

Rochester INSTITUTE OF TECHNOLOGY

Minor Program proposal form

College of Science

**Thomas H. Gosnell School of Life Sciences**

**Name of Minor:** Bioinformatics Analysis

**1.0 Minor Program Approvals**

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|  | Approval request date: | Approval granted date: |
| Academic Unit Curriculum Committee | 4/25/12 | 4/27/12 |
| College Curriculum Committee | 5/21/12 | 5/22/12 |
| Inter-College Curriculum Committee | 10/23/13 | 12-4-12 |

**2.0 Rationale:**

A minor at RIT is a related set of academic courses consisting of no fewer than 15 semester credit hours leading to a formal designation on a student's baccalaureate transcript

How is this set of academic courses related?

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| These courses provide a foundation for the core and historical analyses performed by bioinformaticists on biological data. BIOL-130 and BIOL-330 set the foundation. BIOL-425 provides a context in global and ethical issues surrounding this field. By choosing two of the other four courses students have a choice of different implementations to solidify their understanding through implementing some of the core algorithms utilized by professionals in the field. |

**3.0 Multidisciplinary involvement:**

If this is a multidisciplinary minor spanning two or more academic units, list the units and their role in offering and managing this minor.

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| N/A |

**4.0 Students ineligible to pursue this minor:**

The purpose of the minor is both to broaden a student's college education and deepen it in an area outside the student’s major program. A minor may be related to and complement a student’s major, or it may be in a completely different academic/professional area.   It is the responsibility of the academic unit proposing a minor and the unit’s curriculum committee to indicate any home programs for which the minor is not a broadening experience.

Please list below any home programs whose students will not be allowed to pursue this minor, provide the reasoning, and indicate if this exclusion has been discussed with the affected programs:

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| SBIC and SBID students are ineligible because these courses are core requirements of the programs. |

**5.0 Minor Program Structure, Sequence and Course Offering Schedule:**

Describe the structure of the proposed minor and list all courses, their anticipated offering schedule, and any prerequisites.

* All minors must contain at least fifteen semester credit hours;
* Minors may be discipline-based or interdisciplinary;
* In most cases, minors shall consist of a minimum of two upper division courses (300 or above) to provide reasonable breadth and depth within the minor;
* As per New York State requirements, courses within the minor must be offered with sufficient frequency to allow students to complete the minor within the same time frame allowed for the completion of the baccalaureate degree;
* Provide a program mask showing how students will complete the minor.

Narrative of Minor Program Structure:

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| This set of courses immerses students in the core challenges and strengths of the field of Bioinformatics, as well as the ethical issues involved. Students will gain hands-on experience implementing some of the core algorithms utilized by professionals in the field.  **Prerequisites**  A student must be matriculated in a baccalaureate program and must have successfully completed the following courses or the equivalent:  BIOL-102 General Biology II or BIOL-122 Introductory Biology II or equivalent  BIOL-201 Cellular and Molecular Biology or equivalent  **Requirements**   * Three required courses BIOL-130 Intro to Bioinformatics, BIOL-330 Bioinformatics, and BIOL-425 Ethics in Bioinformatics * A minimum of 6 semester credit hours of additional courses. Other courses will be considered if they are deemed satisfactory by the minor program director. * A grade of a C or better must be attained in all courses applied to the minor. * All prerequisites must be met prior to taking courses that require them. * 9 credits must be in courses not required by the student's home program and must be completed in residency at RIT. |

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| Course Number & Title | SCH | Required | Optional | Fall | Spring | Annual/Bi annual | Prerequisites |
| BIOL-130, Intro to Bioinformatics | 3 | X |  | X |  | Annual | None |
| BIOL-330, Bioinformatics | 3 | X |  | X |  | Annual | BIOL-201 |
| BIOL-425, Ethics in Bioinformatics | 3 | X |  | X |  | Annual | BIOL-201 |
| BIOL-230, Bioinformatics Languages | 3 |  | X |  | X | Annual | CSCI-142 |
| BIOL-430, Bioinformatics Algorithms | 3 |  | X | X |  | Annual | BIOL-330, CSCI-142 |
| BIOL-494, Molecular Modeling and Proteomics | 3 |  | X |  | X | Annual | BIOL-330 |
| BIOL-635, Bioinformatics Seminar | 3 |  | X | X |  | Annual | None |

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| Total credit hours: 15 |  |

Please include below course descriptions for all courses in the proposed minor.

**BIOL-130 Introduction to Bioinformatics**

This course will explore topics in the field of bioinformatics including tools and resources used by the discipline, including direct experience with the common user environment.  Class 3, Credit 3 (F)

**BIOL-330    Bioinformatics**

Bioinformatics introduces students to the analysis of biological sequences: DNA, mRNA, and protein.  Emphasis is placed on classical bioinformatics analyses such as gene prediction, sequence alignment, and phylogenetics.  The methods are applicable to both human and model organism studies in medical, biotechnological, and classical biology research. (BIOL-201 Cellular and Molecular Biology) Class 2, Lab 3, Credit 3 (F)

**BIOL-230    Bioinformatics Languages**

This is an introductory course in scripting languages focusing on the Perl programming language, the R statistical analysis program, and their application to biological data.  We will investigate the use of Perl and R for processing sequence and "-omics" data, managing a variety of biological data types, and providing effective Web and graphical interfaces to existing tools for analysis of these data.  (CSCI-142 Computer Science II or equivalent) Class 2, Lab 3, Credit 3 (S)

**BIOL-425 Ethics in Bioinformatics**

This course focuses on individual and organizational responsibilities in bioinformatics research, product development, product commercialization and clinical and consumer genetic testing. (BIOL-201 Cellular and Molecular Biology or permission of the instructor) Class 3, Credit 3 (F)

**BIOL-430 Bioinformatics Algorithms**  
Bioinformatics Resources 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. (BIOL-330 Bioinformatics, CSCI-142) Class 2, Lab 3, Credit 3 (F)

**BIOL-494 Molecular Modeling and Proteomics**

This course will explore two facets of protein molecules: their structure and their expression.  The structure component will build upon information from earlier bioinformatics courses.  The course will also include the analysis of inter-molecular interactions, such as ligand/receptor pairing, by employing software that permits modeling of molecular docking experiments.  Tissue-specific protein expression will be addressed in lectures with descriptions of microarray, SAGE, 2D gel electrophoresis and other contemporary technologies and in the laboratory through software commonly used to analyze and compare gene expression levels.  Each student will be assigned a project designed to integrate salient principles covered in the course and provide an opportunity for each student to give an oral presentation to his or her peers. (BIOL-330 Bioinformatics) Class 2, Lab 3 Credit 3 (S)

**BIOL-635                                                                            Bioinformatics Seminar**

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. (Graduate standing in Bioinformatics or permission of instructor) Class 3, Credit 3 (F)