learn to select and develop a plan of assessment for a variety of referral questions. Students continue to learn and expand their skills in administering tests. Students primarily learn to interpret, and integrate test data and report the results and recommendations for parents, teachers and multidisciplinary evaluation teams. This course is offered to second-year students matriculating in the school psychology program.
Prerequisites: PSYC and PSYC-632 or equivalent courses.
Typically Offered: Fall

PSYC-750 Internship (3 Credits)
The 1200-hour internship is the culminating experience in the school psychology program. It provides an intensive, supervised training experience in which interns put the knowledge, skills, and attitudes learned during their training program into practice while continuing to develop and expand upon those abilities. The internship year is a broad-based, individualized experience that provides an opportunity to work with a variety of children, parents, teachers, support staff, and administrators. Interns are exposed to a variety of educational meetings, programs, workshops, resources, and conferences through their internship sites. Monthly class seminars supplement the supervised training experience. (All course work completed and faculty approval)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

PSYC-751 Graduate Research Seminar (0 Credits)
The guiding principle of Graduate Research Seminar is that it provides students the opportunity to begin examining potential thesis topics during the student's first semester in the program. The course will involve faculty presentations of their research offered weekly through the semester.
This course is restricted to EXPSYC-MS Major students.
Typically Offered: Fall

PSYC-752 Thesis Proposal (3 Credits)
The Thesis courses will vary widely but will fulfill the work plan agreed by the student and the adviser. The guiding principles of the Thesis Proposal course are to initiate thesis research including selecting a thesis advisor, choosing and defining a topic, surveying relevant research literature, and planning the research. To complete the course, the student will successfully submit and defend a thesis proposal, which is a detailed and complete plan of the thesis research. The thesis proposal should include exhaustive review of relevant literature, statement of the student's thesis, formulation of hypotheses, operational definitions of independent and dependent variables, and a detailed procedure for carrying out the research. The proposal may also include a section on anticipated results with a detailed plan for analysis of data.
This course is restricted to EXPSYC-MS Major students.
Typically Offered: Spring

PSYC-753 Thesis (3 Credits)
The Thesis courses will vary widely but will fulfill the work plan agreed by the student and the thesis adviser. The guiding principle of the Thesis course is to complete the thesis research proposed in Thesis Proposal. The Thesis course consists of carrying out the thesis research, including collection and analysis of data, and completion and public defense of the thesis document for partial fulfillment of the requirements of the degree.
This course is restricted to EXPSYC-MS Major students.
Typically Offered: Fall

PSYC-754 Graduate Psychology Capstone (3 Credits)
This is a project-based course for students enrolled in the MSc Experimental Psychology non-Thesis track focusing on discipline-specific scientific communication skills in the area of Psychology. The capstone course will provide students the opportunity to combine and incorporate knowledge and skills learned in prior coursework and experiences and demonstrate their ability to apply this knowledge in various assignments. A variety of written projects (white paper, focused literature review, and a resume) and an oral presentation will be required and should allow students to demonstrate proficiency in the Program.
Contact Hours: Project 3
Typically Offered: Fall, Spring

PSYC-757 Graduate Special Topics in Psychology (3 Credits)
Seminar open to MSc Experimental Psychology students and graduate students with instructor permission. This course is designed to allow students to focus on a special topic or area of research relative to experimental psychology. The specific topic covered will vary from semester to semester. Students will read original research and examine theories relevant to the topic of study.
This course is restricted to EXPSYC-MS Major students.
Contact Hours: Seminar 3
Typically Offered: Fall, Spring

PSYC-790 Continuation Of Thesis (0 Credits)
Restricted to gpsa graduate program only. Must have permission of department to register for this course.
Typically Offered: Fall, Spring, Summer

PSYC-798 Advanced Research in Psychology (3 Credits)
Practicum open to MSc Experimental Psychology students. This course gives the student first-hand experience in the field of Psychology. The experience may involve a specific research project or other relevant professional development projects independent of the student's thesis research. Students are closely supervised by a faculty member and will develop skills and gain experience in relevant advanced research and professional development in Experimental Psychology.
This course is restricted to EXPSYC-MS Major students.
Contact Hours: Research 3
Typically Offered: Fall, Spring, Summer

PSYC-799 Independent Study (1-6 Credits)
A program of study executed by an individual student with assistance and guidance by an instructor, outside a regular classroom setting. Guidelines for designing and gaining approval for an independent study are provided in College of Liberal Arts Policy I.D.
Typically Offered: Fall, Spring, Summer

Public Policy (PUBL)

PUBL-609 Public Management and Governance (3 Credits)
This course provides an in-depth look at key concepts in public management and governance. Starting with the basic structure of the U.S. Constitution, the course examines how the tensions facing public administrators and officials have changed over time in both public organizational theory and practice. Topics include public institution and organization theory, public budgeting, citizen engagement, e-government, public-private partnerships, collaboration and governance, and recent innovations in management practice. Class will include guest lectures from current public administrators.
Contact Hours: Lecture 3
Typically Offered: Spring

PUBL-610 Technological Innovation and Public Policy (3 Credits)
Technological innovation, the incremental and revolutionary improvements in technology, has been a major driver in economic, social, military, and political change. This course will introduce generic models of innovation that span multiple sectors including: energy, environment, health, and bio- and information-technologies. The course will then analyze how governments choose policies, such as patents, to spur and shape innovation and its impacts on the economy and society. Students will be introduced to a global perspective on innovation policy including economic competitiveness, technology transfer and appropriate technology.
Contact Hours: Lecture 3
Typically Offered: Spring

PUBL-620 Information & Communications Policy (3 Credits)
This course examines how federal and international policies are developed to influence innovation in, and regulation of, information, computer and telecommunications technologies. In particular the course will examine such topics as privacy, freedom of speech, cybersecurity, intellectual property rights, access to information technology, and regulation of the Internet.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

PUBL-630 Energy Policy (3 Credits)
This course provides an overview of energy resources, technologies, and policies designed to ensure clean, stable supplies of energy for the future. The course evaluates the impacts of fossil fuel, renewable energy, and hydrogen technologies on society and how public policies can be used to influence their development. The development of U.S. energy policy is of particular concern, although a global perspective will be integrated throughout the course.
Contact Hours: Lecture 3
Typically Offered: Spring

PUBL-631 Climate Change: Science, Technology and Policy (3 Credits)
This multidisciplinary course will provide students with diverse perspectives on global climate change issues, providing a survey of important aspects of the problem augmented by readings in the primary literature. Topics include atmospheric chemistry, climate modeling, ecological impacts and feedbacks, economics of climate change, international climate policies, and social and environmental justice. The course will include a variety of instructors and guest lecturers, providing an overview of the complex and interrelated nature of global climate change. The course will culminate in a project based on finding solutions to the real-world problem of climate change. Students will be required to take a leadership role in bridging the multiple disciplines presented.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Spring

PUBL-640 Taxes, Spending, Regulation and Evaluation (3 Credits)
This survey course is focused on principles of how government revenue is and can be raised, the role of spending in establishing priorities and policy choices, and regulation of commercial activities. Students will learn the principles and theory of tax policy, and spending and regulatory law by building on a foundation of human experience dating to the ancient world. They will also learn about widely-believed myths about public finance policies. Case study evaluation of policies at different times and places will be a running theme throughout class discussions. The course will enable students to comprehend and help shape proposed tax policies.
Contact Hours: Lecture 3
Typically Offered: Fall

PUBL-650 AI, Policy and Law (3 Credits)
Artificial intelligence (AI) presents many complex issues for society, as technological developments have greatly outpaced public policy. Moreover, the open and commercialized nature of AI tools provides criminals and other adversarial actors with new advantages yet to be effectively countered. This class looks at the legal and policy frameworks and practices needed to build an ecosystem of privacy, security, and trust that will help ensure stakeholders that AI is being developed and deployed in an ethical, safe, and reliable manner. The class will also discuss how organizations are designing their own practices for operationalizing trustworthy or ethical AI in various sectors including law enforcement and criminal justice, commercial sectors, medical and biological research, among others. Students will be given a foundation in the emerging laws, regulations, and policies regarding AI, as well as insight on the broader process of how laws and policies need to adapt for other rapidly emerging technologies. We will explore in detail several approaches currently being considered, including regulatory approaches, standards, and considerations for national and international security. The course also will explore certain other legal issues arising in connection with AI, such antitrust and competition law, intellectual property and proprietary rights matters, and concerns for future technologies (quantum computing, AI and synthetic biology, etc.).
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PUBL-689 Public Policy Graduate Topics (1-4 Credits)
Allows examination of a special problem or topical area in the field of public policy at the graduate level. Topics and specific content and methods vary from year to year or semester to semester.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

PUBL-699 Public Policy Graduate Co-Op (0 Credits)
One semester of paid work experience in a professional setting related to the communication major.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall, Spring, Summer

PUBL-700 Readings in Public Policy (3 Credits)
An in-depth inquiry into key contemporary public policy issues. Students will be exposed to a wide range of important public policy texts, and will learn how to write a literature review in a policy area of their choosing.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Fall

PUBL-701 Graduate Policy Analysis (3 Credits)
This course provides graduate students with necessary tools to help them become effective policy analysts. The course places particular emphasis on understanding the policy process, the different approaches to policy analysis, and the application of quantitative and qualitative methods for evaluating public policies. Students will apply these tools to contemporary public policy decision making at the local, state, federal, and international levels.
Contact Hours: Lecture 3
Typically Offered: Fall

PUBL-702 Graduate Decision Analysis (3 Credits)
This course provides students with an introduction to decision science and analysis. The course focuses on several important tools for making good decisions, including decision trees, including forecasting, risk analysis, and multi-attribute decision making. Students will apply these tools to contemporary public policy decision making at the local, state, federal, and international levels.
Contact Hours: Lecture 3
Typically Offered: Spring

PUBL-703 Evaluation and Research Design (3 Credits)
The focus of this course is on evaluation of program outcomes and research design. Students will explore the questions and methodologies associated with meeting programmatic outcomes, secondary or unanticipated effects, and an analysis of alternative means for achieving program outcomes. Critique of evaluation research methodologies will also be considered.
Typically Offered: Spring

PUBL-705 Seminar: Advanced Methods (3 Credits)
This course will cover the major theoretical and applied analytical methods and techniques in both quantitative and qualitative analysis. An emphasis will be placed on integrating empirical and normative concerns.
Contact Hours: Lecture 3
Typically Offered: Spring

PUBL-730 Telecommunications Policy and Issues (3 Credits)
The objective of this course is to enlighten students relative to telecommunications policy and standards sufficiently, in order for them to be able to deal with the real-world issues that confront telecommunications professionals on a daily basis. Students will not be prepared to act as regulatory experts or to replace specialized experts with legal training, but should be sufficiently cognizant of pertinent issues to know when it is prudent to call in such forces. The domestic as well as the international regulatory, policy and standard arenas will be explored. This course helps students to understand that the telecommunications environment is greatly effected by technology, policy, security, and market forces with a primary focus on telecommunications policy and all that it entails.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

PUBL-785 Capstone Experience (1-6 Credits)
The Public Policy Capstone Experience serves as a culminating experience for those MS in Science, Technology and Public Policy students who chose this option in the Public Policy Department. Over the course of the semester, students will have the opportunity to investigate and address contemporary topics in science and technology policy using analytic skills and theoretical knowledge learned over the course of their MS degree.
Contact Hours: Project 1
Typically Offered: Fall, Spring, Summer

PUBL-788 Graduate Research Experience (0-6 Credits)
Gives the student first-hand experience in designing and performing research. Students are closely supervised by a faculty member, developing their pre-professional skills while learning how to do research first hand. Allows examination of a special problem or topical area in the field of public policy at the graduate level. Topics and specific content and methods vary from year to year or semester to semester.
Typically Offered: Fall, Spring, Summer

PUBL-790 Public Policy Thesis (1-6 Credits)
The master's thesis in science, technology, and public policy requires the student to select a thesis topic, advisor and committee; prepare a written thesis proposal for approval by the faculty; present and defend the thesis before a thesis committee; and submit a bound copy of the thesis to the library and to the program chair.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Thesis 3
Typically Offered: Fall, Spring, Summer

PUBL-791 Continuation of Thesis (0 Credits)
For students continuing to work on their thesis after taking the required thesis credits, but before the thesis is defended.
Typically Offered: Fall, Spring

PUBL-798 Comprehensive Exam (0 Credits)
Prerequisites: PUBL-700, PUBL-701, PUBL-702, PUBL-703 and STSO-710 or equivalent course.
Typically Offered: Fall, Spring, Summer

PUBL-810 Technology, Policy and Sustainability (3 Credits)
This course introduces students to public policy and its role in building a sustainable society. The course places particular emphasis on the policy process; the relationship among technology, policy, and the environment; and policy mechanisms for addressing market and government failures that threaten sustainability.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

Quality Management (QLTM)

QLTM-780 Introduction to Asset Management (3 Credits)
Unscheduled downtime costs businesses millions of dollars each year, but asset management and maintenance is often the last area to attract the attention of managers trying to lower costs. Usually thought of as non-value-added, maintenance and asset management policies can have significant impact on a company's profit. This course introduces the student to the wide range of policies and practices, including capital budget issues related to asset acquisition, cost of ownership, and depreciation; inventory/procurement; maintenance policies such as run-to-failure, preventive maintenance, and reliability centered maintenance; training issues; and developing performance indicators for asset management programs.
Prerequisite: QLTM-340 or STAT-145 or MTSC-211 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

Robotics and Manufacturing Engineering Technology (RMET)

RMET-600 MMSI Graduate Seminar (0 Credits)
This course provides students that are new to the MMSI program an opportunity to develop an understanding of the department's research activities. The students will become more knowledgeable about the Manufacturing & Mechanical Systems Integration program, career options, the capstone and thesis project process (finding an advisor, required documentation and policies regarding completing a project on co-op) and department policies and procedures related to successful completion of the MMSI program.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Seminar 2
Typically Offered: Fall

RMET-625 Statistical Process Control (3 Credits)
A course designed to provide in-depth understanding of statistical process control and acceptance sampling techniques. SPC helps you monitor process behavior to be used in quality process analysis and process improvement. Topics include statistical process charting, and process analysis along with how these techniques are applied to engineering and manufacturing organizations. Students can receive credit for only one of the following: RMET-625, CQAS-621, or STAT-621.
Prerequisites: This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs. Students may only receive credit for one of the following: RMET-625, CQAS-621, or STAT-621 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

RMET-645 Surface Mount Electronics Manufacturing (3 Credits)
This course provides a thorough understanding of the technology, components, equipment, materials and manufacturing process for through hole technology and surface mount technology electronics manufacturing. Students will develop a strong foundation needed for advanced work in surface mount technology (SMT). The activities will provide the students an orientation and familiarization of the manufacturing equipment and process parameters for printed circuit board assembly. Graduate students will explore surface defects and remediation and will prepare a detailed annotated bibliography related to specific aspects of electronics manufacturing. Topics in Design for Manufacturing are also considered for high volume vs. low volume manufacturing. Students may only receive credit for this course or RMET-545, not both.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3, Recitation 1
Typically Offered: Fall

RMET-650 Mechatronics and Mechanical Systems Fundamentals (3 Credits)
This course is intended to help students learn to think like systems engineers. This course will provide a thorough understanding of the systems fundamentals, its design, modeling, and integration. Topics include a thorough coverage of systems architecture, conceptualization, modeling, development and management. Students in this course will be taught industry practices for systems engineering and management from concept stage to post implementation stage. System engineering and modeling tools will also be introduced to assist with the conceptualization, development, and implementation of systems.
This class is restricted to MMSI-MS, MCET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS program students.
Contact Hours: Lecture 3
Typically Offered: Fall

RMET-656 Advanced Concepts in Semiconductor Packaging (3 Credits)
The advanced course in semiconductor packaging will provide a thorough coverage of the materials, processes, failure, and reliability of chip level packaging. Specific topics include single-chip, multi-chip, wafer level and 3D stacked packaging, photonic integrated chip (PIC), smaller passives and embedded passive component technology, advanced substrates and microvia technology, solder technologies, metallurgy and joint formation, thermal management, thermal and mechanical behavior of packaging, failure analysis, and reliability testing. Course includes projects and literature review in topics of semiconductor packaging. This course is cross listed with RMET-556 students may receive credit for RMET-556 or RMET-656, not both.
Prerequisites: RMET-645 or equivalent course. Students cannot take and receive credit for this course if they have taken RMET-556.
Contact Hours: Lecture 3
Typically Offered: Biennially

RMET-671 Advanced Automation Systems and Control (3 Credits)
This course deals with the higher level of topics relating to automation control systems engineering. Learning different programming languages, troubleshooting techniques, advanced programming instructions, the use and application of Human Machine Interface (HMI) panels, analog devices uses and applications, advanced system design, networking and an introduction to Industry 4.0 are all covered in this course. Students will be expected to develop the main system and all subsystems required to solve an automation problem. Students with no/limited PLC programming and automation system design knowledge are required to take RMET-340/341 as a bridge course. Students may take and receive credit for RMET-571 or RMET-671, not for both.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3, Recitation 1
Typically Offered: Spring

RMET-685 Robotics & Automation (3 Credits)
Technology and application of robots and CNC in an integrated manufacturing environment is the focus of this course. An introductory understanding of robotic hardware and software will be provided. The hardware portion of this course involves robot configurations, drive mechanisms, power systems (hydraulic, pneumatic and servo actuators), end-effectors, sensors and control systems. The software portion of this course involves the various methods of textual and lead through programming. Digital interfacing of robots with components such as programmable logic controllers, computer-controlled machines, conveyors, and numerical control will be introduced. Robotic cell design and the socio-economic impact of robotics will also be discussed. This course also has a strong laboratory component that emphasizes hands-on training. This course may be cross listed with RMET-585. Students may not take and receive credit for this course if they have already taken RMET-585.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3, Recitation 1
Typically Offered: Fall, Spring

RMET-687 Robotics: Sensors & Vision (3 Credits)
Robots in many applications require sensors and/or vision systems to allow the robot to fully understand its environment and tasks. Students learn how to design and integrate robot sensor and vision systems to enable the dynamic use of the robot’s capabilities. Robot sensors, 2D and 3D visions systems along with lighting will be used to allow the student to conceptualize, design, and program robotic techniques related to path correction, dynamic positioning, 2D targeting, and 3D picking using robots. Projects will use both robots and simulation software. Students may receive credit for only this course or RMET-587, not both.
Prerequisites: RMET-685 or RMET-585 or equivalent course. Also, students cannot take and receive credit for this course if they have taken RMET-587.
Contact Hours: Lecture 3
Typically Offered: Spring

RMET-689 Special Topics (1-3 Credits)
Special Topics is an experimental graduate course intended as a means for offering innovative topics not currently reflected in the Graduate Engineering Technology curriculum.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3

RMET-699 Grad Co Op (0 Credits)
Work experience in manufacturing position appropriate to selected major in graduate program. Position to be obtained through interviewing process with the assistance of Cooperative Education and Career Services Office. Department permission is required.

RMET-720 Applied Regression Analysis (3 Credits)
This course explores how to model data. Topics include simple linear regression, multiple linear regression, analysis of residuals, transformations, weighted least squares, influence diagnostics, dummy variables, selection of best linear models, nonlinear estimation, and model building. Students can receive credit for only one of the following: RMET-720, CQAS-741, or STAT-741.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Fall

RMET-730 Six Sigma for Design and Manufacturing (3 Credits)
This course presents the philosophy and tools that will enable participants to develop quality strategies and drive process improvements that are linked to and integrated with business plans. Continuous improvement principles are presented, within the six sigma format. The course will help prepare students for six sigma blackbelt certification. Students can receive credit for only one of the following: RMET-730, CQAS-701, or ISEE-682.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Spring

RMET-740 Experimental Design (3 Credits)
This class covers the design and analysis of experiments. We will focus on the design of the experiment to avoid problems that arise at the analysis stage with examples in engineering and manufacturing. Topics include the role of statistics in scientific experimentation; general principles of design, including randomization, replication, and blocking; completely randomized designs, randomized complete block designs, general factorial designs, split-plot designs, random vs. fixed effects, and mixed models. Students can receive credit for only one of the following: RMET-740, CQAS-670, or STAT-670.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3
Typically Offered: Spring

RMET-788 Thesis Planning (3 Credits)
Students will rigorously develop their thesis research ideas, conduct literature reviews, identify and plan methodologies, prepare schedules, and gain a clear understanding of the expectations of the faculty and the discipline. Each student will be required to prepare a committee approved thesis research proposal and may begin work on their thesis.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Spring

RMET-789 MFET Special Topics (3 Credits)
Subject offerings of new and developing areas of knowledge in manufacturing intended to augment the existing curriculum.
This course is restricted to students in MMSI-MS, MCET/MMSI-BSMS, EMET/MMSI-BSMS, MECA/MMSI-BSMS, RMET/MMSI-BSMS programs.
Contact Hours: Lecture 3

RMET-790 Thesis (3 Credits)
Thesis is based on thorough literature review and experimental substantiation of a problem, by the candidate, in an appropriate topic. A written proposal has to be defended and authorized by the faculty adviser/committee. The proposal defense is followed by experimental work, a formal written thesis, and oral presentation of findings. The candidate should have completed the requisite courses for the program before enrolling for the thesis.
Prerequisites: RMET-788 or equivalent course.
Contact Hours: Thesis 3
Typically Offered: Fall, Spring, Summer

RMET-795 Comprehensive Exam (0 Credits)
A written comprehensive exam is one of the non-thesis or non-project methodology for completion of the MS-MMSI degree. Students will demonstrate a fundamental knowledge of the theories and foundation principles. This course will require the student to do an independent review of the concepts within the core courses and the chosen concentration area, and will culminate in a comprehensive written examination. The student must receive a passing grade of at least 80 percent to be successful. Students will have one additional opportunity to pass the exam, if their initial attempt results in a failing grade.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Comprehensive Exam 3
Typically Offered: Fall, Spring, Summer

RMET-797 Capstone Project (3 Credits)
This course provides the MMSI graduate students an opportunity to complete their degree requirements by addressing a practical real-world challenge using the knowledge and skills acquired throughout their studies. This course is not only the culmination of a student's course work but also an indicator of the student's ability to use diverse knowledge to provide a tangible solution to a problem. The capstone project topic can be in the areas of product development, manufacturing automation, management system, quality management or electronics packaging. The course requires a comprehensive project report and a final presentation.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

RMET-798 Continuation of Capstone (0 Credits)
Continuation of Capstone

RMET-799 Independent Study (1-3 Credits)
Faculty directed study of appropriate topics on a tutorial basis. This course is generally used to allow an individual to pursue topics in depth under faculty sponsorship.
Typically Offered: Fall, Spring

School of Individualized Study (SOIS)

SOIS-699 Special Topics (1-3 Credits)
Special topics are experimental courses offered each semester. See course catalog for current titles.
Typically Offered: Fall, Spring, Summer

School of Information (ISCH)

ISCH-620 Graduate Introduction to Programming with Data (3 Credits)
This course provides a functional introduction to programming, data structures, elemental computational theory, and data exploration for graduate students from non-computing backgrounds. Students prepare for working with data and artificial intelligence techniques.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

School Psychology (SPSY)

SPSY-610 Advanced Developmental Psychology (3 Credits)
This course is designed to enhance students' knowledge and skills with regard to infant, child, and adolescent development. We will examine a variety of topics that relate to the physical, cognitive, and social-emotional development of children and adolescents in the context of classic and current theory. We will also explore issues such as attachment, resiliency, and policy issues that pertain to positive child and adolescent development. Students will gain an enhanced knowledge of the sequence of child development and the processes that underlie it by studying child development from a chronological approach. Theories that discuss the various domains of development will be examined through each age period. This course will emphasize the interdependence of all domains of development and contribute to an appreciation of the interrelatedness of theory, research, and applications.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Typically Offered: Fall

SPSY-640 Statistics (3 Credits)
This course reviews descriptive and inferential statistics. Basic and advanced conceptual material will be presented to assist students in their understanding of diverse data analytic methods, their appropriate application, and how to interpret statistical analyses. Topics include one- and two-sample inferential procedures, interval estimation, correlation, nonparametric tests, linear regression, and analysis of variance. Students will learn to integrate concepts with computer applications. Course content will be taught through lectures, discussion, and applied data analysis exercises. Student mastery of the material will be evaluated through small group discussion of data set analyses, written results of the analyses following APA style, and two exams. This course is required for all students matriculating in the school psychology program. Non-matriculating students may take the course with instructor approval.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall

SPSY-641 Research Methods (3 Credits)
This course explores various types of applied research methods as well as important methodological issues and concepts in areas of applied psychology. Methodologies studied include experimentation, quasi-experimentation, analysis of qualitative data, surveys, and assessment research . A review and analysis of factors affecting both the knowledge to be gained from research and the quality of applied research include philosophy of science, research paradigms, ethics, reliability, and threats to validity.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Spring

SPSY-711 Graduate Biopsychology (3 Credits)
A graduate level introduction to the field of behavioral neuroscience, the study of neurobiological basis of cognition and behavior. Topics include neuro-anatomy and physiology, localization of function, brain injury, research methods in behavioral neuroscience, and biological basis of learning, language, memory, emotion, conscious states, sexual behavior, etc.
This course is restricted to SCPSYC-ACT or SCPSYC-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

SPSY-753 Thesis (1 Credit)
This course provides students with the opportunity to conduct original research. The purpose of the course is for students to apply concepts they learn in research methods and inferential statistic course as well as experience the scientific method at a deeper level. The thesis is an optional requirement for those in the MS school psychology program, however, it is a requirement for the advanced graduate certificate. (Permission from instructor)
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring

Science, Technology & Society (STSO)

STSO-621 Graduate Biodiversity and Society (3 Credits)
Biodiversity, the diversity of life on earth from genes to ecosystems, is on the decline worldwide and considered one of the most pressing issues facing humanity. This interdisciplinary course explores the wide-ranging challenges and opportunities to understand biodiversity loss and address biodiversity conservation, with a focus on human wellbeing, cultural values, social science dimensions, and other humanistic discipline contributions.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Biennially

STSO-710 Graduate Science and Technology Policy Seminar (3 Credits)
STP examines how local, state, federal and international policies are developed to influence innovation, the transfer of technology and industrial productivity in the United States and other selected nations. It provides a framework for considering the mechanisms of policy as a form of promotion and control for science and technology, even once those innovations are democratized and effectively uncontrollable. Further focus is dedicated to the structure of governance inherent in U.S. domestic policy, limits of that approach, the influences of international actors, and utilizing case studies to demonstrate the challenges inherent in managing differing types of technology. This seminar is restricted to degree-seeking graduate students or those with permission from the instructor.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Typically Offered: Biennially

STSO-720 Graduate Environmental Policy (3 Credits)
This course introduces graduate students to environmental regulation and policy. Students will learn the ideological bases for public intervention into environmental management. The course will examine different environmental policy instruments such as command and control policies and market-based instruments (such as air, water, land-use issues) to examine how policy plays out in the real world. Using cases from the United States and abroad, the course will focus on policy innovation and concepts and issues such as decentralization, public participation, environmental justice, urban sustainability, risk-based and benefit-cost based decision-making, and energy and climate change.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Lecture 3
Typically Offered: Biennially

STSO-750 Graduate Sustainable Communities (3 Credits)
The concept of sustainability has driven many national and international policies. More recently, we have become aware that unless we physically build and rebuild our communities in ways that contribute to sustainability, making progress toward that goal is unlikely. It is equally important to recognize the social/cultural context of sustainability.
In addition, it is at the local level that the goals of equity (a key consideration in community sustainability), most often achieved through citizen participation and collaborative processes are most easily realized. This course will broaden students understanding of the concept of sustainability, particularly the concept of social sustainability. This course focuses on sustainability as a way to bring light to the connections between natural and human communities, between nature and culture, and among environmental, economic, and social systems. Working closely with local organizations, students will explore the applicability of theoretical concepts.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

STSO-789 STSO Graduate Special Topics (3 Credits)
Allows examination of a special problem or topical area in the field of STS or environmental studies at the graduate level. Topics and specific content and methods vary from year to year or semester to semester.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

Sculpture (SCUL)

SCUL-601 Sculpture (3 Credits)
This course allows students to explore concepts, materials, processes, and techniques to develop a personal, cohesive three-dimensional body of work. Theories and history of sculpture will be discussed as relevant to individual directions. Course may be retaken. ** Fee: A materials fee is required for this course**.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

SCUL-611 Expanded Forms (3 Credits)
This course focuses on the diverse forms of expression that have emerged in contemporary fine art, including installation, performance art, video, and digital art among the many other possibilities. Students will research some of these expanded forms and produce artwork in at least one of these forms. Course may be retaken. *** Fee: A materials fee is required for this course**.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

SCUL-643 Foundry Practices (3 Credits)
This course will introduce and develop students' skills in casting metals with an emphasis on cast iron and the use of cupola. Course content will cover advanced pattern-making, mold-making, sprueing, patination, and casting techniques will be introduced. Students will create several cast metal pieces using different mold-making materials and alloys. At the completion of this course students will be able to develop their concepts through cast metal sculpture. **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
This course is available to RIT degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

SCUL-673 Figure Sculpture (3 Credits)
This course will focus on the creation of three-dimensional figurative work. Course content will cover sculpting directly from live models and creating multiple armatures with a focus on both anatomical correctness and individual interpretation. Students will use this knowledge to create several oil clay maquettes. At the completion of this course students will produce finished figurative sculptures translating chosen maquettes into a permanent material **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

SCUL-683 Welding and Fabrication (3 Credits)
This course will introduce develop skills in metal fabrication. Course content will cover several different types of equipment utilized in the welding and cutting processes. Students will learn to effectively use equipment to fabricate mild steel. At the completion of this course students will complete a body of work consisting of finished fabricated steel sculptures in addition to understanding the rationale for working in an additive fashion. The course will be taught off-campus at Rochester Arc and Flame Center, 115 Fedex Way, Rochester, NY. **Fee: There is a materials fee required for this course and an additional course fee applied via student account. See course notes for course fee information**
This course is restricted to CAD Graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

Security Technology (SECU)

SECU-700 Security Technology Management (3 Credits)
This course examines security threats and technologies, associated research and development processes, and relationships among technology developers, and numerous management concerns pertaining to the adoption, implementation and utilization of security enhancing technologies throughout society. No prerequisite.
Contact Hours: Lecture 3
Typically Offered: Fall

SECU-701 Security Technology Policy, Law and Ethics (3 Credits)
This course will introduce the ethical component of security policies and practices especially those involving security systems, tools and related technologies. Within this general framework several specialized topics are addressed including: scientific misconduct in security technology R&D, regulation construction and ethical enforcement practices, reasonable expectations of privacy established in case law rulings, abusive/illegal use of security technologies, causes of personal and vicarious civil liability, and links between personal integrity and professional ethics.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

SECU-702 Managing Cyber Threats and Critical Information Infrastructure (3 Credits)
The course explores economic, political, cultural, organizational and technological factors underlying information security threats, conflicts, competitions, and response capabilities, and how these may compromise national, organizational and personal security.
Prerequisites: SECU-700 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SECU-703 Security Enhanced Environmental Design (3 Credits)
This course will provide students with an understanding of the integration of technology into security designs. Physical barriers, locks, lighting, alarm, and CCTV systems are just of few of the many relatively low-to-high technologies that will be addressed with regard to public and private facilities, landscaping and architecture planning.
Prerequisites: SECU-700 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

SECU-704 Internal Organization Security Management (3 Credits)
This course provides an essential overview of internal security theory, fundamentals, laws, regulations and best investigative practices with an emphasis on innovative tools and methods now available to enhance internal security functions in all types of organizations.
Prerequisites: SECU-700 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

Service Quality Management (SERQ)

SERQ-710 Service Design Fundamentals (3 Credits)
Service design is a holistic design process. It uses skills from a variety of disciplines (design, management and process engineering) to develop models to create new services or to improve existing services in the most efficient and effective manner possible. The emphasis of the process is to provide value to the customer; as a service differentiator or create unique experiences for the customer. Service design uses methods and tools from a variety of disciplines to assist with the analysis and creation of enhanced systems. These tools include; mapping, blueprinting, analysis of customer behavior, market analysis, service marketing, and service recovery. The outcome of this course is to provide students with the fundamentals of service design thinking to allow them to lead the efforts of systematic design in a variety of disciplines.
This course is restricted to SVCLED-MS, HSPT-MS Major students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

SERQ-712 Breakthrough Thinking, Creativity, and Innovation (3 Credits)
This is an introductory-level survey course on the dynamics of innovation. The course focuses on individual, team and organization-human and systems dynamics that impact organizational innovation. Students gain awareness in, understanding of and important skills in fostering multi-level organizational human ecologies conducive to the creation of innovation. Issues and challenges important to leaders at all levels in an organization, entrepreneurs and talent management practitioners will be examined and explored. There is a required fee for the class to pay for the administration of the ISPI and Meyers Briggs evaluation instruments. Students will develop in their understanding of innovation, their own personal innovation capabilities, preferences, and the human dynamics unique to innovation applied in an organizational context. This background is becoming increasingly critical to developing innovation capabilities in and across organizations in our increasingly competitive and complex world. This course will build awareness and improve competency in the application of overall course content and design principles particular to developing innovation-competent individuals, teams, and organizations.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

SERQ-714 Service Leadership and Innovation Practicum (1-3 Credits)
To gain experience in applied innovation students will observe, interact and discuss with service organizations how they develop and execute innovation strategies to enhance their service environment. At the conclusion of the experience students will relate this benchmarking experience to innovation strategies in the service industries
Prerequisite: SERQ-712 or equivalent course.
Typically Offered: Fall or Spring or Summer

SERQ-720 Strategic Foresight and Innovation (3 Credits)
This course introduces the concepts, principles, and practices necessary to lead into the future and avoid organizational mis-steps by taking an action-oriented approach to planning, implementing, evaluating, and revising competitive strategy in service firms. The course will address basic concepts and principles of strategic foresight , the process of developing foresight and implementing strategy in organizations, development of robust, future-oriented strategies using learning scenarios, strategy mapping, and tools for strategy evaluation such as performance metrics, scorecards and dashboards.
Contact Hours: Lecture 3
Typically Offered: Spring

SERQ-722 Customer Centricity (3 Credits)
The Customer Centricity course develops the learners ability to help their organization manage its interactions with its valued customers across multiple channels, maximize revenue opportunities, build foundations to increase customer satisfaction, and drive customer retention and loyalty.
Contact Hours: Lecture 3
Typically Offered: Spring

SERQ-723 Service Analytics (3 Credits)
Analytics in service organizations is based on four phases: analysis and determination of what data to collect, gathering the data, analyzing it, and communicating the findings to others. In this course, students will learn the fundamentals of analytics to develop a measurement strategy for a given area of research and analysis. While this measurement process is used to ensure that operations function well and customer needs are met; the real power of measurement lies in using analytics predicatively to drive growth and service, to transform the organization and the value delivered to customers. Topics include big data, the role of measurement in growth and innovation, methodologies to measure quality, and other intangibles.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

SERQ-730 Project Management in the Service Sector (3 Credits)
Managing public and private sector projects is a complex, demanding process involving ethical considerations, leadership, the ability to understand complex rules and regulations, the politics of the administration and the vagaries of the budget process. This conceptual framework will address planning, selection of team members, contracts and agreements, monitoring and adjusting the project progress and completion of the project through turnkey stages. The end result of this process is to contribute to establishment of trust of the stakeholders, minimize failure and maximize success.
Prerequisites: SERQ-710 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

SERQ-732 Assessment of Service Quality (3 Credits)
The service sector encompasses a large and varied arena making the assessment of service quality challenging. This course will provide quality evaluation strategies which span a variety of service sectors. To build a comprehensive picture of public and private sector quality service indicators will be reviewed as well as strategies to assess service quality. Each of these approaches will be analyzed, discussed and evaluated for the output generated. To assist with this overview, the Serve/Qual model, including the identification of service standards to meet and exceed customer expectations, will be used to evaluate service quality.
Contact Hours: Lecture 3
Typically Offered: Fall

SERQ-735 Data Mining In the Service Sector (3 Credits)
To gather and analyze public/private service sector information to inform decisions is the goal of every public/private sector administration. Data can drive success of governments and organizations or lead to their downfall. This course will explore data mining used in the public/private sector, how to gather it and utilize the results of the data collections to inform decisions that reflect the needs and desires of the stakeholders in this sector.
Contact Hours: Lecture 3
Typically Offered: Fall

SERQ-737 Leadership Development (3 Credits)
The course approaches leadership development from a systems perspective examining and mastering proactive leadership approaches, understanding and using team building and team learning, examining various leadership techniques including, benchmarking, continuous improvement, six sigma and lean, gap analysis, and more. Dialog and case analysis are used to enable all students to comprehend the myriad of tools available to be able to construct a strong learning organization.
Contact Hours: Lecture 3
Typically Offered: Summer

SERQ-740 Leading Innovation (3 Credits)
Achieving competitive advantage in today's world demands that organizations know how to innovate, and do so not once, but repeatedly. Creativity, rapid learning through continuous improvement, and the ability to turn ideas into action, products, processes and services are crucial. How do leaders foster and sustain a culture of innovation? What unique competencies and skills do you need as a leader and what skills do your teams need? How is managing an innovation team different than managing other kinds of teams within an organization? Through this course, service leadership students will leverage and build on their growing knowledge about innovation, the individual and group skills required for innovating gained in SERQ-712. Students will gain deeper insights into innovation leadership requirements for creating, managing and curating a thriving environment in which cutting edge ideas are encouraged, born and grown. Open to students in the service leadership and innovation MS program and non-majors on a space available basis with department permission.
Prerequisite: SERQ-712 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

SERQ-745 Social Psychology of Service (3 Credits)
Service interactions are an increasing segment of human interactions in today's society. This course will examine service relationships, encounters and experiences from the perspective of human motivation and relating existing theories of social psychology to the delivery of services. An analysis of the interactions of customers and employees will help the student restrain their use of intuition and overlay critical thinking skills with human dynamics. The areas to be included in this course include; emotional intelligence, reciprocity, persuasion, conflict and communication, motivation, diversity, retention, and other related theories.
Contact Hours: Lecture 3
Typically Offered: Summer

SERQ-747 Design Thinking and Creativity (3 Credits)
The use of creative problem solving to discover new alternatives in the design of products and services is the essence of design thinking. The innovation design thinking process seeks creative inspiration to solve a problem, generating and selecting ideas to develop a path from design to market. Design thinking tools and strategies are discussed as are "Wicked Problems" and the impact design thinking can have on developing a solution for these problems. An in-depth approach uses stories and prototypes to design products/ services in an effort to solve problems in an innovative and sustainable manner.
Contact Hours: Lecture 3
Typically Offered: Fall

SERQ-775 Leading Not For Profit (NFP) Organizations (3 Credits)
A leader for a not-for-profit organization, whether private enterprises or government, requires an orientation for leadership based on a mission to achieve stability, growth and consumer satisfaction with outcomes. This course will deal with the realities of leadership in a not-for profit organization and how leadership skills are applied in this environment. The course will explore the nuances for collaboration and networking as a leadership strategy as well as achieving clarity in the mission, vision and goals of the organization. The unique aspects of leadership in this environment will be discussed as well as the role of stakeholders, whether they are board members or those in government charged with overseeing the use of public resources.
Contact Hours: Lecture 3
Typically Offered: Fall

SERQ-780 Internship (3 Credits)
This course provides the student with the opportunity to apply their graduate coursework to the world of work. Students will be placed or seek out internship opportunities in a work scenario similar to their ultimate career choice in the field. A mentor for the student must be identified in the place of the internship. The role of the mentor will be to work with students to develop a plan for the internship, facilitate the internship experience, and verify the student's accomplishment of specified outcomes as a result of the internship. Once the mentor approves of the plan of work and student accomplishments at the conclusion of the internship they will send this final report to the student's program adviser.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

SERQ-787 Service Design and Implementation (3 Credits)
Internally driven service businesses have been the norm for many years, at best, customer-compelled companies understand the value of co-creation and customer centricity. In this course, students research and select design theories and customer centric processes to construct a customer co-created service system/process. This future-oriented approach allows the learner to apply foundation principles of service design and innovation to invent strategies to resolve customer problems.
Prerequisite: SERQ-710 and SERQ-720 and SERQ-712 and SERQ-723 and SERQ-740 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

SERQ-789 Special Topics (3 Credits)
Selected topics is an innovative course not reflected in the accepted curriculum. Once the outline is submitted titles will appear in the course listing for the semester. The course may be taken more than once as topics change.
This course is restricted to students in the SVCLED-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

SERQ-790 Research Thesis (1-6 Credits)
A thesis is based on experimental evidence obtained by the candidate in an appropriate topic demonstrating the extension of theory into practice. A written proposal which is defended and authorized by the faculty adviser/committee followed by a formal written thesis and oral presentation of findings are required. Typically the candidate will have completed research methods, data analysis, and graduate writing strategies prior to enrolling in this course and will start the thesis process by taking thesis planning as soon as they have completed the prerequisites to allow them to finish the thesis when they have finished their coursework. The candidate must obtain the approval of their graduate adviser who will guide the thesis before registering for this course.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

SERQ-791 Continuation of Research Thesis (0 Credits)
Continuation of Research Thesis
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

SERQ-794 Integrative Problem Solving (3 Credits)
Students will demonstrate synthesis and integration of the theories and foundation principles of their discipline. This will be achieved through application of core knowledge in a series of progressive problem situations culminating in a comprehensive examination. To be successful students must receive a passing grade of at least 80 percent in the course. Students will have one additional opportunity to register for and pass the Integrative problems solving course if their initial attempt result in a failing grade. (No more than 12 semester hours of course work remaining to complete the program; completion of all core courses in their program; be currently enrolled in the program; possess a program GPA of 3.0 or higher; no outstanding incomplete grades, nor can the student be on academic/disciplinary probation.)
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Fall, Summer

SERQ-795 Comprehensive Exam (0 Credits)
Students will demonstrate synthesis and integration of the theories and foundation principles of their discipline to respond to questions found in the comprehensive examination. This demonstration will apply core knowledge to problem situations to be successful students must receive a passing grade of at least 80 percent. (12 semester hours or less of coursework remaining to complete the program; completion of all core courses in the discipline; currently enrolled in the program; possess a program GPA of 3.0 or higher; no outstanding incomplete grades; student cannot be on academic/disciplinary probation; for disciplines requiring integrative problem solving successful completion of that course.)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Summer

SERQ-797 Capstone Project (3-4 Credits)
The purpose of this course is to provide students the opportunity to conduct research, develop a plan and evaluation components and submit the project as a demonstration of final proficiency in the program. The topic selected by the student will be guided by the faculty teaching the class and it will require the student to coalesce and incorporate into the final project a culmination of all their course work in the program to date.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

SERQ-798 Continuation of Capstone Project (0 Credits)
Continuation of Capstone Project
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Software Engineering (SWEN)

SWEN-601 Software Construction (3 Credits)
This is a programming based course to enhance individual, technical engineering knowledge and skills as preparation for masters level graduate work in computing. Students will be introduced to programming language syntax, object oriented concepts, data structures and foundational algorithms. An emphasis will be placed on obtaining practical programming skills, through regular programming assignments and practicum.
Corequisites: SWEN-610 and SWEN-746 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

SWEN-602 Engineering Discipline in Software Construction (3 Credits)
This is a project-based course to enhance individual, technical engineering knowledge and skills followed by introduction to team project knowledge and skills. Topics include adapting to new languages, tools and technologies; developing and analyzing models as a prelude to implementation; software construction concepts (proper documentation, implementing to standards etc.); unit and integration testing; component-level estimation; and software engineering professionalism; team task allocation, coordination and tracking.
Reserved for students in DATASCI-MS or SOFTENG-MS programs.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

SWEN-610 Foundations of Software Engineering (3 Credits)
An overview course in software engineering emphasizing software design and software development projects. The course will focus on object-oriented (OO) analysis, design principles and techniques. Students will be introduced to OO modeling, design patterns and design/code refactoring techniques. While there is a significant emphasis on product development, students will be required to use a rigorous process in a team-based product development project. Major topics include analysis and specification of software, subsystem modeling using patterns, and software testing. A term-long, team-based project is used to reinforce concepts presented in class. Programming is required.
Co-requisites: SWEN-601 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

SWEN-614 Engineering Cloud Software Systems (3 Credits)
The course focuses on designing and implementing applications using cloud software systems infrastructure and technologies. The course introduces the basic concept and knowledge on cloud computing systems and application infrastructure. It also contains brief introductions on key technologies and paradigms related to developing big data applications in the cloud. The course also includes student-led case studies of cloud computing applications in different application domains, e.g., healthcare, financial, IoT (Internet of Things), and so on. The course contains a set of related topics which are covered via hands-on class instruction, application development in teams, course materials, and class discussions. Programming projects and demo presentations are required.
Prerequisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261) or equivalent courses).
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

SWEN-640 Research Methods (3 Credits)
Overview of the academic research methodologies used in graduate level work. Topics include: Writing style, Audience analysis, Research Planning, Experiment design and result analysis, Document structure, Research validation, and the process for submission and review to conferences and journals. In this course the student will identify and develop a detailed thesis or capstone proposal that may be continued in a subsequent course. An in-depth study of a software engineering topic will be research focused. The student selects a research problem, conducts background research, and selects appropriate technology and methodologies needed to fully conduct the project. The topic is selected by the student and is in agreement with the student's advisor and committee. The proposal is presented in a scholarly format for approval by the advisor and committee.
Prerequisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261) or equivalent courses).
Contact Hours: Lecture 3
Typically Offered: Spring

SWEN-660 Graduate Affinity Research Group (3 Credits)
This course is a project-based, research-focused course that supports teamwork, collaboration, and both professional and technical skill building. Students will work in teams that consist of both students and professor. Topics include research methods, technical communication, and technical topics that are relevant to the project(s). This course require permission of the instructor to enroll.
This course requires permission of the Instructor to enroll.
Contact Hours: Studio 3
Typically Offered: Fall, Spring, Summer

SWEN-699 Graduate Co-op Experience (0 Credits)
One block of full-time, paid employment in software engineering. See the software engineering graduate program coordinator or RIT's Office of Career Services and Cooperative Education for further details. Completion of all bridge courses and 17 semester hours of graduate courses are required for enrollment.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

SWEN-701 Practicum I (3 Credits)
A project course where students practice what they have learned or are learning in class, through directed study. Teams work with contemporary tools, technologies, and methodologies. The practicum is an ongoing project in which students register to participate as engineers in a specific role in accordance to individual levels of expertise and profile.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

SWEN-702 Practicum II (3 Credits)
A project course where students practice what they have learned or are learning in class, through directed study. During the first week of class teams of students are assembled. The practicum is an ongoing project in which students register to participate as senior engineers in a specific role in accordance to individual levels of expertise and profile.
Prerequisites: SWEN-701 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

SWEN-711 Engineering Self-Adaptive Software Systems With Reinforcement Learning (3 Credits)
This course introduces beginning graduate students to key concepts and techniques underlying the engineering of self-adaptive and autonomic software systems. Such software systems are capable of self-management, self-healing, self-tuning, self-configuration and self-protection. The course content includes an introduction of self-adaptive software systems and defines their characteristics. This will be followed by foundational engineering principles and methodology for achieving self-adaptive systems – feedback control, modeling, machine learning, and systems concepts. Selected seminal research paper reading and a term-long project will also be covered in the class.
Prerequisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261) or equivalent courses).
Contact Hours: Lecture 3
Typically Offered: Fall

SWEN-712 Engineering Accessible Software (3 Credits)
This course introduces software accessibility principles, which are relevant to the Software Engineering approach of software development. The course will survey assistive technologies, accessibility standards and their applications to new and existing software, and how to incorporate accessibility principles at the various phases of the software development life cycle. Students will deliver software based on software engineering approach to users with different abilities e.g. people with visual impairments, and older users. Other topics include mobile accessibility, accessibility testing, validation technologies, and tools.
Prerequisites: SWEN-601 and SWEN-610 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

SWEN-722 Process Engineering (3 Credits)
In this course, students will study various lifecycle models for developing software systems. They will study the Software Process Engineering Metamodel (SPEM) standard as a tool for modeling and analyzing engineering processes. Students will use SPEM to characterize various process and organization models and patterns, and they will align these process characteristics to categories of needs for various organizations and projects. The students will study process engineering frameworks and the configuration and assembly of reusable process components into processes. Students will also study how tools and methods support the process. Students will also study software process assessment models, including the Capability Maturity Models, and learn how to identify specific recommendations for an organization to improve their processes. Students will apply their learning to engineer software engineering processes, tools, and methods appropriate for their graduate projects, course projects, and projects for organizations they have worked for.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

SWEN-732 Collaborative Software Development (3 Credits)
This course covers processes, tools, and techniques for software development, in general, and collaborative, distributed software development, in particular. Students will learn how to design a process specific to their organization and development project needs. This includes how to select a software development life-cycle model, how to select and sequence the development and management activities of a collaborative, distributed software development team structure and dynamics, and how to define the work products, tools, and methods used to perform those activities. The Software Process Engineering Metamodel (SPEM, an Object Management Group standard) will serve to graphically describe, analyze, discuss, and improve software development processes. Special attention will be given to collaboration needs and approaches for small and large teams that may be globally distributed.
Prerequisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261) or equivalent courses).
Contact Hours: Lecture 3
Typically Offered: Fall

SWEN-745 Software Modeling (3 Credits)
Modeling plays a pivotal role during the software lifecycle during the pre-construction and post-construction activities of the software lifecycle. During the pre-construction stage, models help software engineers understand, specify, and analyze software requirements and designs. During the post-construction stage, models can be used to analyze software systems while in operation. This kind of analysis includes reliability and safety issues as well as timing constraint analysis. (Department approval)
This course is restricted to students with graduate standing in Software Engineering program or GCCIS PHD program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall

SWEN-746 Model-Driven Development (3 Credits)
Software models help the software engineer to understand, specify, and analyze software requirements, designs, and implementations (code components, databases, support files, etc.). Model-driven development is a software engineering practice that uses tool-enabled transformation of requirements models to design models and then to code and associated implementation artifacts. Students will use the Unified Modeling Language (UML) and other modeling techniques to capture software requirements, designs, and implementations. Students will also use formal modeling methods to semi-automatically transform among the various models and to study the quality attributes of the modeled software, such as performance, reliability, security, and other qualities.
Co-requisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261)) or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

SWEN-749 Software Evolution and Reengineering (3 Credits)
This course explores the concepts of software evolution and reengineering and introduces approaches and support tools used to extract the information needed to assess existing software systems. Major maintenance activities are presented including estimating maintenance costs, managing change and predicting maintainability with software quality metrics. Organizational issues relative to product maintenance are discussed. Principles of software reuse and reverse engineering techniques are demonstrated through the use of class activities, team projects and case studies.
Prerequisites: SWEN-745 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

SWEN-755 Software Architecture (3 Credits)
A system's software architecture is the first technical artifact that illustrates a proposed solution to a stated problem. For all but the simplest system, the achievement of qualities such as flexibility, modifiability, security, and reliability is critically dependent on the components and interactions defined by the architecture. The course focuses on the definition of architectural structures, the analysis of architectures in terms of trade-offs among conflicting constraints, the documentation of architecture for use over a product's life cycle, and the role of architecture during coding activities.
Prerequisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261) or equivalent courses).
Contact Hours: Lecture 3
Typically Offered: Fall

SWEN-772 Software Quality Engineering (3 Credits)
This course begins with an exploration of the concepts underlying quality systems and the use of metrics. Students are encouraged to discuss the advantages as well as the limitations of systems and quantitative approaches, with a view to understanding the 40 importance of interpretation in metrics usage and of matching quality systems choices to organizational objectives and culture. They learn the use of modern metrics such as DRE, PCE, COQ/COPQ, reliability objectives and SUMI scores through exercises in analyzing and interpreting charts. This is complemented with a project where they work in teams to design an appropriate quality system for a specific project/organizational situation, and discuss the application and analysis of its evaluation experimentation as a means of improving the quality aspects of subject project/organizational situation.
This course is restricted to students with graduate standing in Software Engineering program or GCCIS PHD program.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring

SWEN-777 Software Quality Assurance (3 Credits)
This course explores the concepts of process and product quality assurance and introduces approaches and support tools used to extract the information needed to assess and evaluate the quality of existing software systems. Major maintenance activities are detailed including unit and regression testing, test case generation, software refactoring, API migrations, bug localization and triage, and predicting technical debt. Students will participate in an active learning approach by exercising and practicing code reviews, software testing tools, and quality frameworks.
Prerequisites: (SOFTENG-U or CSCISWEN-U or SOFTENG-MS students) and ((SWEN-601 and SWEN-610) or (SWEN-261) or equivalent courses).
Contact Hours: Lecture 3
Typically Offered: Spring

SWEN-780 Capstone Research Project (3-6 Credits)
This course provides the student with an opportunity to explore a project-based research experience that advances knowledge in that area. The student selects a research problem, conducts background research, develops the system, analyses the results, and builds a professional document and presentation that disseminates the project. The report must include an in-depth research report on a topic selected by the student and in agreement with the student's adviser. The report must be structured as a conference paper, and must be submitted to a conference selected by the student and his/her adviser.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture/Lab 6
Typically Offered: Fall, Spring, Summer

SWEN-781 Continuation of Capstone (0 Credits)
This course provides the student with an opportunity to complete their capstone project, if extra time if needed after enrollment in SWEN-790. The student continues to work closely with his/her adviser.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

SWEN-783 Software Engineering Masters Project I (3 Credits)
The first course in a two-course project experience. Students will need to determine, before they take the course, whether they will complete a thesis or a practical project. Students that choose thesis will work with an advisor (called a sponsor) to complete a scientific research study that results in a complete Master's Thesis. Thesis project details will be determined by the student and their advisor. Students that choose the practical project will preferably work in a group to develop solutions to problems posed by either internal or external customers (also called sponsors). The size of the group may vary, and while a group is preferred, exceptions may be made to allow for one-person projects. The project may require considerable software development or evolution and maintenance of existing software products, and culminates with the completion and presentation of the first major increment of the project solution. Projects will be solicited by the department prior to students selecting (or being assigned to) the project that they will work on for the capstone. Sponsors may be internal or external to the software engineering department; they may be members of other departments, other colleges, other universities, or they may be industry professionals. The primary requirement for sponsors is that the sponsor be an expert in their field.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

SWEN-784 Software Engineering Masters Project II (3 Credits)
The second course in a two-course project experience. Students on a practical project will submit several additional increments that build upon the solution submitted at the end of the first course. Students on a Master's Thesis will complete their experiments, and draft their thesis into a final draft. All students (regardless of project) will present their work either to a committee (as required by thesis) or to the customers and a technical audience, and turn over a portfolio complete with all project related artifacts, and an evaluation of their experiences as a team.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

SWEN-789 Graduate Special Topics (3 Credits)
This course will cover specialized topics in software engineering. Such topics are often considered emerging and advanced. Graduate standing and specific prerequisites will be noted upon specific proposal of a course.
Prerequisites: SWEN-610 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Fall, Spring, Summer

SWEN-790 Thesis (6 Credits)
This course provides the student with an opportunity to execute a thesis project, analyze and document the project in thesis document form. An in-depth study of a software engineering topic will be research focused, having built upon the thesis proposal developed prior to this course. The student is advised by their primary faculty adviser and committee. The thesis and thesis defense is presented for approval by the thesis adviser and committee.
Enrollment requires completion of all core courses and permission from the department offering the course.
Contact Hours: Thesis 6
Typically Offered: Fall, Spring, Summer

SWEN-791 Continuation of Thesis (0 Credits)
This course provides the student with an opportunity to complete their thesis project once having enrolled in both thesis courses (SWEN-794, SWEN-795) if extra time is needed. The student continues to work closely with his/her adviser and thesis committee.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

SWEN-799 Independent Study (3-6 Credits)
This course provides the graduate student an opportunity to explore an aspect of software engineering in depth, under the direction of an adviser. The student selects a topic, conducts background research, develops the system, analyses results, and disseminates the project work. The report explains the topic/problem, the student's approach and the results. (Completion of 9 semester hours is needed for enrollment)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Statistics (STAT)

STAT-611 Statistical Software - R (3 Credits)
This course is an introduction to the statistical-software package R, which is often used in professional practice. Some comparisons with other statistical-software packages will also be made. Topics include: data structures; reading and writing data; data manipulation, subsetting, reshaping, sorting, and merging; conditional execution and looping; built-in functions; creation of new functions; graphics; matrices and arrays; simulations and app development with Shiny.
This course is restricted to students in APPSTAT-MS or SMPPI-ACT.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-614 Applied Statistics (3 Credits)
Statistical tools for modern data analysis can be used across a range of industries to help you guide organizational, societal and scientific advances. This course is designed to provide an introduction to the tools and techniques to accomplish this. Topics covered will include continuous and discrete distributions, descriptive statistics, hypothesis testing, power, estimation, confidence intervals, regression, one-way ANOVA and Chi-square tests.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

STAT-621 Statistical Quality Control (3 Credits)
A practical course designed to provide in-depth understanding of the principles and practices of statistical process control, process capability, and acceptance sampling. Topics include: statistical concepts relating to processes, Shewhart charts for attribute and variables data, CUSUM charts, EWMA charts, process capability studies, attribute and variables acceptance sampling techniques.
This class is restricted to students in the APPSTAT-MS, SMPPI-ACT, STATQL-ACT or MMSI-MS programs.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-631 Foundations of Statistics (3 Credits)
This course introduces principles of probability and statistics with a strong emphasis on conceptual aspects of statistical inference. Topics include fundamentals of probability, probability distribution functions, expectation and variance, discrete and continuous distributions, sampling distributions, confidence intervals and hypothesis tests.
This course is restricted to students in APPSTAT-MS or SMPPI-ACT.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-641 Applied Linear Models - Regression (3 Credits)
A course that studies how a response variable is related to a set of predictor variables. Regression techniques provide a foundation for the analysis of observational data and provide insight into the analysis of data from designed experiments. Topics include happenstance data versus designed experiments, simple linear regression, the matrix approach to simple and multiple linear regression, analysis of residuals, transformations, weighted least squares, polynomial models, influence diagnostics, dummy variables, selection of best linear models, nonlinear estimation, and model building.
This class is restricted to students in the APPSTAT-MS, SMPPI-ACT, or APPSTAT-U programs.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

STAT-642 Applied Linear Models - ANOVA (3 Credits)
This course introduces students to analysis of models with categorical factors, with emphasis on interpretation. Topics include the role of statistics in scientific studies, fixed and random effects, mixed models, covariates, hierarchical models, and repeated measures.
This class is restricted to students in the APPSTAT-MS, SMPPI-ACT, or APPSTAT-U programs.
Contact Hours: Lecture 3
Typically Offered: Spring, Summer

STAT-670 Design of Experiments (3 Credits)
How to design and analyze experiments, with an emphasis on applications in engineering and the physical sciences. Topics include the role of statistics in scientific experimentation; general principles of design, including randomization, replication, and blocking; replicated and unreplicated two-level factorial designs; two-level fractional-factorial designs; response surface designs.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-672 Survey Design and Analysis (3 Credits)
This course is an introduction to sample survey design with emphasis on practical aspects of survey methodology. Topics include: survey planning, sample design and selection, survey instrument design, data collection methods, and analysis and reporting. Application areas discussed will include program evaluation, opinion polling, customer satisfaction, product and service design, and evaluating marketing effectiveness. Data collection methods to be discussed will include face-to-face, mail, Internet and telephone.
This course is restricted to students in APPSTAT-MS or SMPPI-ACT.
Contact Hours: Lecture 3
Typically Offered: Summer

STAT-675 Data Visualization & Storytelling (3 Credits)
This course introduces concepts of data visualization and storytelling. Students explore the use of graphical representations of data to convey information. Topics include data visualization principles, defining a research question or business case, establishing data requirements, using R programming language to create custom plots, enhancing data visualizations and dashboards, and telling a data-driven story with visualizations.
This class is restricted to students in APPSTAT-MS.
Contact Hours: Lecture 3
Typically Offered: Spring

STAT-699 Graduate Co-op (0 Credits)
See the graduate program coordinator or RIT's Office of Cooperative Education for further details.
Typically Offered: Fall, Spring, Summer

STAT-720 Mathematics For Statistics (2 Credits)
This is a survey of the mathematical tools of some of the more mathematically rigorous statistics courses of the MS program. The topics include partial and higher-order differentiation, various methods of integration, the gamma and beta functions, and a brief overview of linear algebra, all in the context of application to statistics.
This course is restricted to students in APPSTAT-MS or SMPPI-ACT.
Contact Hours: Lecture 2
Typically Offered: Summer

STAT-745 Predictive Analytics (3 Credits)
This course is designed to provide the student with solid practical skills in implementing basic statistical and machine learning techniques for the purpose of predictive analytics. Throughout the course, many real world case studies are used to motivate and explain the strengths and appropriateness of each method of interest. In those case studies, students will learn how to apply data cleaning, visualization, and other exploratory data analysis tools to a variety of real world complex data. Students will gain experience with reproducibility and documentation of computational projects and with developing basic data products for predictive analytics. The following techniques will be implemented and then tested with cross-validation: regularization in linear models, regression and smoothing splines, k-nearest neighbor, and tree-based methods, including random forest.
Prerequisites: STAT-611 and STAT-641 or equivalent courses and graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Spring

STAT-747 Principles of Statistical Data Mining (3 Credits)
This course covers topics such as clustering, classification and regression trees, multiple linear regression under various conditions, logistic regression, PCA and kernel PCA, model-based clustering via mixture of gaussians, spectral clustering, text mining, neural networks, support vector machines, multidimensional scaling, variable selection, model selection, k-means clustering, k-nearest neighbors classifiers, statistical tools for modern machine learning and data mining, naïve Bayes classifiers, variance reduction methods (bagging) and ensemble methods for predictive optimality.
Prerequisites: STAT-611 and STAT-631 and STAT-641 or equivalent courses and graduate student standing.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-753 Nonparametric Statistics and Bootstrapping (3 Credits)
The emphasis of this course is how to make valid statistical inference in situations when the typical parametric assumptions no longer hold, with an emphasis on applications. This includes certain analyses based on rank and/or ordinal data and resampling (bootstrapping) techniques. The course provides a review of hypothesis testing and confidence-interval construction. Topics based on ranks or ordinal data include: sign and Wilcoxon signed-rank tests, Mann-Whitney and Friedman tests, runs tests, chi-square tests, rank correlation, rank order tests, Kolmogorov-Smirnov statistics. Topics based on bootstrapping include: estimating bias and variability, confidence interval methods and tests of hypothesis.
Prerequisites: STAT-631 or equivalent course and APPSTAT-MS or SMPPI-ACT program students.
Contact Hours: Lecture 3
Typically Offered: Summer

STAT-756 Multivariate Analysis (3 Credits)
Multivariate data are characterized by multiple responses. This course concentrates on the mathematical and statistical theory that underlies the analysis of multivariate data. Some important applied methods are covered. Topics include matrix algebra, the multivariate normal model, multivariate t-tests, repeated measures, principal component analysis, factor analysis, canonical correlation analysis, clustering, and discriminant analysis.
Prerequisites: STAT-641 or equivalent course and APPSTAT-MS or SMPPI-ACT program students.
Contact Hours: Lecture 3
Typically Offered: Summer

STAT-758 Multivariate Statistics for Imaging Science (3 Credits)
This course introduces multivariate statistical techniques and shows how they are applied in the field of Imaging Science. The emphasis is on practical applications, and all topics will include case studies from imaging science. Topics include experimental design and analysis, the multivariate Gaussian distribution, principal components analysis, singular value decomposition, orthogonal subspace projection, cluster analysis, canonical correlation and canonical correlation regression, regression, multivariate noise whitening. This course is not intended for CQAS students unless they have particular interest in imaging science. CQAS students should be taking the course STAT-756-Multivariate Analysis.
Prerequisites: This class is restricted to students in APPSTAT-MS, SMPPI-ACT, IMGS-MS, IMGS-PHD, CLRS-MS or CLRS-PHD.
Contact Hours: Lecture 3
Typically Offered: Summer

STAT-762 SAS Database Programming (3 Credits)
This course focuses on the SAS programming language to read data, create and manipulate SAS data sets, using Structured Query Language (SQL), creating SAS macros, and SAS programming efficiency. This course covers the material required for "SAS Base Programming" and "SAS Advanced Programming " certification exams.
Prerequisites: STAT-611 or equivalent course and APPSTAT-MS or SMPPI-ACT students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-773 Time Series Analysis and Forecasting (3 Credits)
This course is designed to provide the student with a solid practical hands-on introduction to the fundamentals of time series analysis and forecasting. Topics include stationarity, filtering, differencing, time series decomposition, time series regression, exponential smoothing, and Box-Jenkins techniques. Within each of these we will discuss seasonal and nonseasonal models.
Prerequisites: STAT-641 or equivalent course and APPSTAT-MS or SMPPI-ACT program students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-775 Design and Analysis of Clinical Trials (3 Credits)
This is a graduate level survey course that stresses the concepts of statistical design and analysis for clinical trials. Topics include the design, implementation, and analysis of trials, including treatment allocation and randomization, factorial designs, cross-over designs, sample size and power, reporting and publishing, etc. SAS for Windows statistical software will be used throughout the course for data analysis.
Prerequisites: STAT-611 or equivalent course and APPSTAT-MS or SMPPI-ACT students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-776 Causal Inference (3 Credits)
As the need for causal discovery increases, and supportive data are increasingly available, there is a growing need to understand causal inference methods and applications beyond experiments. This course is a survey of a broad array of topics including the concepts of causal inference, causal inference methods, and applications of and implementation of causal inference techniques. Topics will include causal diagrams, and causal inference methods such as propensity score methods, instrumental variables, and methods for time-varying exposures Implementation of the methods using statistical software will be addressed. Prerequisites include a regression course and a statistical software course.
Prerequisites: This class is restricted to students in APPSTAT-MS or SMPPI-ACT who have successfully completed STAT-611 and STAT-641 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

STAT-784 Categorical Data Analysis (3 Credits)
The course develops statistical methods for modeling and analysis of data for which the response variable is categorical. Topics include: contingency tables, matched pair analysis, Fisher's exact test, logistic regression, analysis of odds ratios, log linear models, multi-categorical logit models, ordinal and paired response analysis.
Prerequisites: STAT-641 or equivalent course and APPSTAT-MS or SMPPI-ACT program students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-786 Advanced Programming in R (1 Credit)
This course is a continuation of the R programming language that was begun in STAT-611. Topics include: more on function writing; ggplot2 graphics; changing text to commands or functions; handling larger data sets, efficiency considerations; simulations; select statistical applications.
Prerequisites: STAT-611 or equivalent course and APPSTAT-MS or SMPPI-ACT students.
Contact Hours: Lecture 1
Typically Offered: Summer

STAT-787 Advanced Statistical Computing (3 Credits)
This project-based course introduces students to advanced concepts of statistical computing. We will work in the environment of R—one of the most common and powerful statistical computing languages that are used in professional practice. Topics include: object-oriented features of R, function writing, using environments, non-local assignments (closures), and connections; converting text to code, speeding up processing, advanced features in regular expressions, introduction to the Grammar of Graphics (ggplot2) and lattice methods for graphics, R markdown, computing on large datasets (without reading all data into RAM memory), cleaning and reshaping of messy data, web scraping, interactive web applications (with Shiny), advanced reading from files and writing to files, simulations, select statistical applications.
Prerequisite: This class is restricted to students in APPSTAT-MS and SMPPI-ACT who have successfully completed STAT 611 and STAT-741 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Summer

STAT-789 Special Topics (1-3 Credits)
This course provides for the presentation of subject matter of specialized value in the field of applied statistics not offered as a regular part of the program.
This course is restricted to students in APPSTAT-MS or SMPPI-ACT.
Typically Offered: Fall, Spring

STAT-790 Capstone Thesis/Project (1-6 Credits)
This course is a graduate course for students enrolled in the Thesis/Project track of the MS Applied Statistics Program. (Enrollment in this course requires permission from the Director of Graduate Programs for Applied Statistics.)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

STAT-791 Continue of Capstone Thesis/Project (0 Credits)
This course is a graduate course for students enrolled in the Thesis/Project track of the MS Applied Statistics Program. (Enrollment in this course requires permission from the Director of Graduate Programs for Applied Statistics.)
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

STAT-792 Capstone (3 Credits)
This course is designed to provide a capstone experience for MS students at the end of the graduate studies, and will require a synthesis of knowledge obtained from earlier coursework.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAT-795 Graduate Seminar (0 Credits)
This course provides for one or more semesters of study and research activity. This course is required for all first-year full-time funded students in the MS program.
Enrollment in this course requires permission from the department offering the course.
Contact Hours: Lecture 1
Typically Offered: Fall, Spring, Summer

STAT-799 Independent Study (1-3 Credits)
Credit will be assigned at the discretion of the department. A written proposal of the work involved will be required of the candidate, and may be modified at the discretion of the faculty involved before approval is given to proceed.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

Studio Arts (STAR)

STAR-603 CAD Drawing (3 Credits)
This class covers basic CAD (computer-aided design) drawing for both design and presentation. Topics covered will include a broad range of drawing types, three-dimensional modeling, and presentation techniques. The course includes demonstrations, lectures, group-discussions, projects, and presentations. At the completion of this course, students will use skills obtained in CAD orthographic drawing and 3-dimensional modeling to refine and present ideas and projects.
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall or Spring

STAR-605 Figure Drawing (3 Credits)
This course will focus on building figure drawing skills in a traditional life drawing class format with emphasis on dynamic line quality, visual perception and contemporary approaches to figure drawing. Students will work directly from the model in a variety of media. At the completion of this course, students will gain an understanding of diverse representations and applications of the human figure using various drawing materials and processes.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

STAR-635 Curating and Managing Art Spaces (3 Credits)
This course explores the roles of contemporary, traditional, and alternative art spaces through curatorial studies, exhibition evaluation and criticism. Student will consider gallery administration roles and supporting operations, and undertake site visitations and gallery research. Students will organize and install a final exhibition project in an approved exhibition venue.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

STAR-645 Art Exhibition Critque (3 Credits)
This course will explore the role of the art exhibition and its effect on the discourse and practice of art. Course content will focus on: contemporary and historical exhibition studies, individual and group projects. Student will also conduct site visitations and evaluation, and critique work in the context of exhibition.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Fall

STAR-649 Topics in Contemporary Issues (3 Credits)
This course will focus selected contemporary issues in the field of fine arts and crafts including specific artists, trends, practices, theory, or criticism. A topic course description will be published each term the course is offered. This course can be retaken but individual topics may not.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

STAR-650 Topics in Studio Arts (3 Credits)
This course will focus on traditional or contemporary process, techniques, media or material used in the creation of artwork. Topic will be determined by faculty teaching the course. A topic course description will be published each term the course is offered. This course can be retaken but individual topics may not.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

STAR-651 Topics in Studio Art Contemporary Issues (3 Credits)
This course will focus on selected contemporary issues in the field of studio arts including specific artists, trends, theory, or criticism. A topic course description will be published each term the course is offered. This course can be retaken but individual topics may not.
This course is restricted to Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall or Spring or Summer

STAR-663 Contemporary Drawing (3 Credits)
This course places an emphasis on drawing and the development of form, space, and expression from a variety of sources. Course content will include traditional drawing mediums and practices for exploration of unusual materials, concepts, and mark-making. Students will develop an individual mode of expression through drawing and surface exploration as well as an understanding of contemporary practices. At the completion of this course, students will create a body of work exploring developed ideas based on individual research with drawing as a practice. **Materials fee is required for this course**
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

STAR-678 Screenprinting (3 Credits)
This course will be a comprehensive introduction to non-toxic silkscreen printing concepts and techniques. Organized to create a broad introductory experience, the course will focus on the expansion of problem solving and skill building within the context of screenprinting. The course will address a wide variety of media, tools, techniques both traditional and technological and the theoretical concepts to facilitate skill development and experimentation with process. Accumulative aspects of the curriculum will include the exploration of historical and cultural concepts of materiality and the multiple, intertwined aspects of personal interpretation and experience. **Fee: There is a lab fee required for this course**
This course is restricted to CAD degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

STAR-698 Studio Arts Internship (1-6 Credits)
Studio Arts Internship will provide students with the option to work with established artists or in fine art related businesses. Students may apply for internships to businesses based on the availability of positions and business job needs. Students must obtain permission of an instructor and complete the Internship Permission Form to enroll.
Prerequisites: This class is restricted to students in FNAS-MFA with department permission.
Typically Offered: Fall, Spring

STAR-699 Studio Arts Co-op (0 Credits)
Cooperative Education will provide Studio Arts students with hands-on experience in their field, directly related to a student’s major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students’ own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in FNAS-MFA with department permission.
Typically Offered: Fall, Spring, Summer

STAR-701 Technology in the Studio (3 Credits)
This course will introduce a contemporary technology used by the course instructor in their studio practice. Students will be encouraged to investigate how this technology may be applied in their making process. The subjects offered in the course will vary according to the faculty teaching the class. The course can be taken multiple times with faculty permission.
This course is available to RIT degree-seeking graduate students.
Contact Hours: Studio 6
Typically Offered: Fall or Spring

STAR-702 Studio Art Research (3 Credits)
This course will prepare graduate students for the written component of the thesis. Course content will cover defining research in the arts, arts based research, research through practice, critical judgment, writing strategically and critically for reflective thinking and scholarly dissemination. At the completion of this course students will be able to write a thesis proposal addressing a research question or direction along with objectives, context, and methods.
Prerequisites: STAR-701 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

STAR-706 Business Practices for Studio Artists (3 Credits)
This class is devoted to business issues that artists must address including portfolio management, pricing and marketing strategies, and public relations for pursuit of a professional career as studio artists. Financial and communication skills are highlighted as are networking skills for the advancement of an artist’s work.
Prerequisites: This course is restricted to students in the FNAS-MFA or GLASS-MFA or METAL-MFA or CCER-MFA or WOOD-MFA programs.
Contact Hours: Lecture 3
Typically Offered: Spring

STAR-714 Ideation and Series (3 Credits)
Creative flow, having an endless stream of ideas, alternatives, and choices for solutions, helps creative work evolve and reach more advanced levels. In this course students develop appropriate skills and strategies to generate ideas and develop them effectively into a cohesive body of work.
Prerequisites: This course is restricted to students in the FNAS-MFA or GLASS-MFA or METAL-MFA or CCER-MFA or WOOD-MFA programs.
Contact Hours: Studio 6
Typically Offered: Fall

STAR-718 Research Methods and Publication (3 Credits)
Students will conduct research appropriate for individual thesis directions, incorporate that research into writing, analyze and review their thesis body of work then produce and publish their written thesis document.
Prerequisites: STAR-702 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

STAR-730 Developing an Online Brand (3 Credits)
This course will provide a comprehensive exploration of the planning, building, and managing website and social media. The course will include instruction on creating, publishing and managing content for internet self-promotion as well as ways to use social media to create new opportunities. Students will be encouraged to explore and develop effective approaches to documenting their processes of making and portfolios for online publishing.
This course is restricted to CAD Graduate students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

STAR-758 Studio Art Critique (3 Credits)
Students will explore the process of critical analysis of studio work. Content will focus on the structure and form of the critique process. They will discuss, defend, and interpret existing studio work as they work towards their thesis. Faculty led critiques will include studio visits for in depth analysis of works in progress.
Prerequisites: This course is restricted to students in the FNAS-MFA or GLASS-MFA or METAL-MFA or CCER-MFA or WOOD-MFA programs.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

STAR-790 Research and Thesis (3 Credits)
This is the first of two courses designed to advance a student towards completion of their thesis. Students will work independently on their approved proposal while meeting on a regular basis with their committee chair. Students are required to meet at least twice with their full committee during the semester.
Prerequisites: STAR-702 or equivalent course.
Typically Offered: Fall

STAR-799 Studio Arts Independent Study (1-6 Credits)
Studio Arts Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty advisor, will propose and conduct a course of study. An approved Independent Study Permission Form must be submitted to Student Services to enroll.
Prerequisites: This class is restricted to students in FNAS-MFA with instructor permission.
Typically Offered: Fall, Spring

STAR-887 Studio Arts Part-Time Co-op (0 Credits)
Cooperative Education will provide Studio Arts students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in FNAS-MFA with department permission.
Typically Offered: Fall, Spring, Summer

STAR-890 Thesis (6 Credits)
For this final thesis course students continue working with their committee to evaluate work produced, and select the work to be exhibited. In addition, students will work with gallery coordinators and curators to install and exhibit their final body of work. Students are expected to defend their work to the committee through an oral defense and a written document.
Prerequisite: STAR-790 or equivalent course.
Typically Offered: Spring

STAR-892 Continuation of Thesis Studio Arts (0 Credits)
The Studio Arts Continuation of Thesis course provides student additional semester(s) to complete their thesis research, project, and thesis document.
Prerequisites: This course is restricted to students in the FNAS-MFA or GLASS-MFA or METAL-MFA or CCER-MFA or WOOD-MFA programs.
Typically Offered: Fall, Spring, Summer

Study Abroad (SAB)

SAB-662 Study Abroad (0-54 Credits)
This course is used for students who are studying abroad.
Typically Offered: Fall, Spring, Summer

Telecommunications Engineering Technology (TCET)

TCET-601 Programming & Problem Solving in Python (3 Credits)
This course provides students with the programming, scripting and problem-solving techniques required for other classes in the CNET MS curriculum and to provide the software skills that are required in today's telecommunication industry. The class will be taught using a programming language that is commonly used in industry today such as Python. The course will cover the following material: Basic programming constructs, Programming best practices, Algorithmic complexity, Data abstraction, Sorting and searching algorithms, Problem solving techniques. Homework assignments will be based upon real-world examples from the telecommunications industry.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-615 Converged Network Concepts (3 Credits)
The course provides the student with a solid understanding of access, distribution and backbone network, architecture, equipment and technology related to a variety of service-provided networks and services critical to the operation of converged and IP networks. Passive Optical Networking, Hybrid Fiber Coax technology, multiplexing, modulation schemes, coding, signaling, and networking protocols used in convergence technologies for the delivery of information in a variety of packet and next-generation networks are covered in detail. Students may not take and receive credit for this course if they have already taken CPET-515.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-620 Applied Machine Learning (3 Credits)
Machine learning has applications in a wide variety of fields ranging from medicine and finance to telecommunications and autonomous self-driving vehicles. This course introduces machine learning and gives you the knowledge to understand and apply machine learning to solve problems in a variety of application areas. The course covers neural net structures, deep learning, support vector machines, training and testing methods, clustering, classification, and prediction with applications across a variety of fields. The focus will be on developing a foundation from which a variety of machine learning methods can be applied. Students may not take and receive credit for this course if they have already taken EEET-520.
This class is restricted to degree-seeking graduate students or those with permission from instructor. If you have earned credit for EEET-520 or you are currently enrolled in EEET-520 you will not be permitted to enroll in TCET-620.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-651 Wireless Communications (3 Credits)
Wireless, digital point-to-point communication systems require a wide array of technologies, some analog (such as antennas, amplifiers, mixers) and some digital (filters, equalizers, decoders, etc.). The course emphasizes system- and component-level analyses of a complete transceiver operating on a fading channel. Fundamental concepts, classical techniques, and some state-of-the-art advances are presented. These concepts are illustrated with hands-on activities using software-defined radio. Students may not take and receive credit for this course if they have already taken EEET-551.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-661 Telecommunications Systems (3 Credits)
The fundamental principles that govern the communication of information are introduced. At the end of this course, students will understand signal spectral analysis and the principles of digital and analog modulation formats. Topics in the course are spectral analysis techniques, modulation schemes, and noise and bit error rates.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-671 Patents and Trade Secrets (3 Credits)
This course explores the legal characteristics and limitations of intellectual property rights protected by patents and trade secrets in the United States through study of relevant statutes, court decisions, and inventor behavior. The course is appropriate for anyone who anticipates involvement in the creation or management of intellectual property rights. NOTE: A party's legal rights depend upon their unique and specific factual situation. This course does not provide legal advice or direction.
This class is restricted to degree-seeking graduate students or those with permission from instructor.
Contact Hours: Lecture 3
Typically Offered: Biennially

TCET-689 Special Topics in MSTET (1-3 Credits)
Subject offerings of new and developing areas of knowledge in telecommunications engineering technology intended to augment the existing curriculum. Special Topics courses are offered periodically, watch for titles in the course listing each semester.
Typically Offered: Spring

TCET-699 TCET Graduate Co-op (0 Credits)
TCET Graduate Co-op. Department permission is required.
Typically Offered: Fall, Spring, Summer

TCET-710 Principles of Telecommunications Networks (3 Credits)
The course provides the student with a solid understanding of local access and backbone network, architecture, equipment and technology related to the Public Switched Telephone (PSTN), Cable (MSO), Access and Converged/IP networks. Passive Optical Networking and Hybrid Fiber Coax technology is also covered.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-720 Telecommunications Concepts (3 Credits)
The course provides the student with a solid understanding of Digital and Time Division Multiplexing and Modulation schemes used in the transmission of information in a variety of networks, both packet and circuit switched. Traffic engineering and Quality of Service concepts are covered as well as a number of network protocols and signaling platforms such as MPLS and SIP.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-723 Telecommunications Network Engineering (3 Credits)
This course covers accepted network design principles and methodologies as they apply to circuit, packet, frame, cell and synchronization networks. Course topics are transmission engineering, traffic engineering models, timing and synchronization, design of voice and data networks, and electrical grounding concepts.
Prerequisites: TCET-615 or TCET-710 and TCET-720 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-730 Telecommunications Policy and Issues (3 Credits)
The objective of this course is to enlighten students relative to telecommunications policy and standards sufficiently, in order for them to be able to deal with the real-world issues that confront telecommunications professionals on a daily basis. Students will not be prepared to act as regulatory experts or to replace specialized experts with legal training, but should be sufficiently cognizant of pertinent issues to know when it is prudent to call in such forces. The domestic as well as the international regulatory, policy and standard arenas will be explored. This course helps students to understand that the telecommunications environment is greatly effected by technology, policy, security, and market forces with a primary focus on telecommunications policy and all that it entails.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-740 Fiber Optic Communications (2 Credits)
Fiber-optic, point-to-point telecommunication systems are used as a framework to understand the wide array of fiber-optic telecom technologies, including light sources, optical fiber, and photoreceivers. An emphasis on the nature & behavior of optical signals provides insight into these technologies and into the important fiber-channel impairments of attenuation and dispersion. Fundamental concepts and state-of-the-art advances of these technologies are covered, as well as component-level and system-level analysis.
Contact Hours: Lecture 2
Typically Offered: Fall

TCET-741 Fiber Optic Communications Lab (1 Credit)
This course provides extensive hands-on experience with key technologies used within fiber-optic telecommunication systems, including optical fiber, laser diodes, light-emitting diodes, photodiodes, and pluggable transceivers, as well as key diagnostics such as power meters, oscilloscopes, optical time-domain reflectometers, and optical spectrum analyzers. Students will be trained in laser safety, ESD safety, and fiber-connector inspection, and will develop a broad understanding of fiber-optic test and measurement including transmitter & receiver characterization as well as measuring the fiber-channel impairments of attenuation and dispersion.
Co-requisite: TCET-740 or equivalent course.
Contact Hours: Laboratory 2
Typically Offered: Fall

TCET-745 Advanced Fiber-Optic Communications (3 Credits)
This course focuses on characterizing and designing the capacity and reach of fiber-optic transmission systems in terms of key performance metrics (BER, Q-factor, eye diagrams, and system margin, transmission penalty, optical-power budgets, and OSNR budgets), the impact of key physical impairments (loss, dispersion, nonlinearity), and techniques used to overcome these impairments (optical amplification, dispersion compensation, power mitigation). Widespread fiber-optic transmission modalities (such as wavelength-division multiplexing and amplitude modulation) as well as emerging modalities (such as polarization-division multiplexing and phase modulation) will be covered.
Prerequisites: TCET-740 and TCET-741 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-747 Next Generation Networks (3 Credits)
This hybrid course is a cross between an independent study and a seminar course. It provides MSTET students the opportunity to research and report on near term Next Generation Networks (NGN). The course consists of professor provided discussion on NGN followed by each student researching NGN types. Basically, a case study approach is utilized. Immediately after completing the research and written paper regarding one's selected topic/case, each student will read each others and then present theirs to all other students in the class. As a result, every student will not only benefit from their own research of topics/cases but also be informed of other NGN by other students. Students should already have some understanding of how to perform research and must possess at least adequate writing skills.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-748 Fiber Optic Test & Measurement (3 Credits)
This course covers the test & measurement of fiber-optic components & diagnostics, including: time-based, frequency-based, polarization-based measurement of optical & electro-optic components; test-station design, specification, activation, calibration, and usage; reliability testing & industry test standards; optical-waveguide coupling; design & analysis of diagnostics; polarization generation, manipulation, and detection; data acquisition & analysis.
Prerequisites: TCET-740 and TCET-741 or equivalent courses.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-750 Wireless Systems Regulation (3 Credits)
The fundamental legal and regulatory principles of U.S. wireless mobile and fixed radio frequency communication systems are studied in this course. At the end of this course, students will be able to (1) analyze the legal and regulatory issues related to wireless base station site zoning approval, (2) calculate radio-frequency human exposure levels and (3) apply relevant regulations related to deployment of the wireless infrastructure.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-752 Advanced Wireless Communication (3 Credits)
This course focuses on modern wideband wireless communications over the frequency-selective channel. It covers channel models, equalization and synchronization techniques, and contemporary modulations such as SC-FDE and OFDM. State-of-the-art and emerging technologies, such as MIMO, massive MIMO, and spatial modulation are included. These are studied in the context of current mobile and networking standards, such as 3G, LTE, and 5G, and IEEE 802.x.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-753 Wireless Networks (3 Credits)
This course focuses on multiplexing, multiple access, medium access control, and frequency reuse, and how these influences a wireless network's choice of protocols, topology, security, efficiency, etc. Following this approach, cellular, sensor, WLANs, WPANs, IoT, and other important current wireless network technologies are explored.
Prerequisites: TCET-651 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

TCET-755 Wireless Communications Techniques (3 Credits)
This course focuses on techniques for data transmission over the wireless channel. Students who take this course will start by learning about digital communications over the noisy channel, including how to model, simulate, and evaluate the system's performance. Then, they will move on to the wireless channel, which presents a new set of challenges, such as multipath fading. Students will learn techniques to achieve reliable, efficient communication over this channel, such as coding, diversity, and MIMO. Students will be assigned exercises where they'll use a computer and a software-defined radio to simulate, design, and evaluate their own communications systems.
Prerequisites: TCET-750 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-760 Network Planning & Design (3 Credits)
This course teaches the art and science of metropolitan and wide area network design for both modern delay (data) networks and traditional blocking (voice) networks; the greatest emphasis is on modern delay networks. Both qualitative and quantitative approaches are used as the student progresses through the network analysis, architecture and network design processes. An advanced WAN Fiber Optic design tool, such as OPNET Transport Planner is utilized in a required graduate project. The following are typical types of projects: Write an RFP, design an extensive metropolitan and wide area network using the latest technologies, design an extensive fiber optic network using a design tool like OPNET Transport Planner. Note: Since some students may not yet have taken a fiber course, the OPNET project stresses the use of the tool rather than the specifics of fiber optics.
This course is restricted to students in the TCET-MS program.
Contact Hours: Lecture 3
Typically Offered: Spring

TCET-788 Thesis Planning (3 Credits)
This course begins the work on a previously approved thesis proposal and culminates upon successful investigation of the chosen research topic and scholarly development of initial data and results that show likelihood of successful completion of the thesis. The thesis advisor will specify the documentation and presentation needed to satisfy requirements for this course. The MSTET graduate thesis, delivered after subsequently completing TCET-790 Thesis, is a document that describes and presents the results of scholarly research in the field of telecommunications. The results of a MSTET graduate thesis provide new knowledge, processes, software or other assets that advance the state of the art of telecommunications, even in a modest way. (Department consent required)
Typically Offered: Fall, Spring, Summer

TCET-789 Special Topics in MSTET (1-3 Credits)
Subject offerings of new and developing areas of knowledge in telecommunications engineering technology intended to augment the existing curriculum. Special topics courses are offered periodically. Watch for titles in the course listing each semester.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

TCET-790 Thesis (3 Credits)
This course continues research work started in TCET-788 Thesis Planning after completion of that initial research and documentation. The MSTET graduate thesis is a document that describes and presents the results of scholarly research in the field of telecommunications. The results of a MSTET graduate thesis provide new knowledge, processes, software or other assets that advance the state of the art of telecommunications, even in a modest way. (Department consent required)
Prerequisites: TCET-788 or equivalent course.
Typically Offered: Fall, Spring, Summer

TCET-795 TCET Comprehensive Exam (0 Credits)
Students will demonstrate synthesis and integration of the theories and foundation principles of their discipline to respond to questions found in the comprehensive examination. This demonstration will apply core knowledge to problem situations. To be successful, students must receive a passing grade of at least 80 percent. (Prerequisites: Currently enrolled in the TCET program; possess a GPA of 3.0 or higher; no outstanding incomplete grades; minimum grade of "C" in all core program courses; no pending or outstanding academic actions; department approval).
Typically Offered: Fall, Spring

TCET-797 Graduate Project (3 Credits)
The MSTET graduate project describes and presents the results of scholarly research in the field of telecommunications. The results of a MSTET graduate project provide new knowledge, processes, software, or other assets that advance the state of the art of telecommunications or organize or implement existing knowledge in a unique and useful way. Department permission is required.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring, Summer

TCET-899 Graduate Independent Study (1-4 Credits)
Study or laboratory work on a topic in or related to telecommunications engineering technology.
This course requires permission of the Instructor to enroll.
Typically Offered: Fall, Spring

User Experience & Design (UXDE)

UXDE-711 User Interface Design (3 Credits)
This course provides an introduction to human-centered interface design. Students research, explore and create design-based solutions for user interfaces. An introduction to visual design elements and principles such as form, color, typography, imagery, visual hierarchy, layout and information architecture. Emphasis is placed on integrating and applying design skills and processes to web standards and device guidelines. Projects are focused on designing navigational solutions for online web and touch-screen applications such as mobile phones and touch-pads. At the conclusion of the course students will be able to research, analyze and create user interface mock-ups based on appropriate visual design principles across multiple devices and platforms. Students will gain a core user interface design foundation to incorporate into their professional role during the planning and UI design phases of interactive projects. **Note: Course is restricted to RIT Online graduate students only**
Reserved for online students.
Contact Hours: Lecture 7
Typically Offered: Fall

UXDE-721 User Experience Design (3 Credits)
This course introduces students to the design process for researching, identifying and implementing a user experience strategy for online web and app development. Students will learn to research, gather and evaluate source material to organize, write and design interaction solutions. The user experience workflow will cover: defining client and user goals, user identification, content organization, information architecture, wire-framing methods and basic UX validation through user testing across various platforms. At the conclusion of the course students will complete and document a UX project plan based on graphical user interface requirements and interactive conventions. Students will be able to incorporate the UX design process into their professional role during the research, planning and interaction design phases of user experience projects. and may have limited repeatability
Contact Hours: Lecture 7
Typically Offered: Spring

UXDE-722 Interaction Design and Development (3 Credits)
This course provides an introduction to interaction design and development including internet, web and mobile technologies. Topics covered include computer-based communication and information systems: basic HTML 5, CSS3, JavaScript and WYSIWYG editors for creating content and project workflows for delivery online and mobile content. The course will examine and integrate programmatic solutions and project planning processes for single and responsive design solutions. Best practices and technologies for hybrid, native and web solutions will also be identified and explored. At the conclusion of the course students will be able to programmatically implement web based user experiences which incorporates user interface mock-ups and basic interactive functionality. Students will gain the required technical knowledge to facilitate improved communication with developers and create stronger user experience design solutions during the planning and implementation of interactive projects. **Note: Course is restricted to RIT Online graduate students only**
Contact Hours: Lecture 7
Typically Offered: Spring

Visual Communication Design-Grad (VCDE)

VCDE-601 Advanced Design Systems (3 Credits)
This advanced, studio-based course offers an exploration of systems thinking in the development of interactive design solutions for digital products. Emphasizing contemporary and industry best practices, students conceptualize, structure, and refine cohesive design systems by creating standardized components along with self-authored guidelines to ensure visual and functional consistency. Core concepts—including organization, language, information architecture, and aesthetics—are applied to build flexible, scalable systems that address user needs, contextual constraints, and temporal considerations. Through lectures, collaborative projects, and iterative prototyping, students learn to design for evolving technologies and diverse media, resulting in professional-grade digital experiences that exemplify both technical proficiency and conceptual depth.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall or Spring

VCDE-617 Experimental Workshop (3 Credits)
The course focuses on implementing advanced, newly developing ideas in visual communication design. The specific subtopic for this course varies each time it is taught. As a result it may be repeated with a different subtopic. The subtopic is determined by the instructor. Potential topics include the creation of interactive installations, adaptive/responsive interface design, tangible media design, digital performances, cyber fashion, network art, locative media, scientific visualization, information visualization, event design, projection design, or any new area in digital design. Students can take more than one Experimental Workshop in a term, as long as the subtopic is not repeated.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall, Spring

VCDE-621 Character Design and Rigging (3 Credits)
This course covers first the design of characters and then the creation of them using three-dimensional software, inverse kinematics, parent and rigid binding, bones, and deformers. Students design characters using techniques like interpretant matrices, model sheets, sketches, and maquettes followed by development of the actual character in software. Characters are designed for incorporation into motion graphics, games, real time applications, performance, or visualization.
Prerequisites: VCDE-706 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

VCDE-622 3D Environment Design (3 Credits)
This course covers advanced modeling techniques useful in developing environments, both interior and exterior. The content of the course covers proportions appropriate to a variety of environments, lighting for spaces, surface design to replicate real world materials, and building to an appropriate level of detail for the circumstance.
Prerequisites: VCDE-706 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

VCDE-626 Physical Interface Design (3 Credits)
This course covers the use of basic electronics so that students can develop embedded systems or controllers for games, design environments with ambient intelligence, design interactive museum exhibits and point of purchase installations, or embed electronics in clothing. Students use micro controllers, sensors, switches, lights, and motors to implement their designs.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

VCDE-627 Real Time Design (3 Credits)
In this course, students design levels for games or virtual worlds for a variety of applications. Once the design is complete, the design is implemented using high-end three-dimensional software. In many cases the projects will be large and will be executed by teams of students. Versioning systems will be used to keep track of the most recently developed assets. Models are imported into real time software engines for manipulation.
Prerequisites: VCDE-706 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall, Spring

VCDE-628 3D Particles and Dynamics (3 Credits)
This course focuses on three-dimensional special effects using 3D software in combination with other techniques. Course content addresses particle systems and dynamic simulations in a 3D environment. Physical reality concepts such as water flow, air movement, smoke, clouds, fire, and gravitational effects are explored in relation to their effects on cloth, hair, and fluids. Students will incorporate these dynamic simulations in practical design contexts for film, broadcast, and online.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

VCDE-633 Hard Surface Modeling (3 Credits)
The course focuses on designing and constructing hard surface models including machinery, furniture, vehicles, electronics, and robots. Students explore the use of different modeling techniques in the process and are particularly interested in the flow of the topology within the geometry. Some attention is given to creating controls for moving the hard surface models.
Prerequisites: VCDE-706 or equivalent course.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Fall

VCDE-636 3D Motion Design (3 Credits)
Students will learn the general production workflow of creating and integrating three-dimensional rendered elements into a two-dimensional motion graphics setting. The production process will include an overview of modeling, lighting, shading and rendering techniques in a 3D application. Then the course will also explore how to integrate these assets into a 2D animation setting and techniques of creating a professional, polished result quickly and efficiently.
Prerequisites: VCDE-706 or equivalent course.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-666 Design History Colloquium (3 Credits)
This course is about scholarly issues such as critical thinking, analysis, expression, rigorous questioning, discussion, and dialogue. The course seeks to stimulate a deeper interest in scholarly approaches for graduate students who share an intellectual curiosity about the history of design and seek to expand their knowledge in the emerging field of design studies through a dynamic interplay of design history, design theory and design criticism as these central elements are focused on design objects or artifacts. The Vignelli Center for Design Studies and the Cary Graphic Design Archive offer unique archival resources to support research and interpretive course objectives. The aspect of a colloquium is a gathering of graduate students who share an intellectual curiosity about the history of design and seek to expand their knowledge in the emerging field of design studies. The course objectives are realized through lectures, field trips, guest speakers, archive visits and required research and writing projects. Using a case study format, the course content will focus primarily on the seminal people, places and products of the modern design movement.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring

VCDE-698 Visual Communication Design Internship (1-6 Credits)
The Visual Communication Design Internship will provide students with the option to work in the visual communication design field. Students may apply for internships to businesses based on the availability of positions and business job needs. Students must obtain permission of an instructor and complete the Internship Permission Form to enroll.
Prerequisites: This class is restricted to students in VISCOM-MFA with department permission.
Typically Offered: Fall, Spring

VCDE-699 Visual Communication Design Co-op (0 Credits)
Cooperative Education will provide Visual Communication Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in VISCOM-MFA, CMGD-MFA or GRDE-MFA with department permission.
Typically Offered: Fall, Spring, Summer

VCDE-701 Design History Seminar (3 Credits)
This seminar focuses on a basis in the history of design, which complements the overall graduate studies in the School of Design. Interdisciplinary in nature, the course is thematic and emphasizes performance on the part of the student in dynamic dialogue on course topics. The course content focuses on subjects relative to the history and theory of design (people, processes, products, environment, culture and places), critical thinking and contextual historical issues. Students are expected to read seminal design articles, write critical essays and questions and to participate in weekly discussion groups. On-line technology is utilized in addition to slide lectures.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA, CMGD-MFA and IDDE-MFA majors and other CIAS and RIT graduate students with permission of instructor.
Contact Hours: Lecture 2, Seminar 2
Typically Offered: Fall

VCDE-702 Materials and Methods for Advanced Graphics (3 Credits)
This course will examine methods of synthesizing analog and digital tools to create visual works that communicate complex information through compelling visual interactions. Projects will prompt students to remix materials, techniques, and design elements in unexpected ways to create new hybrid forms. Course content will cover analog and digital image-making techniques, 2D and 3D design, photography, coding, experimental visual manipulation, and unconventional design tools. Students will research, design, and implement their own unique processes that capitalize on a variety of form-making tools, and move fluidly in and out of the computer. At the completion of this course, students will have developed a vast library of interdisciplinary ideas and techniques for visualizing design that integrate a wide range of materials, forms, and methods.
Prerequisites: VCDE-708 or equivalent course.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall or Spring

VCDE-706 3D Modeling and Motion (3 Credits)
This course is an introduction to digital three-dimensional visualization. Students learn all aspects of 3D design, from modeling all the way through rendering the final images to setting keyframes for animation. Once familiar with the basics of production, students are encouraged to focus on specific topics such as lighting and texturing and the creation of visual effects for gaming, broadcast, visualization and education.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-707 Web and UI Design (3 Credits)
This course provides an in-depth look at human-centered interface design. Students develop interactive web pages with functional design and usability for e-commerce, education, and the communication of visual communication. Emphasis is placed on the integration and application of design skills applied to information architecture, user navigation and orientation. Projects are focused on designing alternative navigational solutions for online Web applications and touch-screen devices such as mobile phones and touch-pads.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-708 Typography (3 Credits)
This course examines the historical, theoretical, and perceptual aspects of typography for print and screen use. Grid structure, composition, hierarchy, message conveyance, and formal aspects of typographic design are explored with an emphasis on developing harmonious type and image integration into cohesive, sequential design applications. How temporal structural elements such as rhythm and pacing affect visual communication in a dynamic medium is also investigated and applied.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-709 Digital Design in Motion (3 Credits)
This course focuses on motion design from story reels to the final project. Course content focuses on visual components, and assignments translate production techniques used in traditional filmmaking into the online environment. This includes the use of line, space (two and three-deminsional), composition and framing, simulated camera movements, color, and sound. Using a time-based application as the authoring tool and the techniques outlined in this course, a student will be able to produce interactive stories, such as online graphic novels and webisodes.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-711 Design Methodology (3 Credits)
This seminar explores cross-disciplinary principles, theories and methods that can be used by designers. Through selected readings from current periodicals, critical writing, hands-on involvement, presentations and guest lectures, students will broaden their awareness of topics such as systems thinking, human factors, semiotic theory, and visual rhetoric, and become familiar with brainstorming, problem solving and evaluation methods in order to sharpen their understanding of the design process. Information will be directed toward meaningful concept development and the selection and use of appropriate methodologies for design problem solving.
This course is restricted to CAD Graduate students.
Contact Hours: Lecture 3
Typically Offered: Spring

VCDE-712 Design Studies Seminar (3 Credits)
As an introduction to the field, this course will present the many complex roles of design–as process, product, function, symbol and use. This seminar will approach critical views of design studies from an interdisciplinary perspective. Faculty colleagues representing diverse campus expertise and beyond will contribute from their respective knowledge bases. The course will require readings, discussion, critical thinking, and writings as we examine the impact of history, theory and critical analysis as related to the interpretation and understanding of design.
This course is restricted to VISCOM-MFA students.
Contact Hours: Lecture 2, Seminar 2
Typically Offered: Spring

VCDE-717 Design Systems (3 Credits)
This course investigates a systems thinking approach for the purpose of clear, unified communication. The complexity of multiple components are integrated into a common framework to solve graphic design problems. Conceptual mapping, design process strategies, user-centric goals, visual symbolism, the balance of design with cultural, environmental and technological factors, design writing, and design evaluation are integrated into the course. Both theoretical and applied problems will be developed.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture/Lab 5
Typically Offered: Spring

VCDE-718 Project Design and Implementation (3 Credits)
This course provides students with the necessary skills to further develop a research plan into a specific design inquiry with an application component. Emphasis is placed on identifying connections and integrating content between this course and the culminating first-year experience in the MFA Visual Communication Design program. Students will chose a topic, write a design proposal, and design and implement a project from inception to conclusion. This involves research, development, evaluation, refinement, completion of a finished creative project, and documentation of the process. The project can be produced independently or collaborative with advice from the instructor.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Laboratory 3, Lecture 2
Typically Offered: Spring

VCDE-722 Design Praxis I (3 Credits)
This course involves the research, writing, and production of printed applications based on content developed from RIT's unique archival resources (Vignelli Center, Cary Graphic Design Archive, Cary Collection and Wallace Library) and others. Typography and imagery are used to interpret topics such as design history, theory and criticism with formal visual language.
This course is restricted to VISCOM-MFA students.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

VCDE-723 Interaction Design (3 Credits)
This course applies design methodologies to multimedia applications. Students communicate ideas and information to specific audiences through interactive, instructional applications. Course work will integrate content research, developing measurable objectives, and information architecture with interactivity. At the completion of this course students will be able to design site maps and flowcharts, implement an effective graphical user interface, communicate layered information through a hierarchical structure, control user navigation and feedback using interactivity, and design cross-platform projects for entertainment, games, information systems, and education.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

VCDE-726 Design Praxis II (3 Credits)
The development of digital deliverables and experiences is the central focus of this course. Interpretive projects will be composed of a sequence of text and images applying formal visual principles. The course is intended to center on the interrelationship of themes such as design history, theory and criticism using RIT's unique communications resources (Vignelli Center, Cary Graphic Design Archive, Cary Collection and Wallace Library) and others.
Prerequisites: VCDE-722 or equivalent course.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-728 Motion Graphics (3 Credits)
This course focuses on motion graphics as an extension of traditional design that incorporates a temporal or time-based element into the message. Students are exposed to video compositing software and learn the craft, practice, and theory of what it takes to make it in the fast-paced, competitive world of motion graphics design. Computer software is used to composite visual effects in both animation and live video. Sequencing, storyboarding, digital audio, titling, and animation are integrated to produce time-based projects for film, broadcast, and the web.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Spring

VCDE-731 3D Visual Design (3 Credits)
This course focuses on the visual look of a three-dimensional model. Students apply lighting methods to illuminate 3D models and spaces. The interaction of light and pigment, use of light in painting, photography, and film are used as examples. Techniques in using shading networks are incorporated into the projects. Displacement textures are used to create detail in models. This course also covers a contrast and comparison of various methods and resolutions of rendering and outputting information from 3D software.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-732 Branding and Identity Design (3 Credits)
This course provides an examination of the role of design in brand strategy and cohesive identity systems. Historical and current systems will be researched and analyzed. Development of formal proposals, research, and design strategies for developing integrated solutions are explored. Projects will include client contact, writing of design briefs, collaborative projects, use of social networks for brand expansion, information structures, screen and print formats, and presentation methods.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-733 Digital Media Integration (3 Credits)
This course uses digital video cameras for motion recording and microphones for digital audio recordings. Emphasis is placed on digital video and audio design, production, and integration in multimedia applications. Course projects focus on shooting, digitizing and editing video plus recording, editing and mixing of audio for digital movies.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-737 UX Design Strategies (3 Credits)
This course explores design strategies related to researching, identifying and implementing a digital user experience for online web and app development. Students will apply design research methodologies to gather and evaluate source material to design and implement user interactive solutions. Projects will include defining client and user goals, user identification, user empathy, content organization, information architecture, wire-framing methods and validation through user testing across various platforms. At the conclusion of the course students will design and document several different interactive projects.
Prerequisites: VCDE-707 or equivalent course.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-741 Experiential Graphic Design (3 Credits)
This course focuses on the functions of environmental graphic design in a three-dimensional environment. Through studies of theory of environmental design, exploration and conceptual development, design solutions are directed to assist users in negotiating, or wayfinding, through a space or environment, to identify, direct and inform. Topics include learning methods, communication theory, ergonomics, visual hierarchy, design principles and process. Areas of application include architectural graphics, signage systems, dynamic environments, mapping, exhibit design, museum experiences, and themed environments. Students also explore how to integrate both two- and three-dimensional components to develop physical and digital-based environments.
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture 2, Studio 3
Typically Offered: Fall

VCDE-742 Information Design (3 Credits)
This course explores the importance of reader and user responses to written and visually presented information. Problem-solving, functional requirements, information transmission, accessibility and design structure are integrated while investigating a variety of formats (i.e. charts, diagrams, business forms, tables, maps, instructional materials, wayfinding systems, and technical data.) Applied problems are solved through principles of language, structure, diagrammatic interpretation and the visual display of information. Solutions will be developed for both print media and digital use (i.e. mobile devices, computer screens, kiosks, etc.).
This course is restricted to students in the VISCOM-MFA, GRDE-MFA and CMGD-MFA programs.
Contact Hours: Lecture/Lab 5
Typically Offered: Fall

VCDE-746 Professional Practices (3 Credits)
This course will help students prepare for a professional career in design. Equally as important as design theory, the content focuses on the practical knowledge of production and design skills, and exposure to basic business practices. An overview of business and economics related to the design world, goal setting and productivity skills, professional ethics, marketing, the interviewing process, and strategic analysis is addressed. Projects provide an in-depth look at creating an effective digital portfolio and curriculum vitae based upon personal strengths and interests, with professional standards, and career expectations in mind.
Prerequisites: VCDE-701 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

VCDE-763 Graphic Design Education Seminar (3 Credits)
This graduate design elective is a history of graphic design course which focuses on presenting significant pedagogical models that existed between the Bauhaus and the emergence of Post-Modernism (1919 to 1980). Master design educators, innovative educational programs and significant influences that have shaped contemporary design education and practice will be the primary content. The course will involve lectures, presentations, critical discussion and writing.
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Lecture 3
Typically Offered: Spring

VCDE-790 Thesis: Research and Planning (3 Credits)
Research is the backbone for any project. This course will focus on the design research and planning stages of a thesis project. Students will define a design problem that provides a significant addition to the design field while addressing needs in the local, regional and/or global community. Course content addresses establishing content, planning, scheduling, and research seeking innovative solutions through the process of concept development, ideation, and in-process evaluation.
Prerequisites: VCDE-718 or VCDE-722 or equivalent course.
Contact Hours: Thesis 3
Typically Offered: Fall

VCDE-799 Visual Communication Design Independent Study (1-4 Credits)
Visual Communication Design Independent Study will allow students to obtain instruction in specialized areas of interest to enhance their individual course of study. Working with a faculty adviser, students will propose a focused curriculum related to their academic and/or future career interests. Visual Communication Design Independent Study students must obtain permission of an instructor to enroll.**NOTE: Student must have a minimum 3.0 GPA **
Prerequisites: This class is restricted to students in VISCOM-MFA, CMGD-MFA, GRDE-MFA or IDDE-MFA with instructor permission.
Typically Offered: Fall, Spring

VCDE-887 Visual Communication Design Part-Time Co-op (0 Credits)
Cooperative Education will provide Visual Communication Design students with hands-on experience in their field, directly related to a student's major with an established studio or related business. Students will need to apply for co-ops, and interview as part of the selection process, based on available positions posted by the Co-op and Career Services Office, or found through the students' own research. In programs where co-op is a degree requirement, students must obtain permission of their program or graduate director prior to enrollment. Co-ops are typically paid work experience, and can be part-time (150-479 total hours within the term), or full-time (480+ hours within the term). Co-ops may be one or two consecutive terms - fall, spring, or summer – with department permission.
Prerequisites: This class is restricted to students in VISCOM-MFA, CMGD-MFA or GRDE-MFA with department permission.
Typically Offered: Fall, Spring, Summer

VCDE-890 Thesis: Implementation and Evaluation (6 Credits)
This course will focus on the physical thesis project. Students will continue with concept development concluding with the implementation and retrospective evaluation of their chosen design problem. Solution is presented in a public exhibition, complemented by a written articulation of how the theories and methods employed in the project impact the current and future state of design in society.
Prerequisites: VCDE-790 or equivalent course.
Contact Hours: Thesis 9
Typically Offered: Spring

VCDE-892 Continuation of Thesis Visual Communication Design (0 Credits)
The MFA Visual Communication Design Continuation of Thesis course provides student additional semester(s) to complete their thesis research, project, and thesis document.
Prerequisite: VCDE-890 or equivalent course and student standing in the VISCOM-MFA, CMGD-MFA or GRDE-MFA program.
Typically Offered: Fall, Spring

Weaving & Textile Design (CWTD)

CWTD-630 Quilting Graduate Elective (3 Credits)
This course will introduce the beginner to the textile studio and to textiles as a creative material. Particularly the art of quilting. The students will acquire the ability to sew by hand and by machine. Lectures will include topics such as quilt design, fabric surface design, the history of quilting and techniques of quilting. **Fee: A course fee applied via student account.**
This course is restricted to Graduate College of Art and Design students.
Contact Hours: Studio 6
Typically Offered: Fall, Spring

CWTD-799 Grad Textiles Ind Study (1-6 Credits)
Graduate Textiles Independent Study will provide students with the ability to study in a specialized area with an individual faculty member. Students, with the assistance of a faculty adviser will propose a course of study.
Enrollment in this course requires permission from the department offering the course.
Typically Offered: Fall, Spring

Wegmans School of Health & Nutrition (WSHN)

WSHN-600 Principles and Practices of Health Education (3 Credits)
Students will discover fundamental theories, principles and practices of health education to assess, plan, implement and evaluate components of health that challenge our well-being. Students will develop and practice health education skills to promote community and public health. This course helps prepare students to apply for the Community Health Education Specialist (CHES) credentialing examination.
Contact Hours: Lecture 3
Typically Offered: Spring

WSHN-624 Advanced Nutrition Science (3 Credits)
This course offers an in-depth exposure to macro and micronutrient metabolism and biochemistry in humans. Nutrient structure, function, and physiological regulations of digestion, absorption, and interactions are examined with translational concepts for conditions of health and disease. This integrated perspective of nutrient metabolism prepares students for advanced study of medical nutrition therapy.
Contact Hours: Lecture 3
Typically Offered: Summer

WSHN-700 Research Methods in Health and Well-being (3 Credits)
Research Methods in Health and Well-being addresses requisite foundational skills to conduct rigorous, robust, and ethical research into problems related to health, nutrition and well-being. Evidence-based and translational research issues are presented in tandem with design of research studies, measurement approaches, funding opportunities, and research management considerations.
Contact Hours: Lecture 3
Typically Offered: Fall

WSHN-701 Health and Nutrition Education and Evaluation (3 Credits)
In Health and Nutrition Education and Evaluation, content and research expertise are applied to design effective, theory-based health and nutrition education and establish it as evidence-based. Needs assessment, behavior change models, theories of motivation, and learning styles are presented in the context of planning health and nutrition education and sampling, recruitment, participant retention, instrument development, and data analysis to foster development of evaluation expertise.
Co-requisites: WSHN-700 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Fall

WSHN-702 Dissemination and Implementation Science for Health and Well-being (3 Credits)
Dissemination and Implementation Science for Health and Well-being applies constructs practices, and values of dissemination and implementation sciences to health and well-being education activities. Strategies to foster translation of evidence-based practices to standard practice in public and private programs are applied in an experiential learning format.
Prerequisites: WSHN-700 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

WSHN-710 Population Health, Risk Identification & Management (3 Credits)
Introduces population health with focus on the social determinants of health. Engages students in the concept of risk as an epidemiologic concept and the application of epidemiology to population health surveillance, population health risk assessment. Students will have the opportunity to explore the intersection of population health with public policy, and evaluate how determinants of health, epidemiological findings, health disparities, political interest, availability of resources, and accessibility influence the health and well-being of a community and population.
Prerequisites: WSHN-700 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Spring

WSHN-715 Culinary and Food Systems Management (3 Credits)
Food supply concepts are integrated with principles and practices to manage food service and culinary operations of all sizes. Topics include food safety and allergen training, food production, inventory control, menu planning, food systems sustainability, fiscal management, technology application, human resource development, marketing. Addresses food systems requirements for dietetics and nutrition pathway of the nutritional sciences degree. Prepares student for supervised experiential learning in culinary and food systems management.
Co-requisites: WSHN-775 or equivalent course.
Contact Hours: Lecture 3
Typically Offered: Summer

WSHN-720 Topics in Health and Nutrition (3 Credits)
Topics in Health and Nutrition engages learners to explore topics of current concern and interest in health and nutrition. Topic-specific literature selection, review, and dissection are the focus of group-based journal club discussions that also foster group facilitation and decision-making skills. Issues of individual interest drive investigative and summative activities that develop abilities in peer review and dissemination, including writing, graphic display, and technology-based modes.
Contact Hours: Lecture 3
Typically Offered: Fall, Spring, Summer

WSHN-730 Nutritional Assessment and Counseling (3 Credits)
Fundamental principles and techniques of the art and science of nutritional assessment and counseling are developed in this active learning course. Newly acquired skills are utilized in experiences with case studies, simulation mannequins, and volunteers. Digital and technology-driven tools and experiences are incorporated into nutrition assessment and counseling instruction and experiences. In tandem with Medical Nutrition Therapy, this course prepares the student for clinical supervised experiential learning in healthcare settings.
Prerequisite: NUTR-626 or equivalent course.
Contact Hours: Lecture/Lab 3
Typically Offered: Spring

WSHN-770 Community and Public Health Nutrition Supervised Experiential Learning (3 Credits)
Implementation of community nutrition and public health concepts in experiential learning sites. Skill development opportunities for practice as a dietitian/nutritionist related to community and public health nutrition including nutrition policy, needs assessment, legislation and advocacy, education and interpersonal communication, and ethical approaches to food and nutrition problems.
Prerequisites: NUTR-550 and NUTR-625 and WSHN-700 or equivalent courses or student standing in DIET-MS program. Co-requisites: WSHN-710 or equivalent course.
Contact Hours: Internship 9
Typically Offered: Spring

WSHN-775 Culinary and Food Systems Management Supervised Experiential Learning (3 Credits)
Implementation of culinary and food systems management skills and concepts in one or more supervised experiential learning sites. Addresses food systems management requirements for dietetics and nutrition.
Co-requisites: WSHN-715 or equivalent course.
Contact Hours: Internship 9
Typically Offered: Summer

WSHN-780 Clinical Nutrition Supervised Experiential Learning (6 Credits)
Supervised experiential learning at healthcare facilities to attain competency and meet performance requirements in medical clinical dietetics and nutrition therapy.
Prerequisites: WSHN-624 and NUTR-625 and NUTR-626 and NUTR-655 or equivalent courses. Co-requisites: WSHN-730 or equivalent course.
Contact Hours: Internship 18
Typically Offered: Spring

WSHN-789 Pre-thesis Preparation (0 Credits)
This course engages students in the semester just prior to registering for thesis credits with skill building activities and completion of required components to facilitate future thesis completion. Class sessions will include speakers with expertise on specific research and management skills, group discussion, workshop-based sessions, and opportunities for individual advisement.
This class is restricted to DIET-MS Major students.
Contact Hours: Lecture/Lab 3
Typically Offered: Summer

WSHN-790 Health & Well-being Management Thesis (1-6 Credits)
Application of writing and research skills and principles in an independent investigation of a focused problem under direction of thesis adviser. Components include review of literature, definition of research aims, data collection and analysis, interpretation and discussion of findings, preparation of written paper following specified guidelines and standards, and oral defense of thesis. Enrollment for 6 credits in one semester or as necessary over multiple semesters for a total of 6 credits.
Prerequisites: WSHN-700 or thesis advisor approval or equivalent course.
Contact Hours: Thesis 6
Typically Offered: Fall, Spring, Summer

WSHN-791 Continuation of Thesis (0 Credits)
This course provides students additional semester to complete their thesis research, document and defense.
Typically Offered: Fall, Spring, Summer

WSHN-797 Health & Well-being Management Project (3 Credits)
Application of writing and research skills and principles in an independent investigation of a focused problem under direction of a project adviser. Preparation of a Project Report following specified guidelines and standards, and oral presentation of the key report components.
Prerequisites: WSHN-700 or project advisor approval or equivalent course.
Contact Hours: Project 3
Typically Offered: Fall, Spring, Summer

WSHN-799 Independent Study (1-4 Credits)
This course provides the opportunity for independent investigation, under faculty supervision, on a subject matter either not included in existing courses or further investigation of a topic of interest presented in another course. A student-driven, faculty mentored proposal is drafted that describes the plan of work, deliverables expected, evaluation criteria, and possible credit load.
Typically Offered: Fall, Spring, Summer

GRADUATE ADMISSION

www.rit.edu/admissions/graduate

Admission decisions for graduate applicants are made by the department or college offering the program, and upon receipt of a completed application file from the Office of Graduate Enrollment Services. Correspondence between the student and the university is conducted through the Office of Graduate Enrollment Services, according to the following policies and procedures:

1. Inquiries regarding academic programs, as well as all applications for graduate study, are directed to the Office of Graduate Enrollment Services, Rochester Institute of Technology, Bausch & Lomb Center, 58 Lomb Memorial Drive, Rochester, NY 14623-5604. 585-475-2229, gradinfo@rit.edu.
2. The Office of Graduate Enrollment Services will acknowledge the inquiry or application, instructing the student as to the information required for admission by the school or department to which he or she is applying.
3. Once a student has submitted the formal online application and all other application requirements, the Office of Graduate Enrollment Services will release the applicant's application record, and all required materials and test scores to the Admissions Committee within the academic department. All correspondence and other related admission information are part of the applicant's application record. The applicant record will typically include an RIT application, previous college records (transcripts), applicable test scores, letters of recommendation, personal statement of educational objectives and other documents that may support admission of the candidate.
4. When the school or department has made a decision on the application, the decision form is returned to the Office of Graduate Enrollment Services.
5. The Office of Graduate Enrollment Services notifies candidates of admission decisions.
6. Academic units may informally advise non-degree students, but no formal program of study can be approved prior to admission.
7. The formal program is laid out by the dean's designee (department head, coordinator or program director, etc.) and is the one that must be followed by all students applying for admission or readmission in that program.
8. The basic entry requirements for graduate degree candidates include the completion of a baccalaureate degree and whatever other evidence of the applicant's potential to complete graduate studies may be required by the particular program. Rare exceptions to the baccalaureate requirement can be made in the case of candidates who have demonstrated unusual competence in their field of specialization. For these exceptions the recommendation of the department chairperson or director and the approval of the appropriate dean and the dean of graduate education are required.

The U.S. Government expects international students to prove competency in the English language prior to their acceptance to an American college or university. Applicants from outside the US who do not qualify for a designated English Test Requirement Waiver must take a qualified test of English langauge proficiency. Waiver eligibility can be found in our application instructions: https://www.rit.edu/admissions/graduate/application-instructions (https://www.rit.edu/admissions/graduate/application-instructions/)

Students must achieve established minimum scores prior to consideration for admission into graduate studies. Individual academic units may require higher standards or additional requirements, including balanced sub-scores, when determining an applicant's possible need for additional English language courses. Applicants whose test results fall below the minimum scores for admission but who otherwise meet academic requirements will be referred to the English Langauge Center. They will not be admitted to academic programs until they meet proficiency criteria established by the English Language Center.

Applicants whose test results fall below the minimum scores for admission but who otherwise meet academic requirements will be referred to the English Language Center. They will not be admitted to academic programs until they meet proficiency criteria established by the English Language Center.

In certain cases graduate students may be admitted prior to, but conditional upon completion of the baccalaureate degree.

Applicants should not be considered for admission prior to the start of their final year of undergraduate study. The student must present a final transcript signifying successful completion of their baccalaureate degree by the end of the first term they are enrolled in the graduate program.

Graduate applicants who do not fully satisfy all admission criteria as to grades, test scores or other credentials, but do show sufficient promise to qualify for a trial period of graduate study may be admitted on probation to the university. Such students must achieve a 3.00 (B) program grade point average by the end of their first 9 credit hours of graduate study. Those students who do not meet this criterion will be suspended. Responsibility for specific requirements and maintenance of the student's appropriate status rests with the academic unit in consultation with the Office of Graduate Enrollment Services and the Office of the Registrar.

NYS Immunization Requirement

All students registered for four or more credits and born after January 1, 1957, must comply with New York state and RIT immunization requirements. New York State Law requires proof of immunity to measles, mumps, and rubella through either two MMR immunizations or positive blood titers for each disease. New York state also requires all students, regardless of age, to sign a meningococcal awareness form. RIT requires students age 26 and under to have the meningitis shot. Required immunizations should be obtained before arrival to avoid delay in registration or interruption of classes for which students have enrolled. Contact the Student Health Center (www.rit.edu/studentaffairs/studenthealth (https://www.rit.edu/studenthealth/)) with questions. Additional information and forms are available online.

Readmission

Students who leave a graduate program, or have a lapse in enrollment greater than or equal to three terms, including summer, and wish to return to that program must work with their previous academic department to gain approval and ascertain the steps needed related to readmission.

The academic department must submit the Graduate Readmission Form (see Registrar's Restricted Forms online). This form is to be used by the college/department to re-admit and matriculate a student who has been previously withdrawn from the program and has department approval to return.

If a college/department does not wish to re-admit a student, the student may be instructed to submit a new graduate application and supporting credentials through the Office of Graduate Enrollment Services so as to be re-considered for the program given submission of new application credentials, test scores, etc. The student may also be advised that they may also apply to another RIT program through the Office of Graduate Enrollment Services, if interested.

All student applications are subject to admissions standards at the time of reapplication. The program of study shall be subject to review and may be rewritten. Previous waiver and/or transfer credit may be lost, and program deficiencies may need to be made up.

Each college has the responsibility, upon a student's readmission, of determining which previous courses if any, are applicable toward the degree. Be aware that standards and degree requirements may have changed and previous waiver, transfer, or competency credit may be lost and program deficiencies may need to be made up. All readmission decisions are made by the academic unit.

Readmission is not guaranteed.

Graduate students must complete the graduate program within seven years of the date of matriculation into their program. This does not apply to prerequisites, bridge program courses or similar requirements.

COSTS AND PAYMENT PROCEDURES

The university reserves the right to change its tuition and fees without prior notice. Nonmatriculated students are charged graduate rates for graduate courses.

Graduate Costs

Fall 2025-2026

Item	Per Semester	Per Year
Tuition (12-18 credit hours)	$30,881	$61,762
Student Activities Fee	$215	$430
Student Health Services Fee	$300	$600
Total	$31,396	$62,792

Students registered for 9 or more credit hours are charged a $215 Student Activity Fee per semester.
Students registered for 9 or more credit hours are charged a $300 Student Health Services Fee per semester.
Credit by experience/credit by exam is assessed at $605 per credit hour.
Students enrolled in more than 18 credit hours are charged $1,931 for each additional credit hour.
Courses taken for audit are assessed tuition at one-half the normally assessed rate.

Graduate costs are listed in the table on this page. In addition, any graduate student carrying more than 18 credit hours of study will be charged the full-time tuition rate plus $1,931/credit hour for each hour of study exceeding 18.

Housing and food for full-time students: A variety of housing options (residence halls and apartments) and meal plans are available to graduate students. Costs vary according to options selected. For information about housing and meal plan options, please visit Housing Operations at: www.rit.edu/housing/ (https://www.rit.edu/housing/)

The cost of books and supplies varies depending on the area of study and the number of courses taken by a student. The estimated cost for books and supplies ranges from $500 to $2,500 a year for full-time students and $300 to $700 a year for part-time students.

Charges for tuition, fees, and housing and food are computed on a semester basis. University billing statements may be paid by cash, check, or electronic check (e-check). The university does not accept credit card payments for tuition, fees, and housing and food that appear on the student billing statement. However, we have an arrangement for a third-party vendor to accept MasterCard, Visa, and Discover Card when payment is made online. The vendor does charge a percentage fee for each credit card transaction. Billing-related payments (check) may be mailed to:

Rochester Institute of Technology
Student Financial Services
25 Lomb Memorial Drive
Rochester, NY 14623

Payment also may be made in person at the Office of Student Financial Services on the first floor of the University Services Center. Credit card and e-check payment information can be found at www.rit.edu/sfs/billing-and-payment-options (https://www.rit.edu/sfs/billing-and-payment-options/).

Due dates are clearly designated on the billing statement and our website. Failure to pay the amount due or arrange an optional payment by the due date will result in a late payment fee. Payments due are:

- **Fall semester: August 15, 2025**
- **Spring semester: January 15, 2026**

Payment plan option information can be found at: www.rit.edu/sfs/billing-and-payment-options (https://www.rit.edu/sfs/billing-and-payment-options/)

Electronic Billing

All billing notifications are sent to the student's RIT email address. Students have the option of setting up to three additional authorized users (parent, guardian, sponsor etc.) on their account to receive billing notifications and access to the account.

Student Accident and Sickness Insurance

All registered students are required to maintain medical insurance while attending RIT. Insurance coverage can be through RIT, a family member's policy, or a personal policy.

A student accident and sickness insurance plan is available through RIT. There is a separate charge for this insurance. The plan provides coverage, within limits specified in the policy, for sickness and injury, outpatient services, emergency care, and prescriptions.

Enrollment in this plan is voluntary for all students except registered international undergraduate students (full- and part-time) on A, B, E, F, G, I, J, K, O, Q, R, and V visas. These students will be enrolled automatically in the basic accident and sickness policy on a semiannual basis.

There is no need to waive coverage if it is not desired. Students who want to enroll in this plan may enroll online or by mail. An open enrollment period is available at the beginning of each academic semester. Payment can be made by check, money order, or credit card, or the premium can be added to the student's account.

The open enrollment period ends 30 days after the start of the academic semester in which the student first registers.

For plan and enrollment information, visit the web at www.universityhealthplans.com (https://www.universityhealthplans.com/) or call 800-437-6448. Students are not required to obtain the student accident and sickness insurance plan to receive services at the Student Health Center.

Refund Policies

For information regarding refund policies for withdrawal during the semester, please contact the Student Financial Services Office or visit their website: www.rit.edu/sfs/tuition-refundadjustment (https://www.rit.edu/sfs/tuition-refundadjustment/)

Any student who intentionally defrauds or attempts to defraud the university of tuition, fees, or other charges, or who gives false information in order to obtain financial aid, is subject to legal liability, prosecution, and university disciplinary action.

FINANCIAL AID

www.rit.edu/admissions/aid (https://www.rit.edu/admissions/financial-aid/)

General Information

RIT offers a range of financial aid programs to assist graduate students with their educational expenses. The information provided in this section is an overview of the financial assistance that is available and applicable policies. Please consult the RIT Office of Financial Aid and Scholarships' website for more detailed information.

Scholarships and assistantships are available in most graduate academic departments. In addition, some departments offer externally funded **tuition remission and stipends** from corporate or government sponsors. Please contact the appropriate graduate program director (rit.edu/graduate-program-contacts (https://www.rit.edu/graduate-program-contacts/)) or the Office of Graduate Admission for additional information.

All **federal financial aid** programs (i.e. Direct Unsubsidized Loans, Direct Graduate PLUS Loans, Federal Work-Study) require submission of the Free Application for Federal Student Aid (FAFSA). The FAFSA may be completed online at studentaid.gov (https://studentaid.gov/). Only US citizens or eligible non-citizens may file the FAFSA. Courses not applicable to the student's program of study cannot be counted toward enrollment status nor in the determination of federal financial aid eligibility.

Federal Satisfactory Academic Progress Requirements

To be eligible for federal financial aid, students who are U.S. citizens or eligible non-citizens are required by the U.S. Department of Education (34 CFR 668.34) to maintain Satisfactory Academic Progress (SAP) toward their degree objectives. RIT upholds the federal SAP policy by reviewing student academic records at the end of each semester, including summer. The objective is to ensure ensure student success and accountability and to promote timely advancement toward degree objectives.

All graduate students receiving federal financial aid must remain enrolled in a degree program. Federal regulations also require a quantitative measurement (Pace) where students must complete 67% of credit hours attempted, a qualitative measurement (GPA) where students must have at least a 3.0 cumulative grade point average and a Maximum Time Frame for degree completion in order to receive federal financial aid.

Pace

Any graduate students who have attempted or earned nine (9) or more credit hours must have completed at least 67% of their total attempted credit hours. Credit hours attempted include withdrawals, repeated courses, grade exclusions, non-matriculated courses, and credit by exam. Transfer credits count toward both attempted and completed credit hours. Students who do not meet this pace requirement will not be making SAP.

GPA

Any graduate students who have attempted or earned nine (9) or more credit hours but do not have a cumulative GPA of a 3.0 or higher will be considered not to be making SAP for federal financial aid program.

Students not making SAP due to a pace and/or cumulative GPA issue may appeal their status by submitting a Request for Federal Financial Aid Probation form, available in the Financial Aid and Scholarships section of their eServices account. In addition to this form, students must provide a Federal SAP Action Plan developed by the students' primary academic unit that demonstrates what students must accomplish in order to regain federal SAP.

Maximum Time Frame

Students must complete their program within 150 percent of the published degree program length. For example, a thirty (30) credit hour master's degree program would allow students a maximum of forty-five (45) attempted credit hours to degree completion.

Students who do not appear to be able to meet degree completion within 150% of the program of study are not making SAP and they would be notified by the RIT Office of Financial Aid and Scholarships if an appeal is possible. Maximum time frame appeals would require the completion of an Academic Plan to Graduation form by each student's primary academic unit.

Depending on the SAP issue and the submission of the required SAP documents, the RIT Office of Financial Aid and Scholarships will notify students of the results of their request for a federal financial aid (SAP) probation. If approved, students may continue to receive federal financial aid, as long as they are meeting the goals outlined in their SAP Acton Plan and/or Academic Plan to Graduation.

Federal Financial Aid Probation

The federal financial aid (SAP) probation period for graduate students may not exceed two semesters in length and students are only eligible for one federal financial aid (SAP) probation for their entire graduate career at RIT. As such, students should only request a federal financial aid (SAP) probation if they are seeking federal financial aid.

Financial Aid Refund Policy

Return of Federal Funds

In accordance with federal regulations, the RIT Office of Financial Aid and Scholarships recalculates federal aid eligibility for students who withdraw, drop out, are suspended, or take a leave of absence prior to completing more than 60 percent of a term. “Withdrawal date” is defined as the actual date the students initiated the withdrawal process, the students’ last date of academic related activity or the midpoint of the term for students who leave without notifying the university. Recalculation is based on the percent of earned aid using the following formula: number of days completed up to the withdrawal date/total days in the term. Aid returned to federal programs is then equal to 100 percent minus the percentage earned multiplied by the amount of federal aid disbursed.

Funds are returned to the federal government in the following sequence: Federal Direct Graduate PLUS Loans, Federal Direct Unsubsidized Loans, and other financial aid.

Return of State Scholarships

Regulations vary. Any adjustments are done in accordance with the specific requirements of the sponsoring state.

Privately Funded Grants and Scholarships

In the absence of specific instructions from the sponsor, 100 percent of the semester offer will be credited to the student’s account.

Return of RIT Grants and Scholarships

Institutional funding such as RIT grants and scholarships are prorated based on the tuition refund schedule for withdrawal during a semester. For more information, please contact the RIT Office of Financial Aid and Scholarships or visit rit.edu/admissions/aid (https://www.rit.edu/admissions/financial-aid/)

Financial Aid Programs

Grants/Scholarships	Eligibility	Amount	How To Apply
Graduate Assistantships	Graduate student matriculated into an RIT graduate degree program.	Amounts vary.	Complete Graduate Admissions Application and check appropriate box to be considered for graduate assistantships.
Graduate Merit-based Scholarships	Graduate student matriculated into an RIT graduate degree program.	Amounts vary.	Complete Graduate Admissions Application and check appropriate box to be considered for graduate scholarship
Veterans Tuition Award Program	Eligible Veterans who are New York state residents.	Amounts vary.	File the Free Application for Federal Student Aid (FAFSA). Also file the Veterans Tuition Award Application at hesc.ny.gov.
Veterans Benefits	Eligible veterans and children of deceased veterans, or service-connected disabled veterans.	Amounts vary.	Contact Office of Veteran Student Success at (585) 475-6641 or visit their website at rit.edu/universitystudies/office-veteranstudent-success
Bureau of Indian Affairs Graduate Fellowship Grants	Enrolled full-time and recognized by Secretary of the Interior as a member of an Indian tribe and demonstrating financial need and academic achievement.	Amounts vary	Contact the Native Forward Scholars Fund, formerly known as the American Indian Graduate Center, at (800) 628-1920, or visit their website at nativeforward.org.

Loan	Eligibility	Amount	How To Apply
Federal Direct Loans	Matriculated students who are enrolled at least half-time and who are U.S. citizens or permanent residents.	Maximum yearly amount: $20,500. The maximum amount cannot exceed the cost of attendance minus all other financial aid offered.	File the Free Application for Federal Student Aid (FAFSA) at studentaid.gov. Must be a U.S. citizen or eligible non-citizen.
Federal Direct PLUS Loans for Graduate Students	Matriculated students who are enrolled at least half-time and who are U.S. citizens or permanent residents.	The maximum yearly amount cannot exceed the cost of education minus all financial aid offered.	File the Free Application for Federal Student Aid (FAFSA) and complete a Federal Direct PLUS Loan application. Both can be completed at studentaid.gov

Private Alternative Loans	Maximum yearly amount	Up to the cost of education minus all other financial aid offered.	Consult the Office of Financial Aid and Scholarships website at rit.edu/admissions/ aid/loans#alternative-educational-loans or contact the private lender directly.

Employment	Eligibility	Amount	How To Apply
Federal Work Study Program	Students who are U.S. citizens or permanent residents with financial need: most jobs provided are on campus.	Varies, depending on hours and wage rate (RIT wage rates start at $15.50 per hour).	File the Free Application for Federal Student Aid (FAFSA). Contact the RIT Student Employment Office (rit.edu/seo).
RIT Employment Program	No financial need requirement; most jobs are on campus.	Varies, depending on hours and wage rate (RIT wage rates start at $15.50 per hour).	Contact the RIT Student Employment Office (rit.edu/seo).

International students (F-1 or J-1 visa holders) may generally work on campus for up to 20 hours per week. Special authorization from International Student Services and/or the USCIS is needed for all other employment, including co-ops and internships. Please consult International Student Services at (585) 475-6943 or rit.edu/studentaffairs/iss (https://www.rit.edu/iss/) for employment or visa questions.

This chart covers the most commonly awarded financial aid programs available to full-time graduate students at RIT. Information is correct as of July 2025. Most graduate programs require satisfactory progress toward degree completion to maintain eligibility. Filing the FAFSA by April 1 will ensure priority consideration for all programs. Applications filed after this date will receive consideration as long as funds remain available. Scholarships provided by RIT will be prorated for NTID-sponsored students to reflect lower NTID tuition rates.

UNIVERSITY POLICIES AND PROCEDURES

Academic Policies and Procedures

The complete library of student academic policies and procedures may be found online at:* https://www.rit.edu/policies/student-policy-reference *(*https://www.rit.edu/policies/student-policy-reference/*)

A graduate degree at RIT may be obtained in more than 70 programs ranging from business administration to imaging science. (Please refer to page 4 for a complete listing of graduate programs of study.)

Upon completion of the stipulated requirements, students are certified by their academic departments for their degrees. A statement verifying that a degree has been awarded will be posted to the transcript and diplomas are mailed to all graduates.

Enrollment

1. Student should complete the enrollment and payment process in accordance with university enrollment/billing procedures, as indicated in the current enrollment guide.
2. It is the responsibility of the student to update their address online through the Student Information System (SIS), or to advise the registrar of any change of address.
3. University ID cards are required for students to use many campus facilities and services (e.g., the library, Student Life Center, meal plans, check cashing). Identification cards be picked up at the RIT ID Office, which is located on the first floor of the University Services Center (USC).
4. Students are expected to pursue their degree without a substantial break. Failure to enroll (register) for three successive academic terms, including summer, can result in the loss of active student status.
5. RIT considers graduate-level students to be “full time” in every academic term in which they are enrolled for at least 9 semester credit hours. With appropriate approvals, additional equivalent credit can be granted for such activities as thesis work, teaching assistantships, and internships.

Student Classification

Active graduate students are those who have applied to and been formally accepted into a graduate program through Graduate Enrollment. Such students may enroll for graduate-level courses (600 and above) that fit their home department-approved programs. When enrolling for graduate courses outside the home department, students may need to secure the approval of the department offering the course.

Non-degree-seeking students will be allowed to take graduate courses on a space-available basis with the department’s approval, and with the knowledge that course work completed while a non-degree- seeking student will not necessarily apply to any given academic program.

Active and non-degree-seeking graduate students may enroll for undergraduate-level courses with the understanding that these courses will not apply to any RIT graduate program.

Degree Requirements

Credit Requirements

The minimum credit requirement for a master’s degree is 30 semester credit hours. At least two-thirds of semester credit hours of graduate level course work and research (courses numbered 600-900) are required to be earned in residence at the university.

Transfer Credit

A maximum of 30 percent of the total required semester hours for the graduate degree may be awarded through any combination of transfer credit, waived credit, and credit by competency. Only a course with a grade of B (3.0) or better may be transferred.

Transfer credits are not calculated in the student’s grade point average but will count toward overall credit requirements for the degree. Transfer credits do not count toward the satisfaction of residency requirements.

A graduate student who wishes to take courses at another institution and transfer them toward degree work at RIT must obtain prior permission from the appropriate departmental officer or dean.

Candidacy for an Advanced Degree

A graduate student must be a candidate for an advanced degree for at least one term prior to receipt of the degree. The position of the Graduate Council is that a student is a candidate for the master or doctoral degree when they are formally admitted to RIT as a graduate student.

Dissertation, Thesis, or Project Requirements

Included as part of the total credit-hour requirement may be a research, dissertation, thesis, or project requirement, as specified by each department. The amount of credit the student is to receive must be determined by the time of enrollment for that term. For the purpose of verifying credit, an end-of-term grade of R should be submitted for each enrollment of research and thesis/dissertation guidance by the student’s faculty adviser. Before the degree can be awarded, the acceptance of the thesis/dissertation must be recorded on the student’s permanent record. Students also should note the following continuation of thesis/ dissertation policy. Students who submit a project receive a letter grade upon completion.

Students who complete a thesis or dissertation are required to submit an electronic copy of the thesis or dissertation to ProQuest/UMI for publication.

Continuation of Thesis/Project/ Dissertation

Once work has begun on a thesis, project or dissertation, it is seen as a continuous process until all requirements are completed. If a thesis, project, or dissertation is required, or such an option is elected, and if the student has completed all other requirements for the degree, the student must enroll for the Continuation of Thesis/Project/Dissertation course each term (including summer). This course costs the equivalent of one-semester credit hour, although it earns no credit.

1. Enrollment for the Continuation of Thesis/Project/Dissertation course preserves student access to RIT services; e.g., Wallace Library, academic computing, and faculty and administrative support. With payment of appropriate user fees, access to the Student Life Center and Student Health Center also is preserved.
2. If circumstances beyond students’ control preclude them from making satisfactory progress on their thesis/ project/dissertation, they should consider taking a leave of absence and discuss such a leave in advance with their adviser/department head.

3. The length of time to complete a thesis/ project/dissertation is at the discretion of the department. Be sure to read, however, the first point under "Summary of requirements for master's degree" on this page.

Note: The dissertation is required only of Ph.D. students.

Summary Experience

The Graduate Council regards some form of integrative experience as necessary for graduate students. Such requirements as passing a comprehensive test, writing a thesis based on independent research, or completing an appropriate special project are appropriate examples, provided they are designed to help the student integrate the separate parts of their total educational experience. The nature of the experience will be determined by the individual college or department.

Overlapping Credit for Second Degree

At the discretion of the graduate program director in the second degree area, RIT master's degree credits from a previous degree can be applied toward satisfying a maximum of 1/3 of the credit degree requirements of the second degree.

Exceptions to this requirement may be considered. For individual student cases, an exception requires the approval of the associate provost and dean of Graduate Education. Other exceptions (e.g. related to degree programs) must be approved by Graduate Council.

Financial Standing

Students, former students, and graduates are in good financial standing when their account is paid in full in the Student Financial Services Office. Any student whose account is not paid in full will not receive transcripts or degrees. The university reserves the right to change its tuition and fees without prior notice.

Summary of Requirements for Master's Degree

1. Successfully complete all required courses of the university and the college. These requirements should be met within seven years of the date of matriculation into the student's program. Extension of this rule may be granted through petition to the dean of graduate education.
2. Complete a minimum of 30 semester credit hours for the master's degree. At least two-thirds of semester credit hours of graduate level course work and research (courses numbered 600-900) are required to be earned in residence at the university.
3. Achieve a program cumulative grade point average of 3.0 (B) or better.
4. Complete a thesis/project or other appropriate research or comparable professional achievement, at the discretion of the degree-granting program.
5. Pay in full, or satisfactorily adjust, all financial obligations to the university.

Note: The dean and departmental faculty can be petitioned, in extraordinary circumstances, to review and judge the cases of individual students who believe the spirit of the above requirements have been met yet fall short of the particular requirement. If the petition is accepted and approved by the faculty and dean of the RIT Graduate School, a signed copy will be sent to the registrar for inclusion in the student's permanent record.

Definition of Grades

Grades representing the students' progress in each of the courses for which they are enrolled are given on a grade report form at the end of each term of attendance. The letter grades are as follows:

Grade	Description	Quality Points
A	Excellent	4.0
A-	N/A	3.67
B+	N/A	3.33
B	Above Average	3.0
B-	N/A	2.67
C+	N/A	2.33
C	Satisfactory	2.0
C-	N/A	1.67
D	Minimum Passing Grade	1.0
F	Failure	0.0

C- and below grades do not count toward the fulfillment of program requirements for a graduate degree. **The grades of all courses attempted by graduate students will count in the calculation of the cumulative grade point average.** The program cumulative grade point average shall average 3.0 (B) or above as a graduation requirement. The dean of the college or their designee must approve all applications for graduate courses a student wishes to repeat.

The GPA is computed by the following formula: GPA = total quality points earned divided by total credit hours attempted.

There are other evaluations of course work that do not affect GPA calculations. Only I and R (as described below) can be assigned by individual instructor at the end of a term.

Registered (R)—A permanent grade used in graduate coursework indicating that a student has registered for a given course but has yet to meet the total requirements for the course or has continuing requirements to be met. The grade is given in graduate thesis work. Completion of this work will be noted by having the approved/accepted thesis or dissertation title, as received by the registrar from the department, added to the student's permanent record. Full tuition is charged for these courses. "R" graded courses are allowed in the calculation of the residency requirement for graduate programs; however, they do not affect GPA calculations. A student may receive a grade of "U" or "I" in a given term of an "R" graded course. A "U" grade in this case carries no credit and the course must be repeated.

Withdrawn (W)—A grade that indicates an official course withdrawal has been processed. See policy D05.IV.

Satisfactory (S)—A satisfactory grade at the graduate level may only apply to seminar, cooperative work experience, study abroad affiliate programs, and internship courses where programs have determined that a traditional alpha system letter grade is inappropriate. An "S" grade at the graduate level carries no quality points and therefore does not enter into a GPA calculation. A student may receive a grade of "U" or "I" in an "S" graded course. In this case, a "U" grade carries no credit and the course must be repeated. No more than 15% of a program's degree credits may be "S" graded courses.

Incomplete (I)—When an instructor observes conditions beyond the control of a student such that the student is unable to complete course requirements in the given term or session, the instructor may assign an Incomplete notation ("I") to a student. The instructor determines and advises the student of the due date, not to exceed one term excluding summer session, by which the student must complete course requirements. If the registrar has not received a "Change of Grade" form from the professor after one term excluding summer session, then the Incomplete becomes an "F" grade or a "U" grade if the "I" was associated with an "R" or "S" graded graduate course. An extension of time may be granted at the discretion of the instructor. Credit hours are not earned and the GPA is not affected until a permanent grade is assigned.

Unsatisfactory (U)—A permanent grade used in certain graduate coursework indicating that a student made unsatisfactory progress towards completing the course requirements. No credit hours are earned for a "U" grade and the "U" grade does not affect the calculation of quality points or GPA. A "U" grade in an "R" or "S" graded course carries no credit and the course must be repeated.

If there are extenuating circumstances which render an instructor unable to assign a grade or evaluate a student's work and assign a grade to replace an "Incomplete" notation, the head of the academic unit in which the course was taught will select an instructor to act in the place of the original instructor. After appropriate evaluation of the student's work, that instructor will assign a grade in place of the "Incomplete" notation.

Waived Courses (WV)—Those courses eliminated from the list of requirements that a student must take to graduate. For undergraduate students, only physical education courses and cooperative work experience may be waived because of previously completed experience.

For graduate students, required courses may be waived because of previously completed academic work but in no case shall the resulting graduate program requirements be reduced below 30 semester credit hours. In addition, waiver credit for graduate courses can be applied only towards required courses and not towards elective courses. The process of waiving courses and thereby reducing graduate program requirements is not to be confused with the process of substituting specific courses for published requirements with an equal number of credit hours, thus retaining the total number of credit hours in the specified program. The total combined amount of credit applied through external (non-RIT) transfer credit, waived courses, and credit by competency may not exceed 30% of the total credits in the graduate program as noted in the graduate catalog.

X Grade (X)—Assigned for successful completion of various assessments as defined in Policy D.02.0 Admissions. "X" grade for graduate students indicates Credit by Competency (graduate) (See policy D02.I.2).

"X" graded courses do not count toward the residency requirement and do not affect GPA calculations. Credit hours are included as hours earned.

For graduate students, the total combined amount of credit applied through external (non-RIT) transfer credit, waived courses, and credit by competency may not exceed 30% of the total credits in the graduate program as noted in the graduate catalog. Exceptions to the maximum credit by exam for graduate programs can be granted by the Graduate Council in unusual circumstances upon appeal from the dean of the college involved. For programs housed outside the college structure, the approval of the director of the academic unit is required.

Audit (AU)—Indicates a student has officially registered for the course for no credit. Courses available for audit are at the discretion of the college or academic unit. With permission of the instructor, the student may elect to take examinations and do course assignments. Audited courses do not count toward the residency or other degree requirements. Credit hours are not earned and GPA calculations are not affected.

A student may register for audit any time during the official registration period for the term. However, a student may not change from audit to credit or credit to audit after the official add/drop period (first seven calendar days, excluding Sundays and holidays, of the full fall, and spring terms and summer session). See Policy D03.0 - Registration. Changes from audit to credit must be accompanied by full payment of tuition.

Excluding audit courses, degree-seeking undergraduate students enrolling for 12 or more credit hours or graduate students enrolling for 9 or more credit hours may take any additional hours for audit at no incremental charge provided the total hours do not exceed 18 credit hours.

Excluding audit courses, undergraduate students enrolled for less than 12 credit hours or graduate students enrolled for less than 9 credit hours may take any additional hours for audit at a charge of one-half the normally assessed tuition rate.

Changing Grades

Once a grade has been reported by an instructor, it is not within the right of any person to change this unless an actual error has been made in computing or recording it. If an error has been made, the instructor must complete the appropriate form. The completed form must be approved by the head of the department in which the instructor teaches. When approved, the form is then sent to the registrar. There is, however, an appeal procedure for disputed grades through the Academic Conduct Committee of the college in which the course is offered.

Academic Probation and Suspension

Any degree-seeking graduate students will be placed on probation or suspended from the university according to the criteria enumerated below. All actions are taken at the end of the term; however, a student may petition the dean of their home college for reconsideration of probation or suspension should the removal of an incomplete grade (I) raise the program grade point average above those stated below. For programs housed outside the college structure, the approval of the director of the academic program in which the enrollment is requested is required.

Each degree-seeking graduate student will generate two different grade point averages that appear on the transcript - cumulative and term averages. The university cumulative average reflects all course work completed at RIT at the graduate level.

The term average reflects a single term of academic activity. In addition, each graduate student has a program average used for degree certification that is manually calculated by the academic unit and reflects course work completed at RIT applicable to graduation in a student's current academic program. The current academic program refers to the university and college degree course requirements specified by the degree granting college and noted in the graduate catalog.

In addition to the university requirements outlined below, individual colleges and/or programs may define more rigorous requirements for maintaining good academic standing. This information must be approved by the dean, clearly defined within published college policy, communicated in the university catalog, and communicated to the

Provost's Office. For programs housed outside the college structure, the approval of the director of the academic unit is required.

1. Any degree-seeking graduate student whose cumulative and/or program grade point average (see D5.0 - Grades, section VII) falls below a 3.00 after 9 credit hours (attempted or earned) subsequently will be placed on probation and counseled by the graduate program director (or his/her designee) concerning continuation in the graduate program.
2. Students on probation must raise their program cumulative and program grade point average to 3.00 within 9 credit hours (attempted or earned) or they will be suspended from the graduate program.
3. A graduate student suspended for academic reasons, must apply for readmission.
4. A suspended student cannot enroll in any credit or non-credit course at the university while on suspension.
5. A suspended student may appeal a suspension decision. Individual colleges and/or programs may set limitations on the number of appeals a student can submit.
6. A suspension may be waived upon written appeal to the student's home program. Final suspension waiver approval requires dean (or designee) approval. For programs housed outside the college structure, the approval of the director of the academic unit in which the enrollment is requested is required.
7. A suspended student may be required to satisfy specific academic conditions imposed in order to be considered for readmission to his/her program.
8. A suspended student may be admitted to another program if it is approved by the dean (or designee) of the college in which enrollment is requested. For programs housed outside the college structure, the approval of the director of the academic program in which the enrollment is requested is required

Non-Degree-Seeking Undergraduate and Graduate Policy

Any non-degree-seeking undergraduate student who has a cumulative GPA below 2.00 after 15 credit hours or non-degree- seeking graduate student who has a cumulative GPA below 3.00 after 9 credit hours (attempted or earned) may not register for credit or non-credit courses without the specific approval of the department head offering the course(s).

Student Conduct Policies and Procedures

Standards for Student Conduct

The RIT community intends that campus life will provide opportunities for students to exercise individual responsibility and places high priority on self-regulation by its members. All members of the community are responsible for encouraging positive behavior by others, as well as preventing or correcting conduct by others that is detrimental to RIT's educational mission and values.

As an educational community, RIT strives for a campus environment that is free from coercive or exploitative behavior by its members. Moreover, it sets high standards that challenge students to develop values that enhance their lives professionally and will enable them to contribute constructively to society.

RIT enjoys a diversity of backgrounds, lifestyles, and personal value systems among those who compose the academic community. Students, however, are expected to observe and respect the policies and standards of the university and the right of individuals to hold values that differ from their own and those expressed by RIT. Students are encouraged to review the Student Rights and Responsibilities Handbook for information regarding campus policies and expectations of student conduct.

Students must recognize that they are members of the local, state, and federal communities, and that they are obliged to live in accord with the law without special privilege because of their status as students or temporary residents.

RIT offers a number of services for graduate students. Those described in the following pages are among the most frequently used.

RIT Honor Code

Integrity and strong moral character are valued and expected within and outside of the RIT community. As members of the RIT campus community, including students, trustees, faculty, staff, and administrators, we will:

- Demonstrate civility, respect, decency and sensitivity towards our fellow members of the RIT community, and recognize that all individuals at this university are part of the larger RIT family, and as such are entitled to that support and mutual respect which they deserve.
- Conduct ourselves with the highest standards of moral and ethical behavior. Such behavior includes taking responsibility for our own personal choices, decisions and academic and professional work.
- Affirm through the daily demonstration of these ideals that RIT is a university devoted to the pursuit of knowledge and a free exchange of ideas in an open and respectful climate.

Computer Security and Safeguards

RIT's Code of Conduct for Computer and Network Use guides campus-wide use of all computers and networks. This document, found online at www.rit.edu/computerconduct, outlines RIT's official policy related to ethical use of computing and network resources. ITS put into place multiple safeguards to protect RIT's network environment and the integrity of individual user accounts. Additionally, ITS provides all students, faculty, and staff with antivirus software free of charge.

Health Policies

Health/Medical Records

Medical records are confidential. Information will not be released without the written consent of the student. Exceptions to this rule are made only when required by the public health laws of New York state or a court-ordered subpoena or in a life-threatening situation.

New York State and RIT Immunization Requirements

New York state public law requires that all students enrolled for more than six credit hours in a term and born after January 1, 1957, must provide proof of having received the appropriate immunizations against measles, mumps, and rubella, and to sign a meningitis awareness form. The law applies to all full time and part time students including RIT employees. Immunization requirements include:

- Two MMR vaccinations at least one month apart and after the first birthday;
- A Meningitis Awareness Form, signed by all students regardless of age; and
- Immunization against meningitis, which is required by RIT for all students age 21 and under.

Failure to comply with the New York State immunization law may result in exclusion from classes and the campus, and a $200 fine.

Covid Vaccine Requirement

All RIT students are required to be fully vaccinated. Individuals are considered fully vaccinated

1. two weeks after their second dose in a 2-dose series (such as the Pfizer or Moderna vaccines); or
2. two weeks after a single-dose vaccine (such as Johnson & Johnson's Janssen vaccine).

For more information on RIT's Covid vaccination policy, please visit rit.edu/ready/rit-safety-plan (https://www.rit.edu/emergency-information/#rit-ready-information-on-covid-19).

Note: An email notification is sent to students' RIT email account with directions to complete the necessary health information through the Student Health Center portal. Please note that the immunization form is to be completed by the student online and then downloaded and taken to the student's health provider or school official for verification. The form must then be forwarded to the Student Health Center for approval (fax: 585-475-7530).

CONSUMER INFORMATION

rit.edu/fa/compliance/student-right-know (https://www.rit.edu/fa/compliance/student-right-know/)

In compliance with the federal Student-Right-to-Know and Campus Security Act, and regulations of the U.S. Department of Education, RIT provides the following information to current and prospective students:

Outcomes Rate

Each year RIT gathers information about the career plans of its graduates in accordance with national standards established for the National Association of Colleges and Employers (NACE). These outcome summaries are provided by the university overall at both the undergraduate and graduate levels and reflect the career activities of graduates within six months of degree certification. Outcomes rates describe the percentage of graduates who have entered the workforce, enrolled for further full-time study, or are pursuing alternative plans (e.g., military service, volunteer service, or those not seeking employment at this time). The outcomes rate for the class of 2024 was 90.9% based on a 78.5% knowledge rate (the percent of graduates that RIT had verifiable information on).

Graduate Student Retention and Graduation Rates Over Time

For Master's Degree Seeking Students

92.3%
One-year retention rate, 2023-24 annual cohort

92.2%
Five-year graduation rate, 2019-20 annual cohort

For Doctoral Degree Seeking Students

89.6%
One-year retention rate, 2023-24 annual cohort

69.9%
Seven-year graduation rate, 2017-18 annual cohort

Public Safety

The Public Safety Department is open 24-hours-a-day and is located in Grace Watson Hall. The department encourages the RIT community to take responsibility for their safety by staying informed these services and reporting suspicious activity. Although each individual is ultimately responsible for their own personal safety, learning and practicing basic safety precautions can enhance one's well being. RIT's Public Safety Report is available at: https://www.rit.edu/publicsafety/sites/rit.edu.publicsafety/files/documents/ (https://www.rit.edu/publicsafety/sites/rit.edu.publicsafety/files/documents/2024AnnualSecurityReport.pdf)

The department provides the following services:

- *Blue Light Call Boxes*—Identified by a blue light and located across campus, these call boxes provide a direct line to Public Safety 24-hours-a-day. The location of the call is automatically recorded at the Public Safety Communications Center, making it possible for hard-of-hearing individuals to also use the call boxes. The call boxes may be used to request an escort, assist a motorist, report suspicious individuals or activity, or request access to a locked building or room.
- *Mobile Escort Service*—Available seven- days-a-week, on a timed schedule between 11 p.m. and 3 a.m.
- *Lost and Found*—All lost and found items are stored by Public Safety. Report a lost item at rit.edu/publicsafety/report-lost-item (https://www.rit.edu/publicsafety/report-lost-item/)
- *Emergency Notification*—Family members may contact Public Safety at (585) 475-2853 or **text** (585) 205-8333 to make an emergency notification to a student. Public Safety will locate the student and relay the message.
- *Awareness Programs*—Public safety hosts a variety of prevention awareness programs and services on topics including crime prevention, personal safety, and alcohol awareness. A monthly newsletter, RIT Ready, is distributed to students, faculty, and staff to bolster emergency preparedness on campus.
- *Annual Security and Fire Safety Report*—Public Safety's Annual Security and Fire Safety Report is available online (https://www.rit.edu/publicsafety/sites/rit.edu.publicsafety/files/documents/2024AnnualSecurityReport.pdf) and offers a description of security practices and information on reported occurrences of crime.
- *Confidential Tip Line*—This service is to obtain information that is unattainable through conventional methods and to alert public safety to endangering behavior that might go otherwise unreported. Individuals who utilize the tip line are encouraged to leave their names and contact information; however, they will not be contacted. An online form is available at rit.edu/publicsafety/tipline (https://www.rit.edu/publicsafety/tipline/).
- *Crime Statistics*—The Advisory Committee on Public Safety provides, upon request, all campus crime statistics as reported to the Department of Education. RIT crime statistics can be found at the Department of Education website (ope.ed.gov/security (https://ope.ed.gov/campussafety/#/)) or by contacting Public Safety. A hard copy of reported crime statistics required to be ascertained under Title 20 of the U.S. Code Section 1092(f) will be mailed within 10 days of the request.
- *Sexual Assault Information and CARES*—Confidential counseling services are available to anyone in need by calling (585) 546-2777 (voice/TTY). RIT's Campus Advocacy Response and Support (CARES) provides confidential and crisis intervention and support services for relationship concerns. Contact (585) 475-2261 at any time for assistance.
- *Emergency Preparedness*—RIT regularly communicates, prepares, and practices emergency management with public safety personnel and campus managers from various departments. If necessary, we will provide updated information through broadcast email, mass notification system (RIT ALERT), voicemail, ALERTUS beacons, and the university's website at rit.edu (https://www.rit.edu/).

Student Complaints

RIT's policies and procedures for student complaints are available at: https://www.rit.edu/fa/compliance/student-right-know#rit-student-complaint-policies-and-procedures (https://www.rit.edu/fa/compliance/student-right-know/#rit-student-complaint-policies-and-procedures)

Complaint Procedures for MSCHE, NYSED, and NC-SARA

Middle States Commission on Higher Education (MSCHE) complaint procedures:
https://www.msche.org/complaints/

New York State Education Department (NYSED) complaint procedures:

www.nysed.gov/college-university-evaluation/filing-complaint-about-college-or-university (http://www.nysed.gov/college-university-evaluation/filing-complaint-about-college-or-university/)

National Council for State Authorization Reciprocity Agreements (NC-SARA) complaint procedures:
https://www.nc-sara.org/sara-student-complaints-0 (https://www.nc-sara.org/sara-student-complaints-0/)

Complaint Resolution Policies and Procedures for Distance Education Students

RIT distance education students who have a consumer protection complaint regarding a distance education program should first seek to resolve the complaint within the RIT college in which the student is registered. View RIT college contacts for consumer protection complaints (https://www.rit.edu/academicaffairs/academicprogrammgmnt/complaints-regarding-distance-education-programs/).

Consumer protection-based complaints must be made to the RIT contact person listed above for the college that offers the student's program. Complaints should be made during the semester of occurrence, but must be made no later than the last day of the following academic semester. The RIT contact person for the college offering the distance program will acknowledge receipt of the complaint within fifteen (15) days. If the student's attempt at resolution within the RIT college is unsuccessful, the student may appeal the college's decision by contacting the RIT Vice Provost (https://www.rit.edu/academicaffairs/academicprogrammgmnt/contact-us/) within fifteen (15) days of being informed of the decision. A decision on the student's appeal will be issued within sixty (60) days along with any proposed remedy, if applicable.

Complaints regarding grades and student conduct violations are not part of the distance education complaint process. They are governed entirely by institutional policy and the laws of New York State. For more information, see the following RIT policies:
Final Course Grade Disputes (https://www.rit.edu/policies/d170/)
Student Conduct Process (https://www.rit.edu/policies/d180/)

When submitting complaints to regulatory bodies, there are different avenues for distance education students completing their RIT education in New York State and those completing their RIT education outside of New York State. Distance education students should follow the process below which represents their individual situation:

Distance Education Students Located in New York State

Student complaints not resolved at the institutional level who have followed all grievance procedures and protocols defined by the University, and reside in the state of New York, have the right to file a complaint with the NYS Office of College and University Evaluation. Information for distance education students regarding how to file a complaint can be found on the New York State Education Department website (http://www.nysed.gov/college-university-evaluation/state-authorization-reciprocity-agreement-sara/).

Distance Education Students Located Outside of New York State

State Authorization Reciprocity Agreement (SARA) States

If a student bringing a complaint is located outside of New York State, in a state or territory that participates in NC-SARA, and is not satisfied with the outcome of the institutional process for handling complaints, the complaint (except for complaints about grades or student conduct violations) may be appealed, within two years of the incident about which the complaint is made, to the SARA Portal Entity in the home state of the institution against which the complaint has been lodged. All states except California are NC-SARA members.

<u>The SARA Portal Entity Contact for New York State is:</u>
NC-SARA State Portal Contact: Andrea Richards
Supervisor of Higher Education Programs
New York State Education Department
89 Washington Avenue
Albany, NY 12234
518.474.1551
IHEauthorize@nysed.gov

Non-State Authorization Reciprocity Agreement (SARA) States

For those student complaints not resolved at the institutional level who have followed all grievance procedures and protocols defined by the University, and do not reside in a SARA member state or territory, advisement may be sought from the appropriate office in the student's state/territory of residence, listed below.

CALIFORNIA
California Department of Consumer Affairs (https://www.dca.ca.gov/consumers/complaints/oos_students.shtml/)
Consumer Information Center
1625 North Market Blvd., Suite N-112
Sacramento, CA 95834
Phone: 833-942-1120

AMERICAN SAMOA
American Samoa Office of Protection & Advocacy (https://www.americansamoa.gov/departments/)
Attn: Dr. Peter Tinitali
Executive Office Building
Pago Pago, American Samoa 96799
Phone: 684-699-2441

GUAM Guam Office of Attorney General (https://guamattorneygeneral.org/)
287 W O'Brien Dr.
Hagatna, Guam 96910
Phone: 671-475-3324

NORTHERN MARIANA ISLANDS
State Higher Education Agency, Northern Marianas College
POB 501250
Saipan MP 96950-1250
Northern Mariana Islands Alternate Contact:
Northern Mariana Islands Office of the Attorney General (https://www.cnmioag.org/)
Juan A Sablan Memorial Bldg.
Capital Hill
Caller Box 10007, Saipan, MP 96950
Phone: 670-234-5498

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