

Bachelor of Science with Major in Molecular and Integrative Biology

Study of life science in the past has been largely confined to the intellectual platforms associated with individual levels of biological organization, e.g., molecular biology, cellular biology, physiology of organisms, and ecology. This degree program emphasizes integration of knowledge across levels of biological organization from the gene/molecular/cellular to the development and physiology of individual organisms, along with their adaptation to local environments. The new training model has greater potential to contribute to educational success, medical advances, technological innovation, and commercialization of knowledge. Coursework in the degree provides a strong foundation for students planning to either continue their studies in medical science, graduate, and professional programs or pursue technical positions/further training or professional positions in applied health science and biotechnology. Students in the degree program will be encouraged, depending on their interests, to pursue research experiences with faculty in the medical or life sciences, and internships with regional biotechnology corporations.

Required 120 credits, (36 of which must be numbered 300 or above, and 30 of which must be from UND) including:

I. Essential Studies (ES) requirements (See University ES listing), minimum 39 total credits. The following course must be taken as part of the Essential Studies requirement:

Code	Title	Credits
COMM 110	Fundamentals of Public Speaking	3
Total Credits		3

II. Core and Advanced Requirements (48 credit hours):

A. Core requirements (24 hours), all courses below:

Code	Title	Credits
BIOL 120	Orientation to the Biology Major	1
BIOL 150 & BIOL 151	General Biology I and General Biology II *	6
BIOL 150L & BIOL 151L	General Biology I Laboratory and General Biology II Laboratory	2
BIOL 312	Evolution	3
BIOL 315	Genetics	3
BIOL 332	General Ecology	3
BIOL 341	Cell Biology	3
BIOL 480	Senior Capstone Seminar **	3
Total Credits		24

* Students who take BIOL 111 Concepts of Biology and BIOL 111L Concepts of Biology Laboratory and earn a grade of "B" or higher in both of those courses prior to becoming a Molecular & Integrative Biology major may complete the General Biology sequence by taking BIOL 150 General Biology I and BIOL 150L General Biology I Laboratory.

** Three credits for an accepted BIOL 489 Senior Honors Thesis can be substituted for the BIOL 480 Senior Capstone Seminar with prior approval of the thesis topic by the Chair of Biology.

We strongly advise mastery of materials in all core courses except BIOL 480 Senior Capstone Seminar prior to enrolling in other 300 or 400 level Biology courses.

No more than one Biology course at the 200 level will count toward the 48 hour major.

At least four upper-division Biology courses with laboratories must be included in the 48 hour major. Specifically:

- The following courses qualify: 332L. General Ecology Laboratory; 336. Systematic Botany; 341L. Cell Biology Laboratory; 363. Entomology; 364L. Parasitology Laboratory; 369L. Histology Laboratory; 376L. Animal Biology Laboratory; 378L. Developmental Biology Lab; 410. Molecular Biology Techniques; 415. Genomics; 416 Ecological Genomics; 418. Systems Biology; 425. Ichthyology; 426. Birds and Mammals; 431. Wildlife Management; 433. Aquatic Ecology; 438. Fisheries Management; 442L. Physiology of Organs and Systems Laboratory; 312L Evolution Lab; BMD 302L. General Microbiology Laboratory.
- BIOL 494 Directed Studies, or BIOL 492 Research, may be counted as one upper-division laboratory requirement with appropriate documentation of the laboratory experience and approval by the supervising faculty member and the Biology Department Chairperson prior to taking the research credits.
- At least 15 of the total 48 credits required for the BS degree must be taken in the UND Biology department, exclusive of the credits earned in other departments.

B. Advanced requirements (minimum 24 credit hours):

Code	Title	Credits
BIOL 410	Molecular Biology Techniques	4
BIOL 470	Biostatistics	4
at least 2 of the following		6-7
BIOL 415	Genomics	
BIOL 418	Systems Biology	
BIOL 416	Ecological Genomics	
at least 1 of the following		3
BIOL 378	Developmental Biology	
BIOL 442	Physiology of Organs and Systems	
BIOL 390	Endocrinology	
at least 1 of the following		2-3
BIOL 397	Cooperative Education (2 cr.)	
BIOL 492	Research (3 cr.)	
Electives. All 300 or 400 level Biology courses will count as elective credit hours. Certain science courses in other departments also qualify as electives.		3-5

- * To identify potential research opportunities in faculty labs, government agencies, or the biotechnology industry, students are encouraged to consult with their advisor and engage with faculty and/or regional biotech corporations early in their program of study regarding availability of research and internship opportunities. Research in other departments or colleges may also satisfy this requirement, with prior approval from the Department Chair.
- ** No more than two upper-division, life sciences-related courses (lecture + lab = 1 course) from UND departments outside Biology will count toward the 48 hour major. Courses will be considered on a case by case basis. To have a course considered provide a syllabus to the Department Chair.

III. Cognate requirements in other departments (27-31 credit hours):

Code	Title	Credits
Mathematics *		
MATH 146 or MATH 165	Applied Calculus I ** Calculus I	3-4
Chemistry and Biochemistry		
General Chemistry		
CHEM 121 & 121L & CHEM 122 & CHEM 122L	General Chemistry I and General Chemistry I Laboratory and General Chemistry II and General Chemistry II Laboratory	
OR		
CHEM 221 & 221L & CHEM 254 & CHEM 254L	Fundamentals of Chemistry - Concepts and Fundamentals of Chemistry Laboratory and Inorganic Chemistry I and Inorganic Chemistry I Laboratory #	
Organic Chemistry		
CHEM 340 & 340L	Survey of Organic Chemistry and Survey of Organic Chemistry Laboratory	

OR

CHEM 341 Organic Chemistry I
& 341L and Organic Chemistry I Laboratory
& CHEM 342 and Organic Chemistry II
& CHEM 342L and Organic Chemistry II Laboratory ***

Biochemistry

BIMD 301 Biochemistry

Physical Sciences

PHYS 211 College Physics I
& PHYS 212 and College Physics II

OR

PHYS 251 University Physics I
& PHYS 252 and University Physics II

* Students with a particular aptitude for mathematics should consider taking both MATH 165 Calculus I and MATH 166 Calculus II and should consult with their advisor regarding this potential option.

** Pre-requisites for either course are the responsibility of the student.

***The sequence of CHEM 341 Organic Chemistry I and CHEM 342 Organic Chemistry II is highly recommended for pre-medicine students because some medical schools require or prefer this combination.

The chemistry sequence CHEM 221, CHEM 221L, CHEM 254, and CHEM 254L is intended for students with a strong background and interest in chemistry and presumes some exposure to calculus.