# Minor in Bioinformatics and Computational Biology

36-37 credits  
(updated Jun 2014, IE)

<table>
<thead>
<tr>
<th>Course</th>
<th>Name</th>
<th>Pre-requisite</th>
<th>Credits</th>
<th>Offered</th>
<th>Taken</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Biology</td>
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<tr>
<td>BIOL 141</td>
<td>Foundations of Biology I</td>
<td>MATH 150&lt;sup&gt;†&lt;/sup&gt;</td>
<td>4</td>
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<tr>
<td>BIOL 142</td>
<td>Foundations of Biology II</td>
<td>MATH 150&lt;sup&gt;†&lt;/sup&gt;, BIOL 141</td>
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<tr>
<td>BIOL 313</td>
<td>Introduction to Bioinformatics</td>
<td>MATH 151, BIOL 141 or CMSC 104&lt;sup&gt;[CR]&lt;/sup&gt;</td>
<td>3</td>
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<tr>
<td>BIOL 495</td>
<td>Seminar in Bioinformatics</td>
<td>BIOL 142, 313; CMSC 202&lt;sup&gt;[CR]&lt;/sup&gt;</td>
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<tr>
<td>Statistics</td>
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<td>STAT 355</td>
<td>Stats w/Applications in Bio Sci</td>
<td>MATH 151, 152</td>
<td>4</td>
<td>FS</td>
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<tr>
<td>Computer Sciences</td>
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<td>CMSC 201&lt;sup&gt;[†]&lt;/sup&gt;</td>
<td>Computer Science I for Majors</td>
<td>MATH 150&lt;sup&gt;†&lt;/sup&gt;</td>
<td>4</td>
<td>FS</td>
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<tr>
<td>CMSC 202</td>
<td>Computer Science II for Majors</td>
<td>CMSC 201; MATH 150</td>
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<tr>
<td>CMSC 203</td>
<td>Discrete Structures</td>
<td>CMSC 201&lt;sup&gt;[CR]&lt;/sup&gt;; MATH 151</td>
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<td>CMSC 341</td>
<td>Data Structures</td>
<td>CMSC 202, 203</td>
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<td>36-37</td>
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</table>

- All required courses must be completed with a grade of C or better
- All courses taken as pre-requisites for other courses must be passed with a C or better
- Courses taken on a P/F basis will not count towards the minor
- A simple majority of the courses for the minor must be completed in residence at UMBC
- The elective course cannot be used to meet major requirements

Semester Legend: F=Fall, S=Spring, Z=Possible Summer (For indicative purposes only. Please check online course availability)

<sup>[†]</sup> MATH 150 or higher or placement in MATH151

<sup>[CR]</sup> Co-Requirement

<sup>[‡]</sup> Requires previous programming experience or CMSC 104.

<sup>[§]</sup> CMSC 201 or equivalent can be used, instead of CMSC 104, to meet the pre-requrement.

<sup>[**]</sup> The sequence IS 147 + IS 247 can be used in place of CMSC 201 to satisfy the prerequisite for CMSC 202 and the co-requisite for CMSC 203 by Information System (IS) majors.

## Approved Bioinformatics & Computational Biology Minor Electives

### Approved BIOL electives

- BIOL 411 - Bacterial Physiology
- BIOL 414 - Eukaryotic Gen. & Mol. Biology
- BIOL 418 - Human Molecular Biology
- BIOL 420 - Advanced Topics in Cell Biology
- BIOL 426 - Approaches to Molecular Biology
- BIOL 428 - Computer Appl. in Mol. Biology
- BIOL 430 - Biological Chemistry
- BIOL 434 - Microbial Molecular Genetics
- BIOL 442 - Developmental Biology
- BIOL 444 - Development and Cancer
- BIOL 445 - Signal Transduction
- BIOL 466 - Population and Quant. Genetics
- BIOL 483 - Evolution: Genes to Genomes
- BIOL 486 - Genome Science

### For non-BIOL/BIOC majors also:

- BIOL 302 - Molecular & General Genetics
- BIOL 303 - Cell Biology
- BIOL 304 - Plant Biology

### BIOL 305 - Comparative Animal Physiology

### Approved MATH/STAT electives

- STAT 419 - Introduction to Biostatistics
- STAT 420 - Statistics for Bioinformatics
- STAT 432 – Stat. Comp. Packages and Applications
- STAT 433 - Statistical Computing
- STAT 451 - Introduction to Probability Theory
- STAT 453 - Introduction to Mathematical Statistics
- STAT 454 - Applied Statistics
- STAT 614 - Environmental Statistics

### For non-MATH/STAT majors also:

- MATH 301 - Intro. to Mathematical Analysis I
- MATH 302 - Intro. to Mathematical Analysis II
- MATH 341 - Computational Methods

### CMSC electives

- CMSC433 - Scripting Languages
- CMSC436 - Data Visualization
- CMSC437 - Graphical User Interface Programming

### Approved CHEM electives

- CHEM 420 - Comp. Appl. in Chem.
- CHEM 431 - Chemistry of Proteins
- CHEM 432 - Advanced Biochemistry
- CHEM 433 - Biochemistry of Nucleic Acids
- CHEM 437 - Comprehensive Biochemistry I
- CHEM 438 - Comprehensive Biochemistry II
- CHEM 444 - Molecular Modeling in Biochemistry

### For non-CHEM majors also:

- CHEM 301 - Physical Chemistry
- CHEM 303 - Physical Chemistry for the Biochem.
- CHEM 352 - Organic Chemistry II

### CMSC441 - Design and Analysis of Algorithms
### CMSC446 - Introduction to Design Patterns
### CMSC461 - Database Management Systems
### CMSC471 - Introduction to Artificial Intelligence
### CMSC476 - Information Retrieval
### CMSC478 - Introduction to Machine Learning