

## Minor in Bioinformatics and Computational Biology

36-37 credits  
(updated Oct 2010, IE)

Course	Name	Pre-requirement	Credits	Offered	Taken	Grade
<b>Biology</b>			15			
BIOL 141	Foundations of Biology I	MATH150 <sup>[CR]</sup>	4	FSZ		
BIOL 142	Foundations of Biology II	MATH150	4	FSZ		
BIOL 313	Introduction to Bioinformatics	MATH 151, BIOL 141 or CMSC 104*	3	S		
BIOL 495	Seminar in Bioinformatics	BIOL 142, BIOL 313, CMSC 202	4	S		
<b>Statistics</b>			4			
STAT 355	Stats w/Applications in Bio Sci	MATH 151, MATH152	4	FS		
<b>Computer Sciences</b>			14			
CMSC 201**	Computer Science I for Majors	MATH 150 <sup>+</sup>	4	FS		
CMSC 202	Computer Science II for Majors	CMSC 201, MATH 150	4	FS		
CMSC 203	Discrete Structures	CMSC 201 <sup>[CR]</sup> , MATH 151	3	FSZ		
CMSC 341	Data Structures	CMSC 202, 203	3	FS		
<b>Elective</b>			4			
CMSC/BIOL/STAT/CHEM	(see List)	(see Catalog)	3-4			
<b>Total</b>			36-37			

- 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)

[CR] Co-Requirement

+ Requires previous programming experience or CMSC 104.

\* CMSC 201 or equivalent can be used, instead of CMSC 104, to meet the pre-requirement.

\*\* 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

#### Approved CMSC electives

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

#### 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