Department of Biology

Chair: Dr. Heidi Super

The Department of Biology offers three degrees (BA, BSEd, and BS):

The Bachelor of Arts (BA) in Biology is designed for those students who desire to go to professional schools of medicine, dentistry, optometry, chiropractic, physical, and occupational therapy, mortuary science, and veterinary medicine or who wish to pursue graduate work in biology. The BA degree is also designed for those students who desire employment in the biomedical industry, environmental sciences, or wildlife management.

The Bachelor of Science in Education (BSEd) in Biology is designed for students who are interested in careers as biology teachers in junior or senior high schools. Students completing this program meet all the requirements for secondary school certification in North Dakota. Furthermore, the broad-based biology curriculum prepares the students not only to teach biology, but also chemistry and physical science. The students are also fully prepared to pursue the graduate program for the Master of Arts in Teaching (MAT) degree in science.

The Bachelor of Science (BS) in Medical Laboratory Science (MLS) [Medical Technology] is a joint program of Minot State University and the University of North Dakota (UND) and complies with the National Accrediting Agency for MLS. Full-time students can complete coursework in three years, and begin clinical training during the summer session at UND in Grand Forks, ND. MLS majors are required to take a minimum of 38 credits of General Education courses. The General Education math and science requirements are automatically met by taking MLS required courses. Following successful completion of coursework, fourth-year students are guaranteed admission to the clinical year at one of the participating accredited hospitals in North Dakota, Montana, Minnesota, Arizona, Colorado, Iowa, Nebraska, Oklahoma, Oregon, South Dakota, Washington, Wisconsin, and Wyoming. Students who earn the BS-MLS degree obtain employment in a number of different medical areas including hospitals, physicians' offices, clinics, public health agencies, and pharmaceutical firms.

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. Minot State University is the only school with the surrounding five state region to offer an undergraduate bioinformatics degree.

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

In addition to the degrees, Biology also directs several pre-professional programs (pre-medical, pre-dental, pre-veterinary, pre-mortuary etc.) and provides courses required for professional degrees in nursing, medical technology, radiologic technology, social work, criminal justice, physical education, elementary education, and special education. Biology also offers a number of general education courses that fulfill the FC2 category of general education.

Biology Department Mission:

The mission of the Department of Biology is to equip students with a broad and substantive knowledge of biology. We actively promote the development of critical thinking skills and an ingrained sense of the scientific method among our students. By actively mentoring students in the classroom and in our research labs, we seek to develop the skills that enable them to apply their newfound knowledge in a research setting and advance the frontiers of biology.

Biology Department Goals:

The goals of the Department of Biology are:

- to provide research opportunities for our students so that they may contribute meaningfully to the study of Biology;
- to prepare students for advanced study in Biological Sciences and Health Sciences;
- to prepare students for biological careers in teaching, government, business, and industry;
- to enrich the General Education of students with Biology courses;
- to support the University and larger community with faculty and student service.

BA Biology Student Learning Goals and Outcomes

Student Learning Goals	Student Learning Outcomes
1. Biology majors will gain a broad background in fundamental principles of biology.	1.1 Freshmen and sophomores will memorize, recall, and describe biological processes and concepts
	1.2 Juniors and seniors will apply biological processes and content to specific biological topics

2. Biology majors will gain knowledge and experience in the basic methods, instrumentation, and quantitative analytical skills used to conduct scientific research.	2.1 Biology majors will conduct experiments, analyze results, and draw appropriate conclusions related to biological phenomena.
3. Biology majors will develop critical reasoning and communication skills	3.1 Biology majors will plan and engage in original research, produce critical reviews of research, and/or present to local, regional, and national audiences
	3.2 Biology graduates will have gained the skills to enter professional programs

BS Medical Lab Science Student Learning Goals and Outcomes

Student Learning Goals	Student Learning Outcomes
1. First-year MLS majors will gain a comprehensive understanding of the curricular requirements, timelines, and career expectations for the MLS professional.	1.1 First-year students will summarize and reconstruct MLS degree requirements and shadow professionals in the field.
2. Second and third-year MLS majors will gain proficiency in concepts of biology and chemistry related to human health	2.1 MLS majors will memorize biological and chemical analytical theory and practice laboratory techniques applicable to clinical testing for human disease.
3. Fourth-year students will gain experience in specific clinical testing for human disease	3.1 MLS majors will practice and interpret laboratory tests in the areas of blood banking, microbiology, clinical chemistry, hematology, and immunology

BS Bioinformatics and Computational Student Learning Goals and Outcomes

Student Learning Goals	Student Learning Outcomes
1. Bioinformatics majors will explore and demonstrate an understanding of basic molecular biology	1.1 Freshmen and sophomore bioinformatics majors will memorize, recognize, recall, and describe basic cellular metabolic pathways and mechanisms pertinent to molecular biology.
	1.2 Juniors and seniors will demonstrate, interpret, synthesize, and apply biological processes and content to specific biological topics
2. Bioinformatics majors will master computer languages used prominently in bioinformatics	2.1 Students will create computer programs that facilitate biological data analysis
3. Bioinformatics majors will develop critical reasoning and communication skills	3.1 Bioinformatics graduates will engage in original research and present at local, regional and national meetings.
	3.2 Bioinformatics graduates have gained the skills to enter the bioinformatics workforce or enter a professional program

BSEd Biology Education Student Learning Goals and Outcomes

Student Learning Goals	Student Learning Outcomes
1. Biology Education majors will gain a broad background in fundamental principles of biology.	1.1 Freshmen and sophomores will memorize, recall, and describe biological processes and concepts
	1.2 Juniors and seniors will demonstrate, interpret, synthesize, and apply biological processes and content to specific biological topics
2. Biology Education majors will gain an understanding of the scientific method and its historical origins across the sciences	2.1 Biology majors will demonstrate the use of the scientific method
3. Biology Education majors will gain knowledge and experience in the basic methods, instrumentation, and quantitative analytical skills used to conduct scientific research.	3.1 Biology Education majors will conduct experiments, analyze results, and draw appropriate conclusions related to biological phenomena.
4. The teacher candidate engages learners in meaningful Application of Content.	4.1 The teacher candidate makes connections among concepts and relates content to real world problems and meaningful applications.
	4.2 The teacher candidate engages learners with higher order thinking about content (i.e. critical thinking, perspective-taking, creativity, collaborative work, and communication).
5. The teacher candidate demonstrates mastery of Content Knowledge useful to student learning.	5.1 The teacher candidate demonstrates knowledge of the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches.
	5.2 The teacher candidate creates learning experiences that make the discipline accessible and meaningful for learners, to assure mastery of the content.
6. The teacher candidate uses systematic Planning for Instruction to reach learning goals.	6.1 The teacher candidate selects, creates, plans, and sequences varied instructional activities to support the growth of all students toward rigorous curriculum goals.
	6.2 The teacher candidate uses formative and summative assessment information to systematically adjust instruction to assist varied students' learning needs.

	6.3 The teacher candidate collaborates and communicates (i.e. with colleagues, specialists, community resources, families, and learners) to meet individual learning needs.
7. The teacher candidate can articulate and use multiple methods of Assessment.	7.1 The teacher candidate can articulate and use multiple methods of assessment, to fairly demonstrate the full extent of student learning.
	7.2 The teacher candidate uses, and engages learners in using, assessments aligned with learning expectations, in order to monitor, support, and document growth.
8. The teacher candidate creates supportive, collaborative Learning Environments.	8.1 The teacher candidate collaborates and communicates with others to build a positive learning climate marked by respect, rigor, and responsibility.
	8.2 The teacher candidate manages the learning environment to engage learners actively in individual and collaborative learning.
9. The teacher candidate engages in ongoing Professional Learning and Ethical Practice.	9.1 The teacher candidate takes responsibility for evidence-based strengths and weaknesses in his/her own practices, engaging in ongoing professional learning.
	9.2 The teacher candidate practices the profession in an ethical manner, considering the effects of his/her decisions and actions on others.
10. The teacher candidate uses varied Instructional Strategies, including technology, to develop useful learning.	10.1 The teacher candidate can reflectively select and use a variety of instructional strategies, including appropriate, current instructional technologies, to make learning accessible to all learners.
	10.2 The teacher candidate applies instructional strategies which encourage learners to develop deep comprehension and apply knowledge in meaningful ways (including students' own digital literacy).

University Teacher Education Policies

Refer to the Teacher Education Policies and Procedure (http://catalog.minotstateu.edu/undergraduate/teachereducationpoliciesandprocedures/) pages of the catalog for details regarding Teacher Education at Minot State University. These pages will explain admission, retention, and exit requirements of the program for biology, chemistry, earth science, physical science, and physics majors in Teacher Education.

Department Teacher Education Requirements

In addition to University-wide teacher education retention policies listed above, science majors in the BSEd degree programs must:

1. Meet regularly with an advisor within the Department of Biology to coordinate coursework within their major.
2. Meet regularly with an advisor within the Department of Biology to coordinate coursework within Science Education.
3. Apply to the Department of Biology to be recommended for Admission to Teacher Education. Minimum requirements for recommendation are:
   a. Complete General Education communications requirement with a minimum GPA of 2.50 with no grade lower than a "C."
   b. Complete basic Skills Test (PPST), SAT, or ACT with satisfactory scores.
   c. Maintain a minimum cumulative GPA of 2.50 for all course work taken.
   d. Complete speech and hearing tests.
   e. Complete autobiography, stating reasons teaching was chosen as a profession.
   f. Obtain written recommendations from two faculty within the Division of Science.
   g. Maintain minimum GPA of 2.50 within the major (at least eight credits completed).

Once admitted to Teacher Education students must:

1. Maintain a GPA of 2.50 for all coursework taken.
2. Maintain a GPA of 2.50 within their major.
3. Maintain a portfolio, which must be completed before application for student teaching will be considered.
4. Apply to the Department of Biology at least two semesters before student teaching.
5. Complete the required science teaching methods courses before student teaching.

All students majoring in another division or department and planning to teach with a minor in the sciences must submit their credentials to the Department of Biology for review at least two semesters before student teaching.

The Department of Biology will initially approve pre-service teachers. In addition, each candidate's progress is reviewed each semester, in accordance with standards set by the University and the Department.

Bachelor of Arts with a Major in Biology

Two introductory courses (8 cr) must be completed prior to enrolling in 300+ courses required for the degree.

Students must take:		
BIOL 151	General Biology II	4
BIOL 150	General Biology I	4
200 level Required Courses		
BIOL 215	Genetics	4
BIOL 240	Biometry	4
300 and 400 level Courses		
BIOL 302	General Microbiology	4
Select five from the following:		14-16
BIOL 301	Evolution	
BIOL 310	Ethnobotany	
BIOL 325	Entomology	
BIOL 330	Biogeography	
BIOL 335	Comparative Vertebrate Anatomy	
BIOL 340	Systematic Zoology	
BIOL 346	Developmental Biology	
BIOL 347	General Ecology	
BIOL 349	Plant Physiology	
BIOL 360	Morphology of Vascular Plants	
BIOL 401	Population Genetics	
BIOL 402	Bioinformatics	
BIOL 405	Prokaryotic Physiology	
BIOL 445	Cancer Biology	
BIOL 448	Systematic Botany	
BIOL 450	Parasitology	
BIOL 455	Hematology	
BIOL 458	Anatomy of Seed Plants	
BIOL 460	Herpetology	
BIOL 465	Immunology	
BIOL 470	Histology	
BIOL 480	Molecular Biology	
BIOL 482	Neurobiology	
Remaining Coursework		**8**
Select one of the following tracks:		
Research Track		
BIOL 492	Directed Research (taken over 2 or more semesters)	1-5
or		
Non-Research Track		
Any two additional BIOL courses (except BIOL 111, BIOL 115, BIOL 127, and BIOL 202)		
Additional Required Courses		
CHEM 121	General Chemistry I	5
CHEM 122	General Chemistry II	5
CHEM 240	Fundamentals of Organic Chemistry	5
or CHEM 341	Organic Chemistry I	
Minor and/or Concentration(s)		
PHYS 211 & PHYS 212	College Physics I and College Physics II	8-10
or PHYS 251 & PHYS 252	University Physics I and University Physics II	
Minor and/or Concentration choice		15-16
Total Hours		81-90

Bachelor of Science in Education with a Major in Biology

Two introductory courses (8 cr) must be completed prior to enrolling in 300+ courses required by the degree. **Note:** if you are transferring in with a degree in Biology that is more than 30 years old and want to earn a BSEd in Biology, you will have to take the coursework of a Biology Minor to update your knowledge.

General Education		38-40
Students must take:		
BIOL 151	General Biology II	4
BIOL 150	General Biology I	4
200 level Required Courses		
BIOL 215	Genetics	4
BIOL 240	Biometry	4
300 and 400 level Courses		
BIOL 302	General Microbiology	4
Select five from the following:		14-16
BIOL 301	Evolution	
BIOL 310	Ethnobotany	
BIOL 325	Entomology	
BIOL 330	Biogeography	
BIOL 335	Comparative Vertebrate Anatomy	
BIOL 340	Systematic Zoology	
BIOL 346	Developmental Biology	
BIOL 347	General Ecology	
BIOL 349	Plant Physiology	
BIOL 360	Morphology of Vascular Plants	
BIOL 401	Population Genetics	
BIOL 402	Bioinformatics	
BIOL 405	Prokaryotic Physiology	
BIOL 445	Cancer Biology	
BIOL 448	Systematic Botany	
BIOL 450	Parasitology	
BIOL 455	Hematology	
BIOL 458	Anatomy of Seed Plants	
BIOL 465	Immunology	
BIOL 470	Histology	
BIOL 480	Molecular Biology	
BIOL 482	Neurobiology	
Remaining Coursework		
Select one of the following tracks:		8
Research Track		
BIOL 492	Directed Research (taken over 2 or more semesters)	
or		
Non-Research Track		
(Any two additional BIOL courses except BIOL 111, BIOL 115, BIOL 127, and BIOL 202)		
Additional Required Courses		
CHEM 121	General Chemistry I	5
CHEM 122	General Chemistry II	5
Math: Take either		3-6
MATH 107	Precalculus	
or MATH 103	College Algebra	
AND		
MATH 105	College Trigonometry	

or MATH 146	Applied Calculus	
or MATH 165	Calculus I	
or MATH 166	Calculus II	
Select one course from geology, and one course from physics		8
Professional Education Sequence (admission to teacher education not required)		
ED 260	Educational Psychology	2
ED 260L	Clinical I	0
ED 282	Managing the Learning Environment	2
ED 282L	Clinical II	0.5
ED 284	Teaching Diverse Learners	2
ED 284L	Clinical III	0.5
ED 320	Curriculum, Planning & Assessment I	2
ED 321L	Clinical IV	0.5
ED 323L	Clinical V	0.5
ED 324L	Fall Experience	0
ED 380	Technology in Teaching	2
SS 283	Diversity in America	3
SPED 110	Introduction to Exceptional Children	3
Select one of the following:		3
PSY 255	Child & Adolescent Psychology	
PSY 352	Adolescent Psychology	
Professional Education Sequence (admission to teacher education required)		
ED 322	Data Driven Integrated Instruction [1]	2
ED 484	Student Teaching Seminar: K12 [1]	2
Department Specific Courses (admission to teacher education required)		
SCI 391	Teaching Science in Secondary Schools [1]	3
ED 493	Student Teaching, Secondary [1]	4-12
Total Hours		133-148

[1] Requires admittance to Teacher Education. Refer to Teacher Education Policies and Procedures (http://catalog.minotstateu.edu/undergraduate/teachereducationpoliciesandprocedures/).

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.

General Education		
General Education Requirements		38
Core Requirements Coursework		
Biology		
Students must take:		
BIOL 150	General Biology I	4
BIOL 215	Genetics	4
BIOL 480	Molecular Biology	4
BIOL 402	Bioinformatics	4
BIOL 492	Directed Research	1-5
Select one of the following:		4
BIOL 151	General Biology II	
BIOL 154	Introduction To Botany	
BIOL 202	Introductory Microbiology	
Chemistry		
CHEM 121	General Chemistry I	5

CHEM 122	General Chemistry II	5
Mathematics		
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 208	Discrete Mathematics I	4
MATH 210	Elementary Statistics	4
MATH 345	Linear Models	4
Computer Science		
(16 credits; which would qualify the student for a CS certificate)		
CSCI 160	Computer Science I	4
CSCI 161	Computer Science II	4
CSCI 260	UNIX Environment	4
CSCI 356	Database Management I	4
Total Hours		105-109

The Medical Laboratory Science (MLS) program at Minot State University is a four-year program leading to the Bachelor of Science Degree in Medical Laboratory Science/Medical Technology. The program consists of courses that are designed to give the medical laboratory science student the necessary, scientific background to enter clinical training at an accredited hospital laboratory.

The program consists of three years of academic coursework completed at Minot State University. Through an affiliation with the University of North Dakota (UND), students spend 12 months in a clinical internship at one of the many participating accredited hospitals, as a member of the Western College Alliance for MLS.

The academic portion of the program provides the student with a broad-based background in the sciences as well as General Education courses in communications, the humanities, and the social and behavioral sciences. The clinical year provides practical, hands on, experience in clinical laboratory techniques.

The first two years of the program primarily involve General Education courses and fundamental courses in chemistry, microbiology, anatomy, and physiology. The third year involves the students in courses more directly relevant to their major, such as parasitology, hematology, and immunology. These courses address more specifically what the student will encounter during the clinical internship year. Minot State University's medical laboratory science program is accredited by the NAACLS through UND. All affiliated hospitals are accredited by the Council on Medical Education. Upon completion, the student is eligible to take the national examination conducted by the Board of Registry to become a certified clinical laboratory scientist by the American Society of Clinical Pathologists MT (ASCP) and the National Certification Agency for Medical Laboratory Personnel National Exam for certification as Medical Laboratory Scientist.

Acceptance to clinical year requires:

1. Satisfactory completion of required preparatory course work prior to the final year.
2. Minimum GPA 2.8.
3. No more than one grade of "D" in preparatory coursework.
4. Not more than three courses with repeats for "D" or "F" grades.
5. Evidence of professional integrity (letter of recommendation from advisor).
6. Completion of the UND application process by the specified deadline.

Bachelor of Science with a Major in Medical Laboratory Science

Required Courses		
BIOL 150	General Biology I	4
BIOL 103	Intro to Medical Lab Science	1
BIOL 202	Introductory Microbiology	4
BIOL 220	Anatomy And Physiology I	4
BIOL 221	Anatomy And Physiology II	4
BIOL 450	Parasitology	4
BIOL 455	Hematology	4
BIOL 465	Immunology	4
CHEM 121	General Chemistry I (& CHEM 121L)	5
CHEM 122	General Chemistry II (& CHEM 122L)	5
CHEM 230	Quantitative Analysis	5

CHEM 240	Fundamentals of Organic Chemistry	5
CHEM 481	Biochemistry I	3
BADM 301	Fundamentals of Management	3
MATH 103	College Algebra	4
CLS Medical Microbiology [1]		2
Total Hours		61

[1] Offered as a distance course through UND. May be taken as a collaboratively through Minot State University.

Biology Minor (Teaching and Non-Teaching)

Students must take:		
BIOL 150	General Biology I	4
BIOL 215	Genetics	4
Select two of the following:		8
BIOL 151	General Biology II	
BIOL 154	Introduction To Botany	
BIOL 202	Introductory Microbiology	
Choose three 300 or 400 level courses		12
Total Hours		28

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 Environment	4
CSCI 356	Database Management I	4
Total Hours		27

Biology Concentration

Students must take:		
BIOL 150	General Biology I	4
Select two of the following:		**8**
BIOL 151	General Biology II	
BIOL 154	Introduction To Botany	
BIOL 202	Introductory Microbiology	
BIOL 215	Genetics	
Total Hours		12