Purpose Statement:
To enhance student preparation for professional school, graduate school, or career opportunities.

Program Description
The Master of Science in Biology is offered through two tracks: Pre-Professional and General Biology. The Pre-Professional track is designed for students who are seeking to be better prepared for health-related professional programs. The General Biology track is a broader, more customized program for students who are seeking to further their education or career opportunities through advanced training in Biology. The program includes mentoring and advising for students for both professional programs and career preparation. The Master of Science in Biology is very affordable compared to similar programs around the country, and students who complete advanced training in Biology at Union are extremely well prepared to be successful at the professional level (for more information, please visit the program website at www.uu.edu/msbio).

Admission Information

Admission Requirements
- Bachelor’s degree from accredited college or university; Official transcript(s) showing all course work, completion of baccalaureate degree(s), and all graduate credit previously attempted. Even if withdrawal occurred prior to earning credits and even if those credits do not apply to the current degree being sought, official transcripts must be sent from each institution.
- Minimum undergraduate GPA of 2.5.
- Minimum of 12 undergraduate hours in biology applicable to a biology major.
- Statement of purpose (500-1000 words) which identifies your educational goals and expectations from the program, as well as your primary and secondary career objectives.
- Three letters of recommendation.
- Scores from professional exam recommended (i.e, GRE, MCAT, PCAT, etc.).

Retention Criteria
- Must maintain minimum 3.0 GPA
- If not achieved after Fall term, student will be on probation, and will be able to raise the GPA with the Winter term course
- If GPA of 3.0 is not achieved after Winter term, student will meet with the program director to discuss progress.

Alternate List
Students who otherwise meet the eligibility requirements for the Master of Science in Biology but who apply after the entering class has been filled will be placed on an alternate list and will be notified if they are selected for inclusion in the program for the upcoming academic year. Students who are placed on the alternate list and who are not admitted will receive a refund of half of their Application Fee ($25).

Completion Requirements
Both the Pre-Professional and General Biology tracks require 30 credit hours and a final GPA of 3.0 to graduate. Students complete the 30 hours over a sequence of three terms, typically taking 14 hours in the fall, 4 hours in the winter, and 12 hours in the spring. This sequence includes a 2 hour required course in the fall, Career Development in Biology, and a 2 hour required Graduate Project in both the fall and spring, leading to the completion of a non-thesis final paper. At least one course during each fall, winter and spring term must include the accompanying lab section. Students may take additional laboratory sections if space permits.

A. BIO 518, 570, 571
B. Fall Semester: Three courses from BIO 505, 507, 510, 512, 517, 519, 520, 521, 525, 527, or 540 (one of the selected courses must have a lab component).
C. Winter Term: One course from BIO 510, 541;
D. Spring Semester: Three courses from BIO 505, 507, 510, 515, 516, 522, or 523 (one of the selected courses must have a lab component).
E. Special Topics in Cell and Molecular Biology may be considered if applicable (BIO 597).

Each student will choose a mentor who will work closely with the student to select appropriate courses. The mentor will also work with the student throughout the Graduate Project courses to complete the non-thesis final paper.

Financial Information
- Application Fee: $50
- Laboratory Fees: A lab fee will be assessed for each lab course.
- Tuition/semester hour: $520
- Deposit: $500 (will be applied to your first semester’s tuition following matriculation); due May 1 or within two weeks of acceptance of your application. The deposit is 100% refundable within 20 business days of the acceptance of your application, 50% refundable between 21 and 35 days after acceptance of your application, non-refundable after 35 days of acceptance of your application). No refunds of deposits will be given after July 1.
- General Student Fee: $24/hour
- All financial information is subject to change without notice.
Financial Assistance

Financial aid information for graduate students is available on our website at www.uu.edu/financialaid/graduate/. Generally, graduate students may be eligible for Federal Direct student loans or private alternative student loans (www.uu.edu/financialaid/loans/alternative-lender-list.cfm), depending on the program of study and the eligibility of the borrower. Union University is also approved by the Department for Veterans Affairs to offer educational benefits to veterans, reservists, and dependents of veterans who qualify for Veterans Benefits. Any person who qualifies for VA Benefits should check with the Office of Student Financial Planning as soon as possible after acceptance into a graduate program. Additional external scholarship information may be obtained through www.fastweb.com

Course Descriptions: Biology (BIO)

501. Invertebrate Zoology (4) F–Even Years
Students will develop practical vocational skills by working within a framework of designing, performing, and communicating novel scientific research as we explore the diversity, natural history, physiology, and behavior of invertebrate animals. Three hours lecture and 3 hours laboratory/week.

505. Applied Anatomy & Physiology I (3) F, August
Accelerated
Prerequisites: BIO 221 and 222 or permission of instructor.
An intensive examination of the human body that addresses the normal complex physiological processes of the cell, fluids and electrolytes, acid-base balance, temperature regulation, vascular hemodynamics, mobilization of fluids through the body and lymphatic system, musculoskeletal systems and function of the myocardium. The acquired information will provide the student with a body of knowledge to critically evaluate co-existing conditions of the surgical patient.

507. Applied Anatomy & Physiology II (3) F, October
Accelerated
Prerequisites: BIO 221 and 222 or permission of instructor.
A continuation of 505 focusing on the normal complex physiological processes of blood components and coagulation and the respiratory, renal, endocrine, digestive and nervous system.

510. Advanced Human Gross Anatomy (3) F, W, S
Prerequisites: BIO 221 & 222 or BIO 505 & 507 or permission of instructor.
This course will incorporate the dissection of cadavers and viewing of anatomical models in understanding the nervous, endocrine, cardiovascular, respiratory, digestive, and urinary systems of the human body. Additional emphasis is placed on the needs of professional health care personnel.

511. Conservation Techniques (3) S–Even Years
A field intensive introduction to techniques for determining the age of many species, trapping for population assessments, terrestrial and aquatic sampling methods, methods for assessing population health through necropsies, and habitat management techniques. One hour lecture and 6 hours laboratory/week.

512/512L. Comparative Vertebrate Anatomy (3) and
Comparative Vertebrate Anatomy Lab (1) F–Odd Years
Study of the similarities of anatomy and early development of vertebrates, complemented by dissection of representative adults. Three hours lecture and optional 3 hours laboratory/week.

515/515L. Genetics (3) and Genetics Lab (1) S
A study of the principles of heredity including both classical and molecular genetics. Three hours lecture and optional 3 hours laboratory/week.

516/516L. Physiology (3) and Physiology Lab (1) S
A study of the principles of physiology, emphasizing metabolic processes common to many organisms. Three hours lecture and optional 3 hours laboratory/week.

517/517L. Developmental Biology (3) and Developmental
Biology Lab (1) F–Odd Years
A study of development in organisms, including both classical, descriptive embryology and contemporary investigations of processes involved in morphogenesis and differentiation. Three hours lecture and optional 3 hours laboratory/week.

518. Career Development in Biology (2) F
This course is designed to develop critical professional skills in students interested in a career in the biological sciences. An emphasis will be in guiding the students through the professional or graduate school application process, specifically developing their interviewing skills. It will stress the significance of networking in professional and social development and help the students find the best fit for their professional education or job search, as well as educating them on alternative career paths in the biological sciences.

519. Clinical Microbiology (2) F
A review of the organisms associated with infections in humans with application directed towards those most commonly encountered in the United States. This will focus on how the body responds to various types of infections, and relevant clinical treatment methods.

520/520L. Immunology (3) and Immunology Lab (1) F
Structure and function of the immune system and some diseases related to the immune system. Laboratory will focus on a group research project. Three hours lecture and optional 3 hours laboratory/week.

521/521L. Advanced Human Anatomy & Physiology I (3)
and Advanced Human Anatomy & Physiology I Lab (1) F
The 1st of a 2-semester sequence designed to establish a knowledge base of human anatomy and physiology. Body systems studied include the integumentary, skeletal, muscular, and nervous systems. Three hours lecture and optional 3 hours laboratory/week.
522/522L. Advanced Human Anatomy and Physiology II (3) and Advanced Human Anatomy & Physiology II Lab (1) S
Prerequisite: BIO 521.
A continuation of BIO 521 studying body systems: endocrine, cardiovascular, respiratory, urinary, digestive, and lymphatic.
Three hours lecture and optional 3 hours laboratory/week.

523/523L. Cell Biology (3) and Cell Biology Lab (1) S
A study of biological systems at the cellular and subcellular levels emphasizing functional aspects such as protein processing and sorting, membrane systems, energy generation in mitochondria and chloroplasts, and cell signaling. Three hours lecture and optional 3 hours laboratory/week.

525/525L. Molecular Biology (3) and Molecular Biology Lab (1) F
Basic principles of molecular biology focusing on recombinant DNA methods as applied to a variety of biological questions. Students will learn basic research laboratory skills through a wide range of methods from gel electrophoresis to subcloning.
Three hours lecture and optional 3 hours laboratory/week.

526. Neurobiology (4) F–Even Years
This course is designed to provide an overview regarding the mechanisms of neurobiology in a wide variety of organisms. Students will gain a better understanding of how several neurological processes occur including electrical signaling of nerve cells, synaptic transmission, synaptic plasticity, pain, movement, sleep, memory, repair and regeneration.
Three hours lecture and 3 hours laboratory/week.

527. Pathobiology (4) F, S
This course introduces students to the pathophysiology underlying human disease progressions with an emphasis on cell injury, adaptation and death, genetic components of disease processes, systemic disease, including cardiovascular, renal, respiratory, endocrine, neurologic and gastrointestinal disorders, and neoplasia. Along with lectures, students will engage with primary research literature to enhance their understanding of various disease processes and research methodology, including critical analysis of basic science and epidemiological data.

528. Tropical Ecology (4) S
This field course is designed to showcase the basic flora and fauna of the tropics and review ecological principles within these unique tropical environments. Lectures and labs focus on the nature of life in tropical climates with specific emphasis on coral reefs, tropical rainforests, mangrove swamps, and seagrass communities. Through learning activities students review taxonomic diversity, form and function, ecological roles, and adaptations of representative tropical organisms. Topics include: adaptation to disturbance, physiological mechanisms, loko-motion and migrations, defenses against predation, sensory reception, productivity, feeding, biodiversity, reproduction and symbiosis through the lens of tropical ecosystems.
Three hours lecture and 3 hours laboratory/week.

529. Environmental GIS (4) F–Odd Years
This course is an introduction to GIS (Global Information Systems) in the context of applications that focus on the environment, conservation biology, and ecology. Main topics covered during the semester will include the historical development of GIS technology, its application, and its theoretical background. Students will develop skills and competency using GIS software and data collection tools. They will apply program knowledge and skills to investigate questions related to ecology, wildlife management, conservation biology, and natural resource management.
Three hours lecture and 3 hours laboratory/week.

535. Conservation Biology (3) S–Even Years
A study of the principles of conservation and wildlife management. Examines the ecology of species of interest and the habitat manipulation techniques used in the conservation of such organisms.

536/536L. Ecology and Conservation of the Vertebrates (3) and Ecology and Conversation of the Vertebrates Lab (1) F–Even Years
Study of the natural history and ecology of North American vertebrates, including fish, amphibians, reptiles, birds and mammals. Conservation concerns of particular vertebrates will be examined.
Three hours lecture and optional 3 hours laboratory/week.

537. Taxonomy of the Vascular Plants (4) S–Odd Years
A study of the vascular plants of the eastern United States, focusing on the common herbaceous plants, vines, shrubs, and trees and their identification in the field. Field trips required.
Two hours lecture and 6 hours laboratory/week.

538/538L. Ecology (3) and Ecology Lab (1) S
A study of the interactions between organisms and their biological and physical environments.
Three hours lecture and optional 3 hours laboratory/week.

540. Experimental Design and Biostatistics (4) F
Statistical analysis of data in a biological context. Students will be given the opportunity to identify a variety of biological problems, develop specific questions, design and conduct experiments to address these questions, formulate and test hypotheses, choose and run the appropriate statistical test, and interpret the outcomes of such test.
Three hours lecture and 3 hours laboratory/week.

541. Histology (4) W
The branch of anatomy that deals with structure, composition, design and function of body tissues as it relates to the principles of physiology, biochemistry, molecular biology and medicine.
Three hours lecture and 3 hours laboratory/week.

542. Medical Parasitology (4) As Needed
Parasitology is a course that will apply information learned in a variety of Biology courses to the study of parasites and parasitic diseases. Specifically, this course will address the ecology, epidemiology and biochemistry of parasites and diseases caused by parasites. The laboratory will focus on the identification of important parasite groups and methods for host examination and diagnosis.
Three hours lecture and 3 hours laboratory/week.
543. Natural Resources Policy (3) F–Odd Years
Examines current laws and policies governing public and private lands and the conservation of wildlife in the United States.

555. Environmental Ethics (3) F–Odd Years
This course will examine the relationship between humans and their natural environment; addressing the problems confronting the necessity to balance conservation with human need and the use of natural resources. Topics to be explored include an ethical consideration for the urban environment and of wilderness preservation, the interplay of local and global environmental ethics, and the ethics of sustainability. An overarching view of the scope of historical and modern bioethical issues will also enter into our discussions.

556. Marine Biology (3) W
Lectures and labs on the nature of life in the ocean and in coastal environments. The first part of the semester is spent at Union University facilities and the second part is spent exploring the coastal environments of South Georgia and the Atlantic Coast of Florida. There is an extra fee associated with this class.

557. Ornithology (3) W
Focuses on the identification and ecology of birds in the eastern United States. Multiple field trips are required, culminating with a 10-day trip to South Georgia and Florida. There is an extra fee associated with this class.

558/558L. Plant Physiology (3) and Plant Physiology Lab (1) S–Even Years
Study of physiological factors influencing the chemical and structural composition of plant absorption and utilization of water and minerals; photosynthesis, translocation, respiration, nitrogen metabolism; and growth and development. Physiology is the study of how plants function, including resource acquisition, energy creation and use, resource allocation, life cycle, and stress response. Three hours lecture and optional 3 hours laboratory/week.

559. Dendrology (4) F–Even Years
This course will focus on the identification and management of trees, focusing on forest ecology and silvicultural practices. The laboratory will include field trips that will focus on tree identification. Three hours lecture and optional 3 hours laboratory/week.

570. Graduate Project I (2) F
Students enrolling in this course will work with a faculty mentor on a year-long project, culminating in a research paper, which will be defended in a public forum before a committee of three faculty members (including the mentor). The mentor will work with the student to select courses to support the general overview of the project.

571. Graduate Project II (2) S
Continuation of BIO 570.

585. Special Topics in Biology (1-4)
Group studies which do not appear in the department course offerings. Course content will be determined by need.

597. Special Topics in Cell and Molecular Biology (3) S
Variable content course designed to address cutting-edge topics in cell and molecular biology.