

Prospective Student Guidebook

Mechanical Engineering Department
Kate Gleason College of Engineering
Rochester Institute of Technology

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R·I·T



**Mechanical
Engineering**

Dear Prospective Mechanical Engineering Student:

Welcome to the mechanical engineering department at Rochester Institute of Technology. I am pleased that you have chosen to learn more about our program offerings as you consider options for your undergraduate degree. This guidebook will help you learn about our department, and the opportunities for growth available through our academic and extracurricular program offerings.

Here in mechanical engineering at RIT, we believe that engineers learn how to become engineers by “doing it, not just talking about it.” This focus on applied, hands-on education is at the heart of our department’s educational philosophy. We provide students with the strong basis in science and mathematics needed to compete in today’s high technology workplace, **and** we help students learn how to apply that knowledge to real world applications.

The principal objectives of the Bachelor of Science in Mechanical Engineering (BSME) program at RIT are to enable our graduates to:

1. Apply fundamental knowledge, skills, and tools of mechanical engineering.
2. Practice mechanical engineering in support of the design of engineered systems.
3. Accept the professional and ethical responsibilities to function as an engineer.
4. Contribute and communicate effectively within and across teams.
5. Continue their development as lifelong learners.
6. Possess a broad education and knowledge of contemporary issues.

The ME Department achieves these objectives by:

- Integrating cooperative education into the program for all students,
- Providing a strong foundation in mathematics and science with a balance between liberal studies and technical courses,
- Establishing balance between the engineering science, an appropriate computational experience, experimental work, and engineering design components of the program,
- Incorporating a strong laboratory component in the program with outstanding laboratory facilities,
- Having a diverse faculty committed to engineering education,
- Making available a combined BS and Masters option to academically stronger students. This option allows a student to complete the requirements of both the BS and Masters degrees in a five-year period. A student in this option completes four co-op work-blocks, and uses one of his/her graduate courses as a free elective for the BS program.

Mechanical engineering is a broad discipline. A degree in mechanical engineering can help you prepare yourself for a wide range of career opportunities. Perhaps you want to work in the automotive industry – if so, then you should consider our automotive engineering option and participate in our internationally acclaimed SAE Formula Racing Team. Maybe you have a career focus on working in the aerospace industry – then consider our Aerospace option, and becoming a member of the Aero design club. Maybe you haven't decided exactly what you want to do yet. Don't worry! Mechanical engineering offers a world of opportunities. You can use your M.E. degree to work in manufacturing, product design, bioengineering, fuel cells, medicine, robotics and automation, micro-systems, management, or entrepreneurship and business startup.

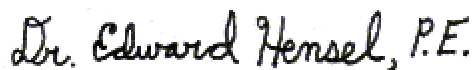
As a mechanical engineer, you can be a generalist, and practice in a wide range of technical fields. Or, as your interests become more specific, you can choose to specialize. Join our student sections of ASME, AIAA, SAE – get involved! If auto and aero racing aren't your bag, then try out our Moonbuggy team, or the robotics club. Our students participate in a number of extracurricular activities ranging from Art and Music to Intramural and Intercollegiate Athletics.

The mechanical engineering program at RIT is a demanding one. You will have to work hard and be dedicated to earn your degree. The hard work is well worth it. Your personal sense of accomplishment, and your value in the marketplace are just a couple of the rewards available to you as you pursue a degree in mechanical engineering from RIT.

Please take some time to visit our department, tour our world-class facilities and laboratories, and meet the students, staff, and faculty of our department. As you review the material in this guidebook, please feel free to contact myself or the mechanical engineering office staff with any questions you may have.

Thank you for considering the RIT mechanical engineering department in your college search, and best wishes to you as you move forward with your future academic plans!

Sincerely,



Edward C. Hensel
Professor and Department Head

ECH/dms

Mechanical Engineering – We
Design the Future!

Kate Gleason College of Engineering, The Mechanical Engineering Department and CO-OP Experience at RIT

Kate Gleason College of Engineering

The College of Engineering offers programs to prepare students for present-day industrial and community life, and to lay a foundation for graduate work in specialized fields. This is accomplished by offering curricula which are strong in fundamentals and maintain a balance among the liberal arts, the physical sciences and professional courses.

The College offers five, five-year cooperative education programs leading to the bachelor of science degree with majors in computer, electrical, industrial & systems, mechanical, and microelectronic engineering. Graduate programs leading to a Master of Science and/or a Master of Engineering degree are offered in all five departments. A Master of Science degree in Applied and Mathematical Statistics is also offered through the Center for Quality and Applied Statistics and a Master of Science in Materials Science and Engineering is offered jointly with the College of Science.

The departments maintain extensive laboratory facilities to provide students with ample opportunity to work with state-of-the-art equipment in their respective fields. The laboratories are equipped to provide meaningful practical experience, offer students the opportunity for independent projects and provide facilities for applied and fundamental research by students and faculty.

The Dean of the College is Dr. Harvey Palmer. He obtained his Ph.D. at the University of Washington and was long associated with the University of Rochester before joining RIT in the summer of 2000.

Department of Mechanical Engineering

Mechanical engineering is a broad discipline, covering such diverse topics as aerodynamics, combustion, system control, materials development, structural integrity, and robotics. The mechanical engineering department at RIT offers a solid foundation in ME fundamentals as well as the opportunity for students to concentrate their studies in one of several specific areas of engineering. In ME classes, students will be exposed to a balance of theory, hands-on experiment and design. Our laboratory facilities are primarily intended for student use, although most professors also participate in ongoing research projects in these same labs. Undergraduate students can become involved with these projects through class, co-op experience, or through participation in the BS/Masters degree program which allows students to earn both Bachelors and Masters degrees in a five-year period. Graduate study can be concentrated in solid body mechanics, thermal fluid sciences or dynamic systems and controls. With a faculty that includes several recipients of teaching awards, RIT has demonstrated commitment to excellence in education.

The mechanical engineering department offers programs at the undergraduate and graduate level. The undergraduate program is a five year (including one year of co-op work experience) accredited program leading to a BS degree. Options described below are available in Aerospace and Automotive Engineering, and a combined program leading to both the BS and Masters degrees simultaneously. The department is currently developing additional options in Bioengineering and Energy and the Environment. At the graduate level, the department offers an MS degree in mechanical engineering or a Masters of Engineering degree in mechanical engineering or jointly with industrial and systems engineering in Manufacturing Engineering. An MS degree in Materials Science is also offered jointly with the College of Science.

The *Aerospace Engineering option* allows for specialized study in the upper-level undergraduate curriculum focusing on engineering aspects of air- and space-borne vehicles. Building on the fundamental courses completed by all mechanical engineering students, a balanced exposure to the aerospace area is gained through a sequence of five specialized courses in four broad areas: aerodynamics, aerospace structures, propulsion, and flight dynamics. In addition, students choosing this option are expected to work on an aerospace engineering design project in the Senior Design I and II capstone design courses taken by all mechanical engineering students in the fifth year of study. A decision to enroll in the aerospace option needs to be made prior to the start of your fourth year, and you may contact Professor Nye for additional information.

The mechanical engineering department also offers an *Automotive Engineering option*. This option is intended to increase the opportunities for students who want to work for the automotive industry both in co-op and upon graduation. It offers a series of specialized courses that provide an introduction to vehicle power plants, dynamics, and control systems.

The sequence starts in the winter of the fourth year with an introductory course acquainting the student with the general field of automotive design and manufacturing. This is followed in the spring quarter and the fifth year with advanced technical electives in vehicle dynamics, internal combustion engines and automotive control applications. In addition all students choosing this concentration are expected to work on an approved automotive senior design project in the Senior Design I and II capstone design sequence taken in the fifth year of the program. A decision to enroll in the automotive option needs to be made prior to the start of your fourth year, and you may contact Professor Nye for additional information.

In addition to the bachelor of science and master of science degree programs, two dual degree programs are available to exemplary mechanical engineering students. These programs offer outstanding students an opportunity to earn both a Bachelor's and a Master's degree within approximately five years of entry to the BS program. Two dual degree programs are available – one leading to a Bachelor of Science and a Master of Engineering degrees (BS/MEng), and one leading to a Bachelor of Science and a Master of Science degrees (BS/MS). The BS/MEng program has a strong career oriented focus, and is primarily directed towards students not considering continued graduate study at the doctoral level. The BS/MS program has a strong research oriented focus, and is primarily directed towards students planning on completing a doctoral degree. All students enrolled in the BS/MS program are required to complete a graduate thesis and conduct scholarly research.

Students enrolled in the dual degree program are required to successfully complete 230-233 quarter credit hours and must complete four co-op work blocks, after which he or she is awarded the BS and Master's degrees simultaneously. A student may apply for admission to this program in the winter quarter of the second year. A transfer student may apply after completing one quarter at RIT. Admission is based on the student's cumulative grade point average, which must be at least 3.2; three letters of recommendation from the faculty; and a letter of application from the student. Students are admitted first to the BS/MEng program, and may change to the BS/MS program upon approval of a thesis proposal. All students in the program are required to maintain a cumulative grade point average of at least 3.2.

Students in this program begin their co-op experience in the summer at the end of the second year. Occasionally dual degree students may be hired by the department, or on a research grant held by a faculty member to do work considered to satisfy a co-op work block, or as laboratory assistants. Quite often the research work done for a professor will contribute to the MS thesis work required of all BS/MS students.

Further information regarding this program can be obtained from Dr. Hensel. You may apply for admission in the winter quarter of your second year by writing a letter to Dr. Hensel.

Cooperative Education Program

The College of Engineering at RIT is firmly committed to a quality cooperative education program. The faculty and administration believe wholeheartedly in the value of cooperative work experience as it forms part of the undergraduate education at RIT. Cooperative education [co-op] gives you the opportunity to apply in the workplace what you learn in the classroom, and bring to the classroom what you learn in the workplace.

Students attend classes during the fall, winter and spring quarters of their first and second year. The cooperative work/study portion of the Engineering program may begin in the summer after the student's second year of the five-year program leading to the Bachelor of Science degree. Students will alternate periods of study on campus with periods of co-op employment. The philosophy of the co-op program is to integrate on-the-job work experience with in-the-classroom academic experience to achieve a more well-rounded education.

A co-op coordinator is assigned to assist mechanical engineering students with placement efforts. This process begins with an orientation session in which students learn about resume building, contacting employers through the co-op office, and numerous details about scheduling, registration, and reporting. It is through the student's efforts, in collaboration with the Cooperative Education and Career Services Office, that they will obtain co-op positions. Although academic credit is not given for cooperative work experience, satisfactory performance during cooperative work periods is considered a requirement for the degree and cooperative work reports are to be submitted to the department. Each student is required to complete one year of co-op experience. This is typically accomplished in five ten week quarters.

It takes hard work and effort on behalf of the students to locate employers who participate in co-op programs, and meet the student's specific needs in regard to career development and professional objectives. A successful program requires the cooperation of all parties involved. Students are encouraged to consider co-op placements in a variety of locations and corporate settings, so that they get a range of exposure to professional opportunities.

Co-op gives you many valuable opportunities. You will be able to undertake various mechanical engineering career options, which will help you make long-term decisions. While taking a break from school, you will be earning a reasonable salary to help pay for your education. Students gain valuable expertise in areas such as oral and written communication, working in a team, and technical skills. Your co-ops will also provide networking which will give you an advantage when looking for a permanent position after graduation. More than half of our graduates are offered full time employment with one of their former co-op companies. In a recent survey, more than ninety percent of our alumni cited co-op as an excellent aspect of their career development.

The Co-op Office provides these services:

- Individual career counseling
- Job search seminars
- Resume writing
- Tips on interviewing skills and techniques
- On-campus interviews with employers
- Career and job search opportunities through the co-op website
- Employer presentations, providing you with information on a company before your interview
- Resource library with literature on companies, careers, job forecasts and other information

For mechanical engineering, there have recently been 80-130 job openings each quarter available through the Co-op office. Students are encouraged to seek out additional appropriate opportunities on their own.

Most jobs available through the co-op office are in New York State and nearby areas. However, there are opportunities nationally and internationally. Being flexible is important for a successful search!

Wages for most students on their first or second co-op period fall between \$8 and \$13 per hour; this increases in later co-ops.

Representative employers who have recently hired/recruited mechanical engineering students are:

**AEROSPACE &
DEFENSE**

Boeing
Joint Warfare Analysis
Center
NAVAIR
Raytheon Company
US Navy
US Marine Corps
US Air Force
Defense Intelligence Agency
Aeronca
Aerospace Corp.
Allied Signal Aerospace
Amphenol Aerospace
Boeing (PA, WA & CA)
Carleton Technologies
Flightline Electronics
General Dynamics
Goodrich Aerospace
Hexcel Pottsville Corp.
Lockheed Martin
Moog
Naval Air Warfare Ctr.
Northrup Grumman Corp.
Parker Hannifin
Pratt & Whitney
Raytheon Aircraft
PC Sierra Technologies
Sikorsky Aircraft
Tactair Fluid Controls
Teradyne
TRW Lucas Aerospace
Parker Hannifin

AUTOMOTIVE

Harley Davidson
General Motors (Several
locations)
Moog
New Venture Gear
TRW
GM
GM Truck & Bus
Valeo
Volvo
Volvo (Sweden)
Borg Warner
Robert Bosch Corp
Cummins Engine
Delphi Automotive
Ford
ITT Automotive
Pactiv

ENERGY SYSTEMS

Barton & Loguidice, P.C.
BME Associates
c3controls
Carrier Corporation

OTHER

Everest VIT
Infineon Technologies
Keyence Corp. of America
NanoDynamics, Inc.
Optical Gaging Products
Garlock
Peko Precision Products

BIOENGINEERING/BIOMEDICAL

Atlantic Testing Laboratories
McNeil Consumer & Specialty
Pharmaceuticals
Wilson Greatbatch Technologies
Bausch & Lomb
Johnson & Johnson

MANUFACTURING

MARKEM Corporation
AMP
Gleason
Dresser Rand
Alstom Signaling
Eastman Kodak
Hansford Manufacturing
Black & Decker (Emhart Power)
General Electric (Several Locations)
Harris Corporation
IBM (Several Locations)
INSA (France)
ITT/Goulds Pumps
Johnson Controls
Motorola
Raymond Corporation
Valmet Paper Machines (Finland)
Xerox Corporation

BS DEGREE IN MECHANICAL ENGINEERING
197 Quarter Credit Hours
Academic Year 20041-20044 8/04

YR.	COURSE NO.	COURSE TITLE	FALL	WTR.	SPR.
1	0304-203	Freshman Seminar	1	1	
	0304-214	Engineering Design Graphics *	x	3	x
	0304-343	Materials Processing *	4	x	
	1016-281, 282, 283	Calculus I, II, III	4	4	4
	1011-208	College Chemistry I	4		
	1011-273, 277	Intro. to Chemistry of Materials, Lab *		4	x
	0304-342	Problem Solving with Computers *		x	3
	1017-311	University Physics I			5
		Liberal Arts (Core)	4	4	4
		Physical Ed. Wellness, Activity, Activity	0	0	0
2	0304-336	Statics	4		
	0304-347, 348	Mechanics of Materials, Lab		5	
	0304-359	Dynamics			5
	0304-344	Materials Science *		4	x
	0304-312	Geometric Dimensioning & Tolerancing *		x	3
	1016-305	Multivariable Calculus	4		
	1016-306	Differential Equations I		4	
	1016-314	Engineering Statistics		4	
	1016-318	Matrices & Boundary Value Problems			4
	1017-312	University Physics II	5		
1017-313	University Physics III			5	
	Liberal Arts (Core)	4			
3	ALTERNATE COURSES/CO-OP		FALL/ WTR.		SPR./ SMR.
	0304-413	Thermodynamics	4		
	0304-437	Design of Machine Elements	4		
	0304-440	Numerical Methods	4		
		Science Elective	4		
	0301-362	Intro. to Electrical Engineering			4
	0304-415	Fluid Mechanics			4
	0304-416	Thermal Fluids Lab I			1
	0304-518	Advanced Computational Techniques			4
		Liberal Arts (Core)			4
	Writing Test	x	x	x	
4	0304-514	Heat Transfer	4		
	0304-543	System Dynamics	5		
		Technical Elective 1	4		
		Liberal Arts (Core)	4		
	0304-550	Transport Phenomena			4
	0304-551	Thermal Fluids Lab II			1
		Technical Elective 2, 3			8
	Liberal Arts (Concentration)			4	
5	0304-630	Senior Design I	4		
	0304-631	Senior Design II			4 **
		Technical Elective 4	4		
		Free Elective 1, 2	4		4
		Liberal Arts (Concentration)	4		4
	Liberal Arts (Sr. Seminar)			2	

* May also be taken in quarter marked "x". ** Not offered in summer quarter.

B.S. DEGREE IN MECHANICAL ENGINEERING Aerospace Option

197 Quarter Credit Hours
Academic Year 20041-20044

6/22/04

YEAR	FALL	WINTER	SPRING	SUMMER
1	Freshman Seminar (E.D.G.)	Freshman Seminar Engr. Des. Graphics (M.P., L.) (P.S. w/C.)	Univ. Physics (E.D.G.)	VACATION
	Matl. Proc., Lab		Prob. Solv. w/ Comp. (C.M., L.)	
	College Chemistry	Chem. Matl., Lab	Calculus III/C	
	Calculus I/A	Calculus II/B	Liberal Arts	
	Liberal Arts	Liberal Arts	P.E. Activity	
	P.E. Wellness	P.E. Activity		
2	Statics	Mech. Matl., Lab	Dynamics (M.S., L.)	VACATION
	Liberal Arts	Matl. Science, Lab (GD&T)	GD&T	
	Diff. Eq./Calc D	MV Calc/Diff Eq.	Matr. & BVP/MV Calc	
	Univ. Physics II	Statistics	Univ. Physics III	
3	Thermodynamics	CO-OP	CO-OP	Intro. To E.E.
	Des. Mach. Elem.			Fluid Mech.
	Num. Methods			ACT, Lab
	Free Elect./Matr. & BVP			Thermo. Fluids Lab I
	Writing Test			Liberal Arts
4	Heat Transfer	CO-OP	Aerodynamics	CO-OP
	System Dynamics		Aeromechanics Lab	
	Intro to Aero		Aerostructures	
	Liberal Arts		Tech. Elective	
			Liberal Arts	
5	CO-OP	Senior Des. I	Senior Des. II	\$\$\$
		Flight Dynamics	Science Elective	
		Propulsion	Senior Seminar	
		Liberal Arts	Liberal Arts	

Courses in **bold** may be taken in quarters (in parenthesis)

**Aerospace Option
Department of Mechanical Engineering
Rochester Institute of Technology**

The mechanical engineering department offers a concentration in aerospace engineering for students majoring in mechanical engineering. This option is offered to extend aerospace career opportunities to our graduates.

The aerospace engineering option allows for specialized study in the upper-level undergraduate curriculum focusing on engineering aspects of air- and space-borne vehicles. The option starts with a course introducing students to the aerospace field. Then, building on the courses completed by all mechanical engineering students, a balanced exposure to the aerospace area is gained through a sequence of four technical electives in the areas of aerodynamics, aerospace structures, propulsion, and flight dynamics. In addition, students choosing this option are expected to work on an aerospace engineering design project in Senior Design I and II as well as find co-op positions in the aerospace industry.

Catalog Descriptions for Aerospace Option Courses

0304-560 Introduction to Aerospace Engineering

Lays the foundation for studies in aerospace engineering. Topics include the history of aviation, basic aerodynamics, airfoils, wings and other aerodynamic shapes, airplane performance, stability and control, propulsion and aircraft structures. This course may be used only as a free elective. (0304-359, 415) **Class 4, Credit 4**

0304-575 Aerodynamics

This course presents the essentials of aerodynamic theory. Topics include differential equations of fluid mechanics, airfoil theory, wings of finite span, inviscid potential flows, laminar and turbulent boundary layer. Airfoil design is explored through software. A design project is required. (0304-560) **Class 4, Credit 4**

0304-671 Aerostructures

The principles of deformable bodies as applied to the analysis and design of aircraft and space vehicle structures. Topics include the study of bending and torsion of thin-walled, multi-cell beams and columns; wing and fuselage stress analysis; and structural stability. Strain energy concepts and matrix methods are utilized throughout the course. (0304-437, 518) **Class 4, Credit 4**

0304-673 Aeromechanics Laboratory

A companion laboratory course for 0304-671 and 0304-675 illustrating the behavior of advanced engineering structures and aerodynamic principles common to aircraft and spacecraft design. Students investigate the bending and torsion of thin-walled single cell and multi-cell members. Wind tunnel experiments investigate basic concepts of lift and drag on bluff bodies, wind sections and lifting bodies. Boundary layer characterization is simulated on digital computers and investigated experimentally. Structural analysis and design evaluation are also simulated where appropriate. (0304-560; corequisites: 0304-671, 575) **Lab 2, Credit 1**

0304-678 Propulsion

The fundamentals of propulsion including the basic operating principles and design methods for flight vehicle propulsion systems. Topics include air-breathing engines (turbojets, ramjets, turboprops, and turbofans) as well as liquid and solid propellant chemical rockets. (0304-514 and 0304-575) **Class 4, Credit 4**

0304-682 Flight Dynamics

This course deals with three-dimensional dynamics of aircraft, including general aircraft performance, stability and control and handling qualities. Topics include mathematical development of equations-of-motion describing full range of aircraft motion; aerodynamic forcing term coefficient development, quaternion alternative; linearization of nonlinear aircraft models determination of range, endurance and rate of climb; simulation of aircraft trajectory; static and dynamic stability; aircraft control; and aircraft handling qualities introduction. (0304-560) **Class 4, Credit 4**

B.S. DEGREE IN MECHANICAL ENGINEERING
Automotive Option

197 Quarter Credit Hours
 Academic Year 20041-20044

6/22/04

YEAR	FALL	WINTER	SPRING	SUMMER
1	Freshman Seminar (E.D.G.)	Freshman Seminar Engr. Des. Graphics (M.P., L.) (P.S. w/C.)	Univ. Physics (E.D.G.)	VACATION
	Matl. Proc., Lab		Prob. Solv. w/ Comp. (C.M., L.)	
	College Chemistry	Chem. Matl., Lab	Calculus III/C	
	Calculus I/A	Calculus II/b	Liberal Arts	
	Liberal Arts	Liberal Arts	P.E. Activity	
	P.E. Wellness	P.E. Activity		
2	Statics	Mech. Matl., Lab	Dynamics (M.S., L.)	VACATION
	Liberal Arts	Matl. Science, Lab (GD&T)	GD&T	
	Diff. Eq./Calc D	MV Calc/Diff. Eq.	Matr. & BVP/MV Calc	
	Univ. Physics II	Statistics	Univ. Physics III	
3	CO-OP	Thermodynamics	Intro. To E.E.	CO-OP
		Des. Mach. Elem.	Fluid Mech.	
		Num. Methods	ACT, Lab	
		Free Elect./Matr. & BVP	Thermo. Fluids Lab I	
		Writing Test	Liberal Arts	
4	CO-OP	Heat Transfer	Transport Phenom.	CO-OP
		System Dynamics	Thermo. Fluids Lab II	
		Tech. Elective	Int. Comb. Engines	
		Intro to Auto	Vehicle Dynamics	
			Liberal Arts	
5	CO-OP	Senior Des. I	Senior Des. II	\$\$\$
		Auto. Controls	Science Elective	
		Liberal Arts	Senior Seminar	
		Liberal Arts	Liberal Arts	

Courses in **bold** may be taken in (quarters in parenthesis)

**Automotive Option
Department of Mechanical Engineering
Rochester Institute of Technology**

The Mechanical Engineering Department now offers an Automotive Engineering concentration for students majoring in mechanical engineering. This concentration is intended to increase the opportunities for students who want to work for the automotive industry both in co-op and upon graduation.

This concentration builds upon course work all mechanical engineering students take in mechanics, thermodynamics, heat transfer and system dynamics by offering a series of specialized technical and free elective courses during the fourth and fifth years. These specialized courses provide an introduction to vehicle power plants, dynamics and control systems. The sequence starts in the winter of the fourth year with an introductory course acquainting the student with the general field of automotive design and manufacturing. This is followed in the spring quarter and the fifth year with advanced technical electives in vehicle dynamics, internal combustion engines and automotive control applications. In addition all students choosing this concentration are expected to work in the automotive industry on their co-ops as well as working on an approved automotive senior design project in Senior Design I and II capstone design sequence taken in the fifth year of the program.

Catalog Descriptions for Automotive Option Courses

0304-540 Introduction to Auto Design & Manufacturing

An introduction to the design and manufacturing practices employed in typical automotive industries. Design practices that are currently being implemented in industry will be emphasized including the use of computer-aided engineering, software, and statistical analysis. The regularly scheduled lecture periods will include guest lecturers from automotive OEMs to introduce the students to current manufacturing technologies. (Fourth-year standing in ME program) **Class 4, Credit 4**

0304-624 Vehicle Dynamics

Deals with the fundamentals of ground vehicle stability and control. The contribution of tire lateral force, stiffness, and aligning torque to vehicle stability is discussed. Bicycle and four-wheel vehicle models are analyzed for neutral, under and over steer characteristics. The effects of suspension geometry, chassis stiffness and roll stiffness on stability and handling are analyzed. (0304-543) **Class 4, Credit 4**

0304-626 Automotive Control Applications

Examines several key vehicle control subsystems. Such subsystems include engine sensors and controls, anti-lock brake systems, and semi-active suspensions. Recent ITS (intelligent transportation systems) developments in the area of AVCS (advanced vehicle control systems) such as collision avoidance will also be studied. Relevant modeling and computer simulations will be performed. (0304-543) **Class 4, Credit 4**

0304-640 Internal Combustion Engines

An introduction to the operation and design of internal combustion engines. Topics include engine types and cycles, fuels, intake and exhaust processes, emissions and emission control systems, heat transfer and lubrication. (0304-413, 514, 550) **Class 4, Credit 4**

Dual Degree Programs

Students enrolled in the dual degree program are required to successfully complete 230-233 quarter credit hours and must complete four co-op work blocks, after which he or she is awarded the BS and Master's degrees simultaneously. A student may apply for admission to this program in the winter quarter of the second year. A transfer student may apply after completing one quarter at RIT. Admission is based on the student's cumulative grade point average, which must be at least 3.2; three letters of recommendation from the faculty; and a letter of application from the student. Students are admitted first to the BS/MEng program, and may change to the BS/MS program upon approval of a thesis proposal. All students in the program are required to maintain a cumulative grade point average of at least 3.2.

B.S./M.Eng. DEGREE IN MECHANICAL ENGINEERING

233 Quarter Credit Hours
Academic Year 20041-20044
3/29/04

YEAR	FALL	WINTER	SPRING	SUMMER	
1	Freshman Seminar (E.D.G.)	Freshman Seminar Engr. Des. Graphics (M.P., L.)	Univ. Physics (E.D.G.)	VACATION	
	Matl. Proc., Lab	(P.S. w/C.)	Prob. Solv. w/ Comp.		
	College Chemistry	Chem. Matl., Lab	(C.M., L.)		
	Calculus I	Calculus II	Calculus III		
	Liberal Arts	Liberal Arts	Liberal Arts		
	P.E. Wellness	P.E. Activity	P.E. Activity		
	Statics	Mech. Matl., Lab	Dynamics (M.S., L.)		CO-OP
	Liberal Arts	Matl. Science, Lab	GD&T		
Calculus IV	(GD&T)	Matrices & BVP			
Univ. Physics II	Diff. Eq. Statistics	Univ. Physics III			
3	Thermodynamics	CO-OP	Intro. To E.E.	CO-OP	
	Des. Mach. Elem.		Fluid Mech.		
	Num. Methods		ACT, Lab		
	<i>Math for Eng. I</i>		Thermo. Fluids Lab I Liberal Arts		
4	Heat Transfer	Science Elect.	Transport Phenom.	CO-OP	
	System Dynamics	Liberal Arts	Liberal Arts		
	Tech. Elective 1	<i>Systems Modeling</i>	Thermo. Fluids Lab II		
	<i>Grad Conc. I</i>	<i>Grad Conc. II</i>	<i>Comp. Implem.</i>		
			<i>Grad Conc. III</i>		
5	<i>DPM</i>	Senior Des. I	Senior Des. II	\$\$\$	
	<i>Grad Conc. IV</i>	<i>Grad. Elect. 2</i>	Free Elective		
	Tech. Elective 2	Tech. Elective 3	Liberal Arts		
	Grad Elective 1	Liberal Arts	<i>Grad. Elect. 3</i>		
		Senior Seminar			

Courses in **bold** may be taken in quarters (in parenthesis)

B.S./M.S. DEGREE IN MECHANICAL ENGINEERING

YEAR	FALL	WINTER	SPRING	SUMMER
1	Freshman Seminar (E.D.G.)	Freshman Seminar Engr. Des. Graphics	Univ. Physics (E.D.G.)	VACATION
	Matl. Proc., Lab	(M.P., L.)	Prob. Solv. w/ Comp.	
	College Chemistry	(P.S. w/C.)		
	Calculus I	Chem. Matl., Lab	Calculus III	
	Liberal Arts	Calculus II	Liberal Arts	
	P.E. Wellness	Liberal Arts	Liberal Arts	
		P.E. Activity	P.E. Activity	
2	Statics	Mech. Matl., Lab	Dynamics	CO-OP
	Liberal Arts	Matl. Science, Lab	(M.S., L.)	
	Calculus IV	(GD&T)	GD&T	
	Univ. Physics II	Diff. Eq.	Matrices & BVP	
		Statistics	Univ. Physics III	
3	Thermodynamics	CO-OP	Intro. To E.E.	CO-OP
	Des. Mach. Elem.		Fluid Mech.	
	Num. Methods		ACT, Lab	
	<i>Math for Eng. I</i>		Thermo. Fluids Lab I	
			<i>Research Methods</i>	
4	Heat Transfer	Science Elect.	Tech. Elective 1	CO-OP/ THESIS WORK
	System Dynamics	Liberal Arts	Tech. Elective 2	
	Transport Phenom.	<i>Math for Eng. II</i>	Liberal Arts	
	<i>Grad Core 1</i>	<i>Grad Core 2</i>	Thermo. Fluids Lab II	
		Senior Seminar	<i>Grad Core 3</i>	
5	Tech. Elective 3	Senior Des. I	Senior Des. II	THESIS
	Liberal Arts	Liberal Arts	Free Elective	
	<i>Grad Elect. 1</i>	<i>Grad Elect. 2</i>	Liberal Arts	
	<i>Thesis (1 cr)</i>	<i>Thesis (4 cr)</i>	<i>Thesis (4 cr)</i>	

Courses **ibold** may be taken in quarters (in parenthesis)

* If you are ahead in your math sequence, you should take Math for Engineers I this quarter, and a Liberal Arts in the Fall of the third year.

*The number of credit hours completed at the end of second year: 100

REQUIREMENTS FOR THE BS DEGREE: 197 QUARTER CREDIT HOURS

REQUIREMENTS FOR THE MS DEGREE: 45 QUARTER CREDIT HOURS

REQUIREMENTS FOR THE BS/MS PROGRAM: 230 QUARTER CREDIT HOURS

A STUDENT MUST TAKE: EIGHT GRADUATE LEVEL COURSES (Math for Eng. I, II, Research Methods, 3 Core & 2 Electives), one 600 level technical elective, and 9 thesis credits to fulfill the MS requirement:

Graduate Core Courses:

Focus Area A.

Focus Area B.

Focus Area C.

Fall

Engineering Vib

Signal Processing

Ideal Flows

Winter

Adv. Mech of Solids

Systems Modeling

Convective Phenomena

Spring

Finite Elements

Control Systems

Intro to CFD Analysis

Students in the BS/MS program are normally expected to complete the requirements for the two degrees in three years from matriculation into the BS/MS program. An extension to complete the Masters Thesis may be granted on a case-by-case basis however, cannot extend beyond 12 months from the completion of all course work.

Student Organizations in Mechanical Engineering:

We believe that students learn by doing. We support several co-curricular student organizations and competition teams in the department, and encourage our students to participate in these clubs and teams, as well as other teams and activities available across campus.

Formula SAE Autosports Competition Team

The RIT Formula SAE Racing Team is a group of approximately thirty students, open to all majors and year levels willing to participate in the design, fabrication, racing and promotion of a high performance formula-style racing vehicle. The all-volunteer team is responsible for every aspect of the project, including engineering design, financial management, and public relations. Each year, the team builds and entirely new racecar with restrictions only to the car's frame and engine to challenge the students' knowledge, creativity and imagination. Automotive knowledge is not required, just the desire to learn, work hard, and have a lot of fun. The team is constantly recruiting new members, and meets weekly on Saturdays at 10:00 am. Team members are always willing to talk about the race car, the Formula SAE competitions (national and international), or give a tour of the RIT machine shop, where the FSAE office is also located. RIT has been firmly established as one of the "giants" of Formula SAE, and the team has placed highly every year for the last twelve years.

Aero Design Team

The Aero Design Team at RIT has existed on campus for many years in a variety of forms. Beginning in the 2000-2001 school year the club was reorganized so that there could be greater involvement by underclassmen. Those involved in the restructuring wanted to provide an environment which would encourage student interest in the field of aerospace engineering regardless of year level.

The RIT Aero Design Team is a student chapter of the American Institute of Aeronautics and Astronautics (AIAA). Combined with RIT Formula, they are also a student chapter of the Society of Automotive Engineers (SAE). Being a university chapter of both AIAA and SAE creates many opportunities for their members. These include airplane design and manufacture competitions sponsored by both SAE and AIAA. Also, through their relationship with these two major engineering communities, opportunities exist for both undergraduate and graduate students to perform aerospace-related research and present technical papers at regional and national conferences, receive scholarship awards, and enter purely design-based competitions dealing with aviation and space problems.

The overall goal of the RIT Aero Design Team is to support and encourage student interest in the field of aerospace and aviation. They are centered completely around hands-on experiences. They look to apply engineering concepts learned in the classroom to real life problems. They do this in a variety of ways, but their primary effort at realizing this goal each year is the design and manufacture of a large RC plane for the SAE Aero Design Competition. This plane is a purely student led effort with little or no faculty involvement. It is a year long task ending with a trip to the East Coast Competition in April and a trip to the West Coast Competition in June.

Human Powered Vehicle Competition Team

The human Powered Vehicle Team at RIT is a competition team that designs, engineers and fabricates a buggy every year to compete in NASA's Great Moonbuggy Race. This nationally known competition is held in Huntsville, Alabama at the Marshall Flight Center. Colleges from around the nation compete in this intense half-mile lunar simulated race. The Moonbuggies must be designed to be lightweight, fit in to a 4'x4'x4' cube and withstand the obstacles that NASA engineers construct. The RIT team is focused on attaining hands-on experience based on classroom knowledge to construct the final vehicle. Every member is an integral part of the team and each one is key in the development of creative designs. The RIT team gets the student body involved on multiple levels incorporating majors such as Mechanical Engineering, Business, Marketing, Industrial Engineering, Computer Engineering, Electrical Engineering, Illustration and even Photography. "We create an off-road vehicle unlike any other."

FIRST Robotics Team

The RIT FIRST club will be sponsoring and mentoring three local high school teams during this year's FIRST Robotics competition season. RIT FIRST will also be a key player in the organization and planning of the 2005 Rochester, NY FIRST Robotics Regional Competition to be held at RIT in the new field house. All students are welcome to attend one of our weekly meetings for additional information or to volunteer to help out with one of the local teams.

American Society of Mechanical Engineers

The student chapter of ASME offers educational, technical, and social activities. It develops leadership skills and leads to contacts with engineers in industry and students at other colleges within the region. The student chapter is active and works closely with the senior section in Rochester.

Society of Automotive Engineers

The purpose of the RIT Society of Automotive Engineers [SAE] is to give students the opportunity to meet with senior engineers in industry and provide students a chance to apply their classroom knowledge in various projects.

Society of Women Engineers

The Society of Women Engineers [SWE] at RIT is a student-run organization. SWE organizes several functions each quarter such as guest speakers, high school outreach, community activities, tours, social events and events with other student organizations. The RIT chapter is strongly committed to the encouragement of women in pursuing a career in engineering or related fields.

Society of Hispanic Professional Engineers

The Society of Hispanic Professional Engineers [SHPE] is an association of professionals and students in engineering, science, technology, business and other related disciplines at RIT. SHPE's basic thrust is to identify and promote professional growth opportunities for Hispanics.

National Society of Black Engineers

The mission of the National Society of Black Engineers is to increase the number of culturally responsible engineers and scientists who excel academically and succeed professionally and positively impact the community.

American Institute of Aeronautics and Astronautics

The student chapter of AIAA is dedicated to promoting careers and opportunities in the aerospace industry.

Pi Tau Sigma

Pi Tau Sigma is the mechanical engineering national honor society. Membership, by invitation, is open to men and women ranked in the upper third of the class in their fourth and fifth years at RIT. Chapter activities are tailored to foster high ideals in the engineering profession, support departmental activities, and promote professionalism. Service activities are supported by fund-raising and social events. Membership is by invitation only, and is based largely on outstanding academic achievement.

ME Student Advisory Committee

At the end of the 2001-02 academic year, we further expanded the role of the student constituents in our program evaluation and assessment, through formation of the Mechanical Engineering Student Advisory Committee, (ME-SAC). The ME-SAC is comprised of representatives from each student club, professional organization, and competition team in the mechanical engineering department, and also includes representatives from inter-departmental programs. Student organizations represented on the ME-SAC include ASME, AIAA, SAE, SWE, Pi Tau Sigma, the SAE Formula Team, the Aero Design Club, Engineering House, and soon the RIT Collegiate FIRST team. The ME-SAC meets approximately monthly with the department head in a lunch meeting.

Tau Beta Pi

This national engineering honor society was founded to mark in a fitting manner those who have conferred honor upon their Alma Mater by distinguished scholarship and exemplary character as students in engineering, or by their attainments as alumni in the field of engineering, and to foster a spirit of liberal culture in engineering colleges. Election to Tau Beta Pi is one of the highest honors that can come to an engineering student from his or her peers. Membership is by invitation only, and is based largely on outstanding academic achievement.

Clubs and Organizations at RIT

There are many other clubs and organizations available for students to join while they pursue their degrees at RIT. They are grouped in the areas of: Careers, Hobby and Special Interest, Music, Greek Life, Sports, Ethnic, Religious and Major Student Organizations. Further information on these student clubs and organizations can be found at <http://clubs.rit.edu/>.

««GreetingLine»» Annual Events

There are a variety of social events scheduled each year to provide students with the opportunity to mingle with faculty, staff, and other students. Some of these events include: a fall golf tournament, monthly coffee hours, fall and spring picnics, and the ««GreetingLine»» banquet.

Mechanical Engineering Department Faculty

The faculty members of the Mechanical Engineering Department are deeply committed to engineering education. Numerous members of our faculty have received awards in recognition of their excellent teaching and mentoring of engineering students. They remain current in their discipline through a wide variety of professional development, service, and scholarly activities. Our faculty members regularly publish materials on advances in engineering education as well as their fields of research.

Lawrence Agbezuge, D.Sc., MS, Columbia; BS, Ghana Imperial College — Visiting Associate Professor

Dianne M. Amuso, BS, Western New England College; MS, Rensselaer Polytechnic Institute—Lecturer – Vanguard Educator Recognition Award, 1999

Margaret Bailey, BS in Architectural Engineering, The Pennsylvania State University; Ph.D., University of Colorado at Boulder—Kate Gleason Associate Professor. – National Science Foundation Fellowship Recipient, 1994-97

Stephen Boedo, BA, State University of New York at Buffalo; MS, Ph.D., Cornell University—Associate Professor

Richard G. Budynas, BME, Union College; MS, University of Rochester; Ph.D., University of Massachusetts; P.E.—Professor

Agamemnon L. Crassidis, BS, MS, Ph.D., State University of New York at Buffalo—Assistant Professor

Elizabeth A. DeBartolo, BS, Duke University; MS, Ph.D., Purdue University—Assistant Professor – Magoon Award for Excellence in Teaching, Purdue University, 1999 and 2000

Hany A. Ghoneim, BS, MS, Cairo University, Egypt; Ph.D., Rutgers University—Professor – Eisenhart Award for Outstanding Teaching, RIT 2001

Amitabha Ghosh, B.Tech., M.Tech., Indian Institute of Technology, India; Ph.D., Mississippi State University— Professor

Surendra K. Gupta, B.Tech., Indian Institute of Technology, India; MS, University of Notre Dame; Ph.D., University of Rochester—Professor - Eisenhart Award for Outstanding Teaching, RIT 2000, Outstanding Educator Award, ASEE St. Lawrence Section, 1998, 1999

Charles W. Haines, AB, Earlham College; MS, Ph.D., Rensselaer Polytechnic Institute; Professor – ASEE Fellow 1999

Edward C. Hensel, BS, Clarkson College; MS, Ph.D., New Mexico State University — Department Head; Professor – Roush Award for Excellence in Teaching, 1991, Edward Roth National Award , SME, 1996

Satish G. Kandlikar, BE, Marathwada University, India; M.Tech., Ph.D., Indian Institute of Technology. James E. Gleason Professor – ASME Fellow, IBM Faculty Award 2003, Eisenhart Award for Outstanding Teaching, RIT 1997

Mark Kempfski, BS, Purdue University; MS, Ph.D., State University of New York Buffalo—Professor

Kevin Kochersberger, BS, MS, Ph.D., Virginia Polytechnic Institute and State University—Associate Professor – Pilot of the Kitty Hawk Flyer for the Centennial Celebration, Dec. 17, 2003; SAE Ralph R. Teetor Educational Award, 1998

Jeffrey D. Kozak, BS, Gannon University; MS, Ph.D., Virginia Polytechnic and State University of Virginia—Assistant Professor

Alan H. Nye, BS, MS, Clarkson College; Ph.D., University of Rochester—Associate Department Head; Professor - SAE Excellence in Engineering Education Award 2004, Carroll Smith Mentor's Cup 2003, SAE Ralph R. Teetor Educational Award 1983

Ali Ogut, B.Ch.E., Hacettepe University, Turkey; MS, Ph.D., University of Maryland—Professor

Elizabeth Paciorek, BS, State University of New York at Buffalo; MS, University of Rochester—Lecturer

Brett J. Pokines, BS, MS, State University of New York Buffalo; Ph.D., Virginia Polytechnic Institute and State University—Assistant Professor

Risa J. Robinson, BS, MS, Rochester Institute of Technology; Ph.D., State University of New York at Buffalo—Associate Professor

William T. Scarbrough, BS, MS, Rochester Institute of Technology—Lecturer

Frank Sciremammano Jr., BS, MS, Ph.D., University of Rochester—Professor – Dow Outstanding Young Engineering Faculty Award, ASEE 1983

Josef S. Torok, BS, University of Akron; MS, Ph.D., Ohio State University—Professor - Eisenhart Award for Outstanding Teaching, RIT 2003

Benjamin Varela, BS, Institute of Technology of Juarez, Mexico; MS, Ph.D., New Mexico State University—Assistant Professor

Panchapakesan Venkataraman, B.Tech., Indian Institute of Technology; MS, Ph.D., Rice University—Associate Professor

Wayne W. Walter, BE, State University of New York Maritime College; MS, Clarkson College; Ph.D., Rensselaer Polytechnic Institute; P.E.— Professor

John D. Wellin, BS, Rochester Institute of Technology; MS, University of Rochester—Lecturer