

Bioinformatics Curriculum Map Curriculum Map

(see below for full descriptions of student learning goals and outcomes)

Course	Outcome #							
	1 Cellular- Molecular Organization	2 Gene Expression	3 Solve Problems- Intg. App.	4 Comp Methods & Apps	5 Bioinfo Programming	6 Bioinfo Databases	7 Scientific Observ. & Analysis	8 Critique Literature
BIOL 111/111L & 113/113L Fund. Bio I & II (Lec. & Lab)	I/P	I					I	
BIOL 332/332L Genetics (Lec. & Lab)	P	P					P	
BIOL 407/407L Cell Mol Bio (Lec. & Lab)	M	M					M	I/P
CHEM 116/116L & 117/117L Gen Chem I & II							I	
CHEM 211/211L&212/212L Or 206/206L Org. Chem I & II or Ess. Org. Chem (Lec. & Lab)	I						P	
CHEM 425 Biochemistry	P	P						
CMPS 130 Python Progr.			P	P	P			
CMPS 147 & 148 Comp Science I & II				I	I/P			
CMPS 231 Data Structures					P			
CMPS 345 Algorithms				P				
CMPS 361 Software Design					P			
CMPS 364 Database Design					P	I/P		
CMPS 369 Web Programming					P			
MATH 121 Calculus I							I	
PSYC 242 or ENSC 345 Statistics							P	
BIIN 210 Pearl Prog.					I			
BIIN 335 Genomics	P	P			I	P		
BIIN 351 Molecular Modeling	M	P	I					
BIIN 430 Bioinformatics	P	P	P	M		P		P
BIIN 450 Adv. Bioinformatics			M		M	M	M	M
SRSH 301-402 Research Honors							M	M

I: Concept Introduced **P:** Practiced **M:** Mastered

Student Learning Goals and Outcomes

Bioinformatics majors should demonstrate:

1. Knowledge of fundamental biological processes at organism, physiological, cellular and molecular levels. Basic understanding of principles of chemistry and their applications to living systems; properties of bio-molecules and their contribution to structure and function of cells.
 - a. Demonstrate knowledge of the structural and functional organization of the living cells. Describe properties of bio-molecules. Explain how macromolecules catalyze chemical transformations and build complex multi-molecular structures of the cell. Exhibit familiarity with the major techniques for studying structure and function of cells at molecular level.
 - b. Explain how macromolecules store and transmit hereditary information. Demonstrate understanding of their molecular structure/function relationships. Understand the impact of variation on biological function.
2. Understanding of computer programming methodology; including algorithm design and program development, utilizing mathematical concepts and tools. Capability of designing and applying software tools for biological data analysis.
 - a. Demonstrate understanding of algorithms and computational methods in bioinformatics. Be able to apply existing computational tools to solve biological problems and perform data analysis.
3. Integrated knowledge and technical skills gained from diverse scientific disciplines of biochemical, mathematical, computational and life sciences; understanding key problems, possible solutions, and latest advances in bioinformatics.
 - a. Demonstrate the ability to resolve scientific problems by applying an integrated approach derived from up-to-date technical skills of biological, chemical, mathematical and computational disciplines.
 - b. Demonstrate strong programming skills. Possess an understanding of the practices and dynamics required to develop bioinformatics software.
 - c. Demonstrate basic understanding of the design, applications and significance of biological databases; Extract, evaluate and manipulate relevant data from large biological data sets.
4. Understanding of the process of scientific inquiry, preparation for rigorous research, quantitative problem solving skills, data analysis and interpretation of results.
 - a. Demonstrate the capability of making scientific observations, develop appropriate hypotheses and design experiments to test the hypotheses. Be able to statistically validate and quantitatively analyze the results obtained from the experiments, interpret the outcomes and make inferences. Write logical and cohesive scientific reports.
 - b. Demonstrate the capability to critically evaluate scientific literature. Design and conduct an original research project, critically analyze the results and present scientific findings orally and in a written report.