Bioinformatics and Computational Biology

The Bachelor of Science (BS) in Bioinformatics and Computational Biology prepares students to enter the bioinformatics field in commercial or academic settings. Bioinformatics is a cross-disciplinary field that encompasses computer science, mathematics, and biology in order to extract meaningful information from large biological data sets. The global bioinformatics industry has grown at double-digit rates for the past decade and continues to be one of the fastest growing fields in the country, and Minot State University is the only school with the surrounding five state region to offer an undergraduate bioinformatics and computational degree. Students in this major will be broadly trained in how to manage large datasets relating to biological data, such as genetic and population datasets. They will be trained in how to properly analyze and draw conclusions from these datasets using statistics and computer programming, along with learning some specialized bioinformatic skills that only biological data will use. Students are required to conduct research with the guidance of a faculty member so that they can apply the skills they have learned to actual real-life data and biological systems. Any student with interests in biological research, statistics, or data management would be a good fit for this program.

For all degrees in Biology, a minimum GPA of 2.50 is required for graduation.

BS Bioinformatics and Computational Student Learning Goals and Outcomes

Student Learning Goals	Student Learning Outcomes
1. Bioinformatics and Computational Biology majors demonstrate a broad background in fundamental principles of biology.	1.1 Bioinformatics majors recall biological processes and concepts.
	1.2 Bioinformatics and Computational Biology majors explain biological processes and concepts.
	1.3 Bioinformatics and Computational Biology majors apply biological processes and concepts to specific biological topics.
2. Majors demonstrate knowledge and experience in the basic methods, instrumentation, and quantitative analytical skills used to conduct scientific research.	2.1 Bioinformatics and Computational Biology majors practice conducting experiements
	2.2 Bioinformatics and Computational Biology majors analyze results of experiments.
	2.3 Bioinformatics and Computational Biology majors draw conclusions from experimental results.
3. Bioinformatics and Computational Biology majors will develop critical reasoning and communication skills.	3.1 Bioinformatics majors engage in original research.
	3.2 Bioinformatics and Computational Biology majors discuss different ways to extract meaningful information from large datasets.
	3.3 Bioinformatics and Computational Biology majors present to local, regional, and national audiences.

Bachelor of Science with a Major in Bioinformatics and Computational Biology

Bioinformatics and Computational Biology is a cross-disciplinary field that encompasses computer science, mathematics, and biology in order to extract meaningful information from large biological datasets. Minot State University is the only school within the surrounding five state region to offer an undergraduate bioinformatics degree.

GOALS: To prepare students for a career in biological data analysis and management. At the end of this program, students will:

- Have an understanding of different computer programming languages that can be applied to answer various biological questions with big datasets.
- Have the fundamental biological scaffolding for major principles in biology, including concepts in molecular and cellular biology, evolution, and general zoology, botany, or microbiology.
- Understand and apply biologically relevant statistical analyses.
- Be able to manage and work with “Big Data” management systems and datasets.
- Be comfortable with the hands-on, laboratory preparation methods that precede data analysis, and be able to take a biological system and prepare it for proper data analyses.

General Education		
General Education Requirements		38
Core Requirements Coursework		
Biology		
Students must take:		
BIOL 150	General Biology I	4

BIOL 215	Genetics	4
BIOL 301	Evolution	3
BIOL 480	Molecular Biology	4
BIOL 402	Bioinformatics	4
BIOL 492	Directed Research	1-5
One of the following:		4
BIOL 151	General Biology II	
or BIOL 202	Introductory Microbiology	
Chemistry		
CHEM 121	General Chemistry I	5
CHEM 122	General Chemistry II	5
Mathematics		
MATH 165	Calculus I	4
MATH 208	Discrete Mathematics I	4
MATH 345	Linear Models	4
One of the following:		
MATH 210	Elementary Statistics	4
or BIOL 240	Biometry	
Computer and Data Science		
(17 credits; which would qualify the student for a Certificate in Data Science)		
CSCI 111	Introductory Programming and Big Data	4
DATA 211	Applied Statistics and Data Visualization	4
DATA 240	Programming for Data Science	4
CSCI 260	UNIX and Linux Systems	4
CSCI 356	Database Management	4

Bioinformatics Minor

BIOL 402	Bioinformatics	4
Mathematics Courses:		
MATH 146	Applied Calculus	3
MATH 165	Calculus I	4
Computer Science		
CSCI 160	Computer Science I	4
CSCI 161	Computer Science II	4
CSCI 260	UNIX and Linux Systems	4
CSCI 356	Database Management	4
Total Hours		**27**