

# BIOINFORMATICS

<http://www.bioinformatics.rit.edu/>

## PROGRAM OVERVIEW FOR EMPLOYERS

The Bioinformatics program at RIT is a truly interdisciplinary major. The Bioinformatics curriculum was developed by faculty in the Departments of Biological Sciences, Chemistry, Computer Science, Mathematics and Statistics, and Information Technology, with the guidance of professionals in the bioinformatics and biotechnology industries throughout the country. It is lab-intensive and includes 18 new courses, developed specifically for this program, which integrate interdisciplinary skills and knowledge. It was designed with the needs of the prospective employer in mind and tailored specifically for this challenging and rapidly changing field. Our students are well prepared to work productively in numerous areas including:

- Bioinformatics software development
- Biomedical research
- Biotechnology
- Comparative genomics
- Genomics
- Molecular imaging
- Pharmaceutical research and development
- Proteomics
- Vaccine development

### Degree(s) Awarded

Bachelor of Science  
 Master of Science  
 Combined BS/MS

### Enrollment

Approximately 45 undergraduate and 25 graduate students

### Cooperative Education Component

Each undergraduate student is *required* to complete *at least one* 10-12 week co-op. Students are eligible to pursue that experience at any time after their 2<sup>nd</sup> year although encouraged to do so during their 3<sup>rd</sup> – 4<sup>th</sup>/5<sup>th</sup> years of study. Graduate students are also eligible.

### Salary Information (Avg/Range)

Co-op: \$13.53                      \$10.00 - \$16.00  
 BS, MS: Insufficient data

### Equipment & Facilities

All students in the Department of Biological Sciences take laboratory courses which use the following:

- teaching laboratories
- student/faculty research laboratories
- NYS-DOH certified animal facility
- Human cadaver laboratory
- Greenhouse
- State of the art equipment for cell and molecular biology and genetics (details can be provided)

Bioinformatics students have access to two laboratories containing Seven Linux and Windows PCs.

These are connected to RIT's Gbps switched Ethernet network and to the Internet via redundant OC-3, T3 and T1 links. RIT is connected to Internet2. Also available are multiple Linux and Sun servers with approximately 20 TB of shared storage space and many common bioinformatics databases.

### Student Skills & Capabilities

Beginning in their first year of study, students attain a combined skill set in the biotechnology laboratory and in computer programming fundamentals. By the end of their second year of study they can program in Java, are familiar with Unix and SQL, and have a strong foundation in the laboratory.

While taking upper level courses, students develop a range of laboratory skills that is nearly equivalent to that attained by students in our Biotechnology program. Additionally, Bioinformatics students gain considerable experience applying common bioinformatics software tools, such as BLAST, ClustalW, the Wisconsin Package, PAUP, PHYLIP, the Staden Package, GENSCAN, and others, and have a deep understanding of the algorithms underlying those tools. Students strive to hone their quantitative and analytical abilities.

# Bioinformatics

## Course Sequence BS degree

### First & Second Years:

Biology Symposium  
Unix Under the Hood  
Intro to Biology I, II, & III\*  
Intro to Bioinformatics  
Computer Science 1-3  
Calculus I & II  
Cell Biology  
Molecular Biology\*  
Bioinformatics\*  
Chemical Principles Lecture & Lab I & II\*  
General & Analytical Chemistry I & II\*  
Discrete Math I & II  
Data Analysis  
Liberal Arts (28 credit hours)  
COOPERATIVE EDUCATION (2<sup>nd</sup> summer) +

### Courses for MS:

Introduction to Bioinformatics Computing\*  
Advanced Bioinformatics Computing  
Bioinformatics Seminar  
Bioinformatics Resources  
Molecular Modeling and Proteomics  
Ethics in Bioinformatics  
Statistical Models for Bioinformatics  
Graduate Electives (11 cr. Hr)  
If have *Computational Science* background:  
Cell & Molecular Genetics I & II **OR**  
If have *Life Sciences* background:  
Programming Language Concepts  
Data Object Development  
Thesis

\* Courses which include laboratories.

+ Students are *required* to complete at least *one quarter* of co-op work experience, generally during third-fifth years. The curriculum is actually planned for completion within four years, but if a student elects to co-op during an academic year, rather than a summer quarter, he/she may need to complete remaining classes during a fifth year, however, only the same number of academic quarters will be needed to graduate.

### Employers of Bioinformatics Co-op and Graduating Students:

Ortho Clinical Diagnostics, Pfizer, Harvard School of Dental Medicine, Anthony IT, Bristol-Myers Squibb, Life Technologies, Applied Biosystems, The J. Craig Venture Institute, Indsoft Inc., 5Linx Enterprises, Childrens' Hospital (Cambridge MA), Baylor College of Medicine, F.H. Hoffman/LaRoche Ltd., Broad Institute (at MIT), 454 Life Science, McNeil Consumer Products, The Institute for Genomic Research, Knowledge Computing, Agriculture Consulting Services, Automated Computer Solutions, Boyce Thompson Institute for Plant Research, FM Global, UCB, Inc., US Food & Drug Administration, University of Rochester Medical Center, US Dept. of Agriculture

### Contact Us:

We appreciate your interest in hiring RIT co-op, graduating students or alumni. We will make every effort to make your recruiting endeavor a success. Please call our office and ask to speak with Charles Dispenza, the program coordinator who works with the Bioinformatics program. For your convenience, you can access additional hiring information and services through our web site at <http://www.rit.edu/recruit>. More information about our Bioinformatics program may be obtained at <http://www.bioinformatics.rit.edu>.

### Charles W. Dispenza, Program Coordinator

Office of Cooperative Education and Career Services  
RIT . Bausch & Lomb Center . 57 Lomb Memorial Drive . Rochester NY 14623-5603  
585.475.5465  
cwdoce@rit.edu

### Third and Fourth /Fifth Years +:

Introduction to Microbiology\*  
Introduction to Bioinformatics Computing\*  
Parallel Computing  
Introduction to Databases and Data Modeling  
Computer Science 4  
Statistical Analysis for Bioinformatics  
Organic Chemistry I\*  
Biochemistry (two courses)\*  
Genetic Engineering\*  
Genomics\*  
Genetics\*  
Molecular Modeling & Proteomics\*  
Advanced Bioinformatics Computing\*  
Parallel Computing  
Liberal Arts courses (26 cr. hr, incl. concentration)  
Institute-wide electives (19 cr. hr)  
COOPERATIVE EDUCATION +

### Additional courses for BS/MS (combined):

Ethics in Bioinformatics  
Biochemistry (one additional course)\*  
Advanced Database Management Seminar  
Bioinformatics Seminar  
Graduate Electives (20 cr. Hr)  
Thesis