BIO - BIOLOGY

BIO 104 General Biology (4 Credit Hours)
Ecology, evolution, energy processes, genetics and cellular structure and function are primary topics of study. Emphasis is on the interactions between living and nonliving things as well as the interrelationships between living organisms (including humans). Issues in science, technology and society will also be explored. The laboratory will emphasize the process of science, and students will practice skills scientists use to answer questions about the natural world. This course is NOT designed for Biology, Environmental, and Neuroscience majors.
Academic Level: Undergraduate
Corequisites: BIO 104L
Satisfies the following Nor'easter Core Requirements: Nor'easter Scientific Method

BIO 104L General Biology Lab
Academic Level: Undergraduate
Corequisites: BIO 104

BIO 105 Biology I: Ecology/Evolution (4 Credit Hours)
This course is an introduction for students to basic concepts and unifying priciples of biology. Topics covered include population, community, and ecosystems ecology, plant and animal evolution, systematics, and taxonomy. Fieldwork and laboratory are an integral part of the course.
May be repeated for credit. *Equivalent to BIO 101, MAR 105.*
Academic Level: Undergraduate
Corequisites: BIO 105L
Satisfies the following Nor'easter Core Requirements: Nor'easter Scientific Method

BIO 105L Biology I: Ecology/Evolution Lab
May be repeated for credit. *Equivalent to BIO 101L.*
Academic Level: Undergraduate
Corequisites: BIO 105

BIO 106 Biology II: Cellular/Molecular (4 Credit Hours)
This course is an introduction for students to basic concepts and unifying principles of biology. Topics covered include cell and molecular biology, genetics, and energetics. Laboratory sessions are an integral part of the course.
May be repeated for credit. *Equivalent to BIO 100.*
Academic Level: Undergraduate
Corequisites: BIO 106L
Satisfies the following Nor'easter Core Requirements: Nor'easter Scientific Method

BIO 106L Biology II: Cellular/Molecular Lab
May be repeated for credit. *Equivalent to BIO 100L.*
Academic Level: Undergraduate
Corequisites: BIO 106

BIO 204 Parasitology (4 Credit Hours)
A survey of eukaryotic host-parasite interactions and parasite life history through an ecological and evolutionary lens. Topics such as overall diversity of parasitism, host defense, parasite evasion, pathology, disease, and control will also be covered. The importance of the conservation biology of parasites will be addressed in the context of anthropogenic influences such as changing climates, migration of humans and animals, and habitat change. In the laboratory, how parasites are identified based on morphology will be studied and practiced. Preserved and stained specimens of selected protozoans and helminths will be used primarily.
Academic Level: Undergraduate
Corequisites: BIO 204L

BIO 204L Parasitology Lab
Academic Level: Undergraduate
Corequisites: BIO 204

BIO 208 Introduction to Anatomy and Physiology I (4 Credit Hours)
Course provides an overview of structure and function of the human body. Topics include basic anatomical and directional terminology; fundamental concepts and principles of cell physiology; histology; the integumentary, skeletal, muscular and nervous systems; special senses. A three-hour laboratory session is an integral part of the course.
May be repeated for credit.
Academic Level: Undergraduate
Corequisites: BIO 208L

BIO 208L Intro Anatomy & Phys Lab 1
May be repeated for credit.
Academic Level: Undergraduate
Corequisites: BIO 208

BIO 209 Introduction to Anatomy and Physiology II (4 Credit Hours)
Course continues the human anatomy and physiology topics and includes cardiovascular, renal and endocrine systems. Three-hour laboratory session is an integral part of the course.
Academic Level: Undergraduate
Corequisites: BIO 209L

BIO 209L Introduction to Anatomy and Physiology II Lab
Academic Level: Undergraduate
Corequisites: BIO 209

BIO 210 Introduction to Biology Research (1-9 Credit Hours)
This course is for students who wish to undertake directed research as a special course. A carefully prepared written plan of proposed research must be presented to and approved by the instructor and school academic director prior to registration.
May be repeated for credit.
Academic Level: Undergraduate

BIO 214 Genetics (4 Credit Hours)
This course presents an integrated approach to the two major branches of genetics - classical Mendelian genetics and molecular genetics. Topics covered include inheritance, DNA replication, transcription, translation, mutation, chromosome structure, genomics, and population genetics. The associated lab provides students with an opportunity to explore and learn the theory behind common techniques and technologies of genetics including polymerase chain reaction, gel electrophoresis, bioinformatics, genotyping assays, and proteomics.
Academic Level: Undergraduate
Corequisites: BIO 214L

BIO 214L Genetics Lab
Genetics lab provides students with an opportunity to explore and learn the theory behind common techniques and technologies of genetics including polymerase chain reaction, gel electrophoresis, bioinformatics, genotyping assays, and proteomics. All lab courses in the School of Biological Sciences include hands-on experience with the tools and techniques specific to the discipline, dynamic in-person interactions with peer learners, and direct supervision by an instructor.
Academic Level: Undergraduate
Corequisites: BIO 214

BIO 215 Introduction to Beekeeping (1 Credit Hours)
Students will learn the basics of keeping honey bees, including bee biology and ecology, care of bees throughout the year, and how to recognize and treat common honey bee ailments and pests. This course also covers the history of bees, and local beekeeping ordinances. By the end of this course, students will be prepared to manage honey bee colonies for bee health and honey production, as outlined in "Best Management Practices for Beekeeping (Maine State Beekeepers Association" (http://mainebeekeepers.org/beekeeping-resources/best-management-practices-for-beekeeping/)
Academic Level: Undergraduate

BIO 221 Principles of Aquaculture (3 Credit Hours)
Principles and practices of aquaculture from many perspectives. Topics include methods, hatchery management, product processing, and environmental issues.
Equivalent to MAR 221.
Academic Level: Undergraduate

BIO 222 Techniques in Finfish and Shellfish Culture (4 Credit Hours)
Principles and practices of aquaculture from many perspectives. Topics include culture methods, hatchery management, product processing and environmental issues.
Equivalent to MAR 222.
Academic Level: Undergraduate
Corequisites: BIO 222L

BIO 222L Techniques in Finfish and Shellfish Culture Lab
Equivalent to MAR 222L.
Academic Level: Undergraduate
Corequisites: BIO 222

BIO 223 Health, Nutrition, and Feeding of Cultured Organism (4 Credit Hours)
A combined lecture and hands-on laboratory course in selected techniques in finfish and shellfish culture. Topics covered include anatomy of cultured species of fin and shellfish, reproductive physiology of fishes and bivalves, larval fish feeding. It includes site visits to commercial hatcheries and farms.
Equivalent to MAR 223.
Academic Level: Undergraduate
Corequisites: BIO 223L

BIO 223L Health, Nutrition, and Feeding of Cultured Organism Lab
Equivalent to MAR 223L.
Academic Level: Undergraduate
Corequisites: BIO 223

BIO 232 Microbiology (4 Credit Hours)
The goal of this course is to provide the student with an understanding of the general concepts of microbiology, and the opportunity to think critically about scientific concepts. The course will explore different bacteria and viruses and focus on the ones that cause disease. We will use seminal research articles related to the main topics of the course, including but not limited to DNA metabolism, gene regulation, bacterial pathogenesis, and viral lifecycles. The labs are designed to familiarize students with aseptic methods of microbiological techniques and with its applications in clinical and environmental microbiology
Equivalent to BIO 266.
Academic Level: Undergraduate
Corequisites: BIO 232L

BIO 232L Microbiology Lab
Academic Level: Undergraduate
Corequisites: BIO 232

BIO 233 Microbiology for Pre-Pharmacy (3 Credit Hours)
Microbiology for Pre-Pharmacy is designed to introduce students to the basic concepts and unifying principles of microbiology. The goals of this course are to provide pre-pharmacy students with a foundation in core microbiological topics, including: structure and function of microorganisms, mechanisms of microbial pathogenesis, beneficial and harmful human-microbe interactions, control of pathogens, and principles of identification and diagnosis of microbial diseases.
Academic Level: Undergraduate

BIO 234 Environmental Microbiology (4 Credit Hours)
Environmental Microbiology is the study of microbes in the environment, their interactions with each other, and interactions with us. This course is designed to give students an understanding of the general concepts of microbiology, as well as how microbes transformation and impact many different environments. It will explore topics in bacterial genetics, detection and control of microorganisms, biogeochemical cycling, probiotics, bacterial communication and quorum sensing, and epidemiology and emerging diseases. The labs are designed to familiarize students with aseptic techniques, environmental sampling, and identifying bacteria and other microbes using both biochemical testing and molecular techniques.
Equivalent to BIO 266.
Academic Level: Undergraduate
Corequisites: BIO 234L

BIO 234L Environmental Microbiology Lab
Academic Level: Undergraduate
Corequisites: BIO 234

BIO 235 Winter Natural History (4 Credit Hours)
In this course, you will learn about the natural history, ecology and evolutionary biology of organisms living in New England forests during winter. Lectures will cover the physical conditions of winter, and how they influence adaptations of plants and animals, as well as their interactions. Additional topics include how aquatic organisms, microorganisms, and humans cope with winter. Labs include outdoor activities such as plant identification, mammal tracking, bird observations and measurements of temperature and snow depth, as well as indoor activities focused on developing skills in data analysis and interpretation. The course is well-suited to students interested in careers in ecology or environmental fields, or for those who just want to learn more about life during winter.
Academic Level: Undergraduate
Corequisites: BIO 235L

BIO 235L Winter Natural History Lab
This course is the required laboratory co-requisite for the lecture portion of the course.
Academic Level: Undergraduate
Corequisites: BIO 235

BIO 241 Anatomy and Art in Italy (1 Credit Hours)
This is a semester-long seminar course examining the importance of anatomical study as represented in the art of Classical Greece and Rome and its rediscovery and elaboration in Renaissance Italy. The co-requisite course will be a 10-day trip to Greece and Italy (May 2020) during which students will tour sites in four cities (Athens, Rome, Florence, and Bologna) representing the birthplaces of ancient and modern anatomical science, and which are home to some of the world's greatest works of art. Students will discover the many varied connections between anatomical study and art, especially in Renaissance Italy. There will be a weekly seminar during the semester to discuss pre-travel reading assignments, images and videos intended to establish background and set the context for the travel experience. In addition, with guidance from the instructor, students will learn/review key aspects of human anatomy and initiate research projects on relevant subjects of their choosing. At the end of the term, a 10-day trip will include tours of ancient Athens and Rome and visits to the museums of the Acropolis and the Vatican, as well as the Borghese gallery with its Renaissance masterpieces, including the sculptures of Bernini. In Florence, students will tour the Uffizi and Accademia galleries to experience the works of Renaissance masters such as Da Vinci and Michelangelo who were part of the re-emergence and improvement of anatomical understanding. While touring Bologna, students will explore the anatomy museums of one of Europe's oldest universities, including the world's best collections of anatomical wax models. Students will reflect on their experiences through a travel journal and in daily discussions with the instructors. This course will fulfill a BIO 200+ elective for majors or general elective credit.
Academic Level: Undergraduate
Corequisites: BIO 241L

BIO 241L Anatomy and Art in Italy Lab (2 Credit Hours)
BIO 241L – Lab /travel - ANATOMY through CLASSICAL and RENAISSANCE ART: A travel course to Greece and Italy This course is the co-requisite travel component of BIO 241.
Additional fees may exist.
Academic Level: Undergraduate
Corequisites: BIO 241

BIO 242 Applied Microbiology (4 Credit Hours)
This course is an introduction for students to basic concepts and unifying principles of microbiology. The goal of this course is to provide the student with an understanding of the general concepts in microbiology, as well as inform about the general practices used to identify and treat the most common infectious agents. The course is oriented towards the clinical aspects of microbiology, but does introduce historically significant discoveries to convey important topics. The labs are designed to familiarize students with aseptic methods of microbiological techniques and with its applications in clinical and environmental microbiology.
Equivalent to BIO 266.
Academic Level: Undergraduate
Corequisites: BIO 242L

BIO 242L Applied Microbiology Lab
Academic Level: Undergraduate
Corequisites: BIO 242

BIO 245 General Principles of Anatomy, Physiology, and Pathophysiology I (4 Credit Hours)
This course uses an organ systems approach to examine the workings of the human body. Students are introduced to fundamental concepts of cellular biology, histology and physiology. Topics include the integumentary, skeletal, muscular and nervous systems. The courses places emphasis on homeostasis and addresses pathophysiological processes. Emphasis is on the interdependent relationships between systems. Case history discussions of various illnesses help to reinforce system inter-relationships. Laboratory sessions are designed to reinforce lecture concepts using dissection, models, and interactive electrophysiology equipment.
Academic Level: Undergraduate
Corequisites: BIO 245L

BIO 245L General Principles of Anatomy, Physiology, and Pathophysiology I Lab
Academic Level: Undergraduate
Corequisites: BIO 245

BIO 254 Medicinal Plant Biology (3 Credit Hours)
Plant-derived compounds or their mimics are contained in numerous pharmaceutical; drugs. Plants synthesize these compounds to defend themselves against a wide array of herbivores and microbes and invest valuable glucose from their primary metabolism into these compounds. In this course you will learn which terrestrial and marine plants are the sources of defense compounds that have pharmaceutical potential or are already the source of drugs. We will discuss how plants synthesize these compounds and where in the plant they are synthesized. By using medicinal plants, herbs, and spices as examples, you will gain an understanding of basic concepts of plant physiology, ecology, and evolution in a lecture course.
Academic Level: Undergraduate

BIO 257 Costa Rica: Tropical Forests (3 Credit Hours)
This course begins on-campus with an overview of the natural history of Costa Rica and how human activities can potentially impact tropical forests. The lab portion of the course takes place over spring break and include group fieldwork in Costa Rica in both dry and rain forests - examining how human-induced global change, such as defaunation, invasive species and global warming impact these two forest types - as well as opportunities for independent investigations. After returning to the United States, students draw upon their travel experience to help them identify strategies to protect these natural systems from further human disturbance.
Academic Level: Undergraduate
Corequisites: BIO 257L

BIO 257L Costa Rica: Tropic Forests Lab (1 Credit Hours)
This field experience in Costa Rica, which takes place over spring break, is the lab companion to the lecture course Costa Rica: Tropics Forest & Global Change. Students will primarily explore rainforest biodiversity at LaSelva Research Station where they will learn from professional naturalists, interact with research scientists, and conduct group field projects examining how human-induced global change such as defaunation, invasive species and global warming impact this forest type. Students will also have ample time for independent investigations of plants, animals, or their interactions, that of are interest to them, in both rainforest at La Selva and in the so-called dry forest in Palo Verde National Park. In addition, students will discover the geologic history of the region while hiking around a volcano, examine life in the forest canopy while ziplining, and learn about sea turtle conservation during a stopover at a Pacific Ocean beach.
Additional fees may exist.
Academic Level: Undergraduate
Corequisites: BIO 257

BIO 290 Biological Topics (3 Credit Hours)
This course is designed for students who wish to study special biological topics in a lecture format that are not available in the formal course offerings of the department. These studies are affected through directed readings, supervised library research, and presentation of oral and written reports by the students. This course may be repeated with a change in topic. Topics will change by semester but may include: vertebrate biology, tropical biology, coral reef ecology, and arctic biology. Spring 2018 BIO 290 A - Costa Rica: Trop Forest/Global The course begins on-campus with an overview of the natural history of Costa Rica, and how human activities can potentially impact tropical forests. The "lab" portion of the course takes place over spring break and includes fieldwork in Costa Rica in both dry and rain forests, examining how human-induced global change, such as defaunation, invasive species and global warming impact these two forest types. After returning to the United States, students draw upon their travel experience to help them identify strategies to protect these natural systems from further human disturbance. Students taking the course at the 400-level are also required to conduct an independent project on a topic of their choosing – in addition, they will serve as research team leaders before, during, and after the fieldwork in Costa Rica, in their area of interest and expertise Spring 2021 BIO 290 B – BIO Principles of Food Safety This course provides an overview of food safety principles and practices from the farm to the table. Course goals are to introduce students to the major biological, chemical and physical threats to food safety, with emphasis on the leading causes of microbial foodborne illness, their associated food groups and the impact of pre- and post-harvest conditions and food processing on disease risk. Students will learn about the role of regulatory agencies and mandated risk analysis in maintaining a safe food supply. The course will also explore issues of consumer concern regarding the food supply, such as genetically-modified organisms and food biosecurity.
May be repeated for credit.
Academic Level: Undergraduate

BIO 290L Topics in Biology:
May be repeated for credit.
Academic Level: Undergraduate
Corequisites: BIO 290

BIO 295 Biological Science Internship (3-4 Credit Hours)
An internship is a high impact learning experience where knowledge and theory from students' program of study are integrated with shadowing, volunteering, or paid employment with a private company, not-for-profit organization or government agency toward the intentional development of transferable knowledge, skills and abilities and practical application of professional competencies. The semester prior to the internship, Academic and Career Advising Center staff assist students with preparing their application materials and searching and applying for Biological Science-related internships within the local community, stateside or abroad, as well as in defining learning objectives, educational and career goals, and professional deliverables to be met throughout the course of training and practice. During the semester of the internship course, under the mentorship of a dedicated professional who has the education and/or background and expertise of the students' discipline of study, students immerse in a remote, hybrid or in-person professional setting. Through guidance, support and regular feedback from the mentor and the internship course instructor, students strive to satisfactorily learn and practice their internship position and achieve their learning objectives. Students follow a course curriculum including: 40 contact hours at the host site per credit hour registered; participation in classes, meetings or workshops as scheduled by the course instructor; timely completion of homework assignments in support of student learning outcomes, professional readiness and career exploration; and end of semester evaluations. Internships culminate in a letter grade determined by the above criteria. Written pre-approval of the internship by the course instructor and Academic Director is required.
May be repeated for credit.
Academic Level: Undergraduate

BIO 305 Mammalogy (4 Credit Hours)
This course will present a broad introduction to the biology of the Class Mammalia in the Phylum Chordata, Kingdom Animalia. All extant mammalian orders and a select group of mammalian families will be treated under the all-encompassing umbrella of evolution, including origins and adaptations. The morphological, physiological, and behavioral adaptations shared by all mammals, as well as certain highly derived adaptations unique to specific groups of mammals, will be related to the ecological challenges under which they evolved. Many of the methodological approaches contributing to this knowledge base will also be considered.
Academic Level: Undergraduate
Corequisites: BIO 305L

BIO 305L Mammalogy Lab
Academic Level: Undergraduate
Corequisites: BIO 305

BIO 306 Virology (3 Credit Hours)
This course is intended to introduce students to a broad variety of viruses that infect animals and humans. The emphasis is on the viruses themselves, not on clinical aspects of viral disease. Topics covered include viral structure and replication cycles, the major families of animal and human viruses, viral pathogenicity, viruses in biotechnology, and the impact of biotechnology on the study of virology and virus diseases.
Academic Level: Undergraduate

BIO 307 Conservation Genetics (3 Credit Hours)
This course will consider genetic diversity as a fundamental aspect of the earth's biodiversity, as recognized by the World Conservation Union, and as a key factor contributing to the development of long-term wildlife management strategies. This course will focus particularly on how genetic diversity is measured, the factors controlling it, how it relates to population viability, and how managers can work to maintain or improve it in both captive and wild populations. Additional time will be spent on population and species-level delineation of management units, and the utility of genetics for answering basic questions in wildlife biology and forensics.
Academic Level: Undergraduate

BIO 309 Pathophysiology (3 Credit Hours)
This course introduces students to the courses, mechanisms and consequences of non-infectious diseases. Emphasis will be placed on diseases that are prevalent in the U.S. population.
May be repeated for credit.
Academic Level: Undergraduate
Satisfies the following Nor'easter Core Requirements: Nor'easter Deeper Dive

BIO 314 Herpetology (4 Credit Hours)
Herpetology is the scientific study of amphibians and reptiles (excluding birds), encompassing their biology, ecology, behavior, evolution, and conservation. A global approach to their diversity will be followed by a focus on the local fauna of the northeastern United States. The biology of this highly diverse group of animals will allow us to study the unique features and adaptations that enable amphibians and reptiles to thrive in a variety of habitats, from deserts to rainforests, and from freshwater to marine environments.
Academic Level: Undergraduate
Corequisites: BIO 314L

BIO 314L Herpetology Lab
In Herpetology lab students gain hands on experience with the diversity of amphibians and reptiles, utilizing dissections and study of preserved specimens as well as field experiences. Students will learn to identify all the amphibians and reptiles of Maine, as well as important worldwide taxa. Also, field techniques in herpetology will be utilized in day and nighttime field trips, as well as training in the use of taxonomic keys to identify and distinguish similar species of larvae and adults.
Academic Level: Undergraduate
Corequisites: BIO 314

BIO 318 Nutrition through the Life Cycle (3 Credit Hours)
This lecture course will focus primarily on normal human nutrition during the lifecycle from infancy through older adulthood. In additon, maternal nutrition, weight control, causes and treatment of obesity and other eating disorders will be explored. The course will review the energy-yielding macronutrients, examine vitamins and minerals, their deficiencies, toxicities and interactions and present an introduction into dietary and nutritional assessment of the individual. The course will conclude with a foreword to alternative nutritional practices.
Academic Level: Undergraduate

BIO 319 Ornithology (4 Credit Hours)
A survey of the world's major families of birds. Topics include evolution, classification, distribution, anatomy , ecology, behavior and vocalization, nesting, migration and identification. Birds are an integral and conspicuous element of the natural world. As such, they provide an opportunity for the application of principles and concepts of scientific observation. Fieldwork and laboratory are an integral part of the course.
Academic Level: Undergraduate
Corequisites: BIO 319L

BIO 319L Ornithology Lab
Academic Level: Undergraduate
Corequisites: BIO 319

BIO 322 Comparative Animal Physiology (3 Credit Hours)
This course will take a comparative approach to the physiology of animals. Students are introduced to a variety of animal systems and homeostatic and adaptive mechanisms. Adaptive mechanisms from the molecular to the organismal level will be considered.
May be repeated for credit.
Academic Level: Undergraduate

BIO 323 Aquarium Science and Operations (4 Credit Hours)
Course involves in-depth study of the scientific, curatorial, technical, managerial and educational components of aquarium operations. *Equivalent to MAR 323.*
Academic Level: Undergraduate
Corequisites: BIO 323L

BIO 323L Prin Aquarium Science Oper Lab
May be repeated for credit. *Equivalent to MAR 323L.*
Academic Level: Undergraduate
Corequisites: BIO 323

BIO 328 Human Evolution (3 Credit Hours)
This course will consider the course of human evolutionary history beginning with the appearance of the Primate Order approximately 14 million years ago, and proceeding forward to the present age. The course will begin with a general overview of mechanisms for evolutionary change before moving on to consider the specific methods used by scientists to understand how and why modern humans evolved, focusing particularly on primatology as a way of understanding hpw natural selection shapes the ecology and behavior of primate species, and geology as a way of documenting the climatological and morphological changes experienced by prehistoric hominids. The course will end with a consideration of human evolutionary innovations occurring since the appearance of anatomically modern humans 100-200 thousand years ago, including language and culture.
Academic Level: Undergraduate

BIO 329 Disease Ecology (3 Credit Hours)
Parasites are a ubiquitous feature of ecological communities, and can strongly impact population growth, extinction risk, community structure and biodiversity, and pose serious risks to human health and food security. This course covers basic principles of disease ecology, including diversity of parasitic organisms and transmission modes, host and parasite traits for defense and infection, mathematical models of disease spread, impacts of disease at different ecological scales, and host-parasite coevolution. These concepts are applied to current real world problems in disease ecology including emerging infectious diseases in humans, wildlife, and agriculture. This course has a quantitative focus.
Academic Level: Undergraduate

BIO 333 Evolution (3 Credit Hours)
This course will present evolution as the unifying principle in biology, seeking to describe how all features of living organisms are the ultimate products of evolutionary forces. Topics will consider both microevolution, focusing on changes in gene frequencies over observable time spans, and macroevolution, focusing on the origins of species and higher order taxa over geological time spans. All topics will be presented through examples geared towards providing students with a broad appreciation of the diversity of life on earth.
Academic Level: Undergraduate

BIO 340 Biology of Sex & Gender (3 Credit Hours)
In this course, we examine current scientific evidence from humans and non-human animals regarding the biological basis of sex and gender. We will focus on topics such as how biological sex is determined and the comparative roles of genes and hormones in gender identity and sexual differentiation. We investigate questions such as: (1) Is the idea of two sexes overly simplistic? (2) Are sexual behavior and gender identity determined by biological and/or cultural factors? and (3) Is gender a social construct? The evolutionary theories and perspectives shaping our current understanding of sex and gender will be explored while examining the significant diversity of sexual behavior and gender roles in the animal world. Throughout the course we will focus on how outcomes of biological research on sex and gender can affect social attitudes towards individuals and the development of laws and policies.
Equivalent to GWS 340.
Academic Level: Undergraduate
Satisfies the following Nor'easter Core Requirements: Nor'easter Deeper Dive, Power, Know, Justice - Open

BIO 345 General Principles of Anatomy, Physiology, and Pathophysiology II (5 Credit Hours)
Course continues studies of the human endocrine, cardiovascular, lymphatic/immune, respiratory, digestive, urinary and reproductive systems. Case history discussions of various illnesses help to reinforce anatomy, physiology and pathophysiology inter-relationship among organ systems. Laboratory sessions are designed to reinforce lecture concepts using dissection, models, and interactive electrophysiology equipment. In addition, students design and perform course material based projects.
May be repeated for credit.
Academic Level: Undergraduate
Corequisites: BIO 345L

BIO 345L General Principles of Anatomy, Physiology, and Pathophysiology II Lab
Academic Level: Undergraduate
Corequisites: BIO 345

BIO 350 Ecology (4 Credit Hours)
A study of organisms and how they interact with one another and with their nonliving environments at multiple levels - i.e., individual, population, community and ecosystem. Outdoor activities stress the interplay between field observation and experiment.
Equivalent to MAR 350.
Academic Level: Undergraduate
Corequisites: BIO 350L

BIO 350L Ecology Lab
May be repeated for credit. *Equivalent to MAR 350L.*
Academic Level: Undergraduate
Corequisites: BIO 350

BIO 365 Immunology (3 Credit Hours)
This course covers all aspects of the human immune system, with particular emphasis on how various pathways work together to protect us from infection. Immunological diseases, both genetic and acquired, are also covered.
May be repeated for credit.
Academic Level: Undergraduate

BIO 370 Cellular and Molecular Biology (3 Credit Hours)
This course explores all aspects of cell and organelle function at the molecular level. It emphasizes protein function in major cellular processes including gene expression, protein sorting, intracellular transport, cell movement, and cell signaling. Lectures are formatted to encourage student-led discussions and include student oral presentations.
May be repeated for credit.
Academic Level: Undergraduate

BIO 374 Medical Neuroanatomy (4 Credit Hours)
This course examines the structure and function of the human central and peripheral nervous system, with a particular focus on the medical conditions that result due to injury or dysfunction to particular nervous system structures. Initial topics include cellular physiology, nervous system development, nervous system anatomy, vascular components, and protective structures. This is followed by more specific study of various nervous system processes, principally those involving sensation and movement. Labs and case studies are integrated with the lecture throughout the semester. The purpose of the lab exercises is to introduce students to anatomical models of the nervous system, so that they may strengthen their understanding of nervous system anatomy. The case study learning activities mimic scenarios that may arise in the medical setting and involve solving problems related to the more difficult concepts in the course.
Academic Level: Undergraduate

BIO 397 Biology Independent Study (1-12 Credit Hours)
May be repeated for credit.
Academic Level: Undergraduate

BIO 404 Neuroscience (4 Credit Hours)
This course studies the structure and function of the human central and peripheral nervous system. Initial topics include cellular physiology, nervous system development, and nervous system anatomy, vascular components, and protective structures. This is followed by more specific study of various nervous system processes, principally those involving sensation and movement. Lectures are supplemented by a weekly recitation session. The purposes of these recitation sessions are to introduce students to anatomical nervous system models in the laboratory setting, and to incorporate case study learning activities that involve solving problems related to the more difficult concepts in the course.
May be repeated for credit.
Academic Level: Undergraduate
Corequisites: BIO 404S

BIO 404S Neuroscience Recitation
Academic Level: Undergraduate
Corequisites: BIO 404

BIO 407 Developmental Biology (3 Credit Hours)
This course illustrates the major concepts and principles of developmental biology. In this course, a historical perspective and current techniques used in developmental biology will be presented. Classical examples, such as sea urchins, zebrafish, fruit fly, Xenopus, chick and mouse, will be included to expose students to a diverse range of species. The relationship between developmental biology and environment, cancer, and regenerative medicine will be discussed. The course will use multiple formats, including lectures, discussions, and student presentations of the relevant literature.
Academic Level: Undergraduate

BIO 410 Biological Sciences Research (1-9 Credit Hours)
This course is for advanced students who wish to undertake directed research as a special course. A carefully prepared written plan of proposed research must be presented to and approved by the instructor and school academic director prior to registration.
May be repeated for credit.
Academic Level: Undergraduate

BIO 413 Global Change Ecology (3 Credit Hours)
Human-induced global change has the potential to impact ecological relationships throughout the biosphere. For example, there is some evidence that global warming and sea-level rise have negatively affected population dynamics, community interactions and ecosystem processes. In this class, we will examine the ecological science behind these and related issues through: lectures on the mechanisms by which global change influences organisms and their interactions; seminar-style discussions of current research on the response of select terrestrial and aquatic ecosystems; and in-depth investigations by students on topics of their choosing.
Academic Level: Undergraduate

BIO 422 Coral Biology (3 Credit Hours)
This course is designed to give students an overall view of the biology of coral reefs. Topics to be covered will include the making of a coral reef, community structure, pharmaceuticals from the sea, customary marine tenure, artificial reefs and reef rehabilitation, the role of coral reefs in the carbon cycle, reef management, the health of the world's reefs, and discussion of the Coral Reef Initiative. We will also read and discuss current journal publications concerning bleaching events, marine protected areas, and weather and anthropogenic effects to the health of the world's coral reefs.
Equivalent to MAR 422.
Academic Level: Undergraduate
Corequisites: BIO 422L

BIO 422L Coral Biology Lab (1 Credit Hours)
This course is a field lab that runs in conjunction with BIO 422 Coral Biology and is held in its entirety at a remote field station at Basil Jones Cut at the northern tip of Ambergris Caye, Belize. The lab is designed to give students an overall view of a live, intact reef system with its surrounding ecosystems such as a mangrove forest and a sea grass bed. The Belize Reef system is part of the larger Mesoamerican Barrier Reef System, the second largest barrier reef system of which 30% is off the coast of Belize. The barrier reef actually makes its only land contact at the northern end of Ambergris Caye at a Pleistocene beach at Rocky Point. Belize has 30 marine protected areas (MPAs) covering almost 35,000 km2 with three separate protected areas on Ambergris Caye. The course is intended to increase the comfort of the student in distinguishing cnidarians, and more specifically scleractinian corals, from other sedentary invertebrates found in the field and to gain experience familiarizing themselves with the appearance that the different families of corals take in nature. Additionally, having such close proximity to the largest barrier reef system in the western hemisphere provides visual comparisons of habitats, geology, biodiversity and anthropogenic influence. Topics to be covered will include the genesis of a coral reef, community structure, pharmaceuticals from the sea, customary marine tenure, artificial reefs and reef rehabilitation, the role of coral reefs in the carbon cycle, reef management, the health of the world's reefs, and discussion of the Coral Reef Initiative. We will also read and discuss current journal publications concerning bleaching events, marine protected areas, and weather and anthropogenic effects to the health of the world's coral reefs.
Equivalent to MAR 422L. Additional fees may exist.
Academic Level: Undergraduate
Corequisites: BIO 422

BIO 440 Medical Biology Topics (3 Credit Hours)
This is an upper-level seminar course exploring in detail an advanced topic in medical biology such as medicinal chemistry and new medical breakthroughs. The specific topic of the seminar varies by semester. Recent topics include: <p>Human Reproduction and Development: This course will examine the process of reproduction with emphases placed upon reproductive organ function, gametogenesis, fertilization and embryonic/fetal development. In addition, the course will address mechanisms of teratogenesis (i.e., development of birth defects) as well as the transformations in the fetal/newborn circulatory system near the time of birth. The course will use multiple formats, including lectures, discussions, and student presentations of the relevant literature. <p>Cardiovascular Physiology:This course explores the workings of the cardiovascular system, using one's understanding of the physiology of the cardiovascular system as a stepping stone to study disease mechanisms and treatments. Topics for discussion will include the electrophysiology and contractile activity of the heart, the science of electrocardiography ("ECGs") and dysrhythmias, the function of the blood vessels, the control of blood pressure & flow, and the mechanisms of myocardial infarction ("heart attack") and congestive heart failure. <p>Autoimmune Disease:This course will explore immune tolerance to 'self' tissues and the immune mechanisms by which this tolerance barrier can be broken, resulting in autoimmune disease. The seminar-style format will include lectures and stundent-led discussion of articles from the primary literature that highlight our current understanding of important autoimmune diseases such as lupus, multiple sclerosis, paraneoplastic disorders and type 1 diabetes.
May be repeated for credit.
Academic Level: Undergraduate

BIO 442 Cancer Biology (3 Credit Hours)
This seminar-style course will cover the molecular events involved in cell transformation, characteristics of tumor cells and their microenvironment, and cancer treatment including immunotherapies. Student-led discussion of primary literature will include studies that have led to our current understanding of tumor biology and current literature in the field. Prerequisite: BIO 214 Genetics. This course fulfills the requirement for a BIO400+ elective for Medical Biology and Biological Sciences majors.
Academic Level: Undergraduate

BIO 443 Cardiovascular Physiology (3 Credit Hours)
This course explores the workings of the cardiovascular system, using one's understanding of the physiology of the cardiovascular system as a stepping-stone to study disease mechanisms and treatments. Topics for discussion will include the electrophysiology and contractile activity of the heart, the science of electrocardiography ("ECGs") and dysrhythmias, the function of the blood vessels, the control of blood pressure & flow, and the mechanisms of myocardial infarction ("heart attack") and congestive heart failure. This course satisfies the "BIO 400 or higher" elective requirement for the Medical Biology and BSI major and also satisfies the third-year critical thinking theme of the core curriculum at UNE.
May be repeated for credit.
Academic Level: Undergraduate

BIO 445 One Health (3 Credit Hours)
The course focuses on the history and current applications of One Health, a collaborative, integrated, and multidisciplinary approach to improve overall health. One Health approaches recognize the interconnectedness of the domains of animals, people, and the environment and the necessity of communication between professionals across the fields of veterinary medicine, human medicine, environmental science, and social science. Knowledge of population and community ecology, disease ecology, and social determinants of disease risk are crucial to our understanding of how emerging diseases can affect humans, other animals, and the environment. The One Health approach can specifically prepare physicians, public health workers and other members of the broader community in the prevention and control of disease outbreaks. Critical reading and discussion of primary literature, emerging disease scenarios, and case studies of emerging zoonotic diseases are used to illustrate the implementation of a One Health approach.
Academic Level: Undergraduate

BIO 450 Biology Topics (3 Credit Hours)
This is an upper-level seminar course exploring in detail an advanced topic in biology such as: biodiversity, pathogenesis, and developmental genetics. Topics vary by semester.
May be repeated for credit.
Academic Level: Undergraduate

BIO 457 Costa Rica: Tropical Forests & Global Change (3 Credit Hours)
Costa Rican tropical forests, which have some of the highest plant and animal diversity on the planet, will be the focus of this travel course. We will begin on-campus with an overview of the natural history of Costa Rica, explore how principles of ecology and evolution apply to the plants and animals of tropical forests, and consider how human activities can potentially impact these forests. The "lab" portion of the course takes place over spring break, and will include group fieldwork examining how human-induced global change impacts rainforests, as well as independent investigations by students in both rainforest and so-called dry forest. After returning to the United States, students draw upon their field experiences to help them identify strategies to protect these natural systems from further human disturbance. Students in this course will be challenged at a high level in terms of both depth of study and workload, including critical reading of the scientific literature.
Academic Level: Undergraduate
Corequisites: BIO 457L

BIO 457L Costa Rica: Tropical Forests & Global Change Lab (1 Credit Hours)
This field experience in Costa Rica, which takes place over spring break, is the lab companion to the lecture course Costa Rica: Tropics Forest & Global Change. Students will primarily explore rainforest biodiversity at LaSelva Research Station where they will learn from professional naturalists, interact with research scientists, and conduct group field projects examining how human-induced global change such as defaunation, invasive species and global warming impact this forest type. Students will also have ample time for independent investigations of plants, animals, or their interactions, that of are interest to them, in both rainforest at La Selva and in the so-called dry forest in Palo Verde National Park. In addition, students will discover the geologic history of the region while hiking around a volcano, examine life in the forest canopy while ziplining, and learn about sea turtle conservation during a stopover at a Pacific Ocean beach. Students in this course will be challenged at a high level in terms of depth of study, including taking a leadership role in data collection and analyses associated with Group Projects, and conducting hypothesis-driven data collection and analyses for Independent Projects (as opposed to natural history-type investigations done in introductory or intermediate level courses).
Academic Level: Undergraduate
Corequisites: BIO 457

BIO 459 Conserv and Ecol Caribbean Isl (3 Credit Hours)
This course will examine basic ecological concepts pertaining to issues relevant to insular areas and tropical regions such as the importance of scale to biodiversity and human impact. We will explore how changes in a system brought on by forest fragmentation due to logging, resource management, or resource scarcity and conflict can affect species richness. We will spend some time relating the rich natural history of a region and its impact on the draw of tourists to the interface between need and want and then relate this to population viability and resilience. We will compare communities disrupted by wildlife management to those in protected areas and discuss in terms of its effect on biodiversity and richness and assess the effectiveness of human intervention and the tolerance limits of each community. The impact of small-scale artisanal fisheries on species richness and the contrast with industrial fisheries will be discussed. Other topics will include forest ecology in the context of a tropical forest dominated by plants or invertebrates and the presence of unique representation of forest beta-diversity. The prerequisites are Bio 105 or BIO 104 or MAR 105.
Equivalent to MAR 459.
Academic Level: Undergraduate
Corequisites: BIO 459L

BIO 459L Conservation and Ecology of the Caribbean Lab (1 Credit Hours)
This course is a field lab course that runs in conjunction with BIO 459 Conservation and Ecology of a Caribbean Island and is held in its entirety in Panama. This lab is designed to immerse students in the neotropical forests and coastal ecosystems of Central America and to create the opportunity to examine the biodiversity and the topography that are the results of the unique geologic origins of the isthmus of Panama. The area is considered a hotbed of diversity owing to the tectonic collision of the two huge land masses of North and South America which brought into existence the land bridge that was dubbed the Great American Interchange. This has attracted the attention of researchers from around the world and brought into existence numerous Smithsonian facilities as well as the world renowned facilities at Barro Colorado Island. This course is designed to expose students to the unique nature of Panamanian jungles through visits to museums, accessing the jungle canopy on ropes, hiking through jungles and into caves, patrolling turtle nesting beaches and swimming on gorgonian dominated reefs. We will examine the geologic process that led to its formation and how this impacted its biodiversity. We will delve into a review of the natural history and discuss how the relationship between the government and its indigenous population is one of the most advanced in the world. We will also discuss how this relationship has opened the door to a more equitable fair trade based ecotourism. Topics covered include the geologic formation of the isthmus, the indigenous population of Panama and how they provide an ecotourism experience, sea turtle and bat biology, the polymorphism of Bocas del Toro poison dart frogs, sloths, sustainable farming of cacao, community-based wildlife management, the biodiversity of Panamanian jungles, and the methods that scientists use to research the natural history of the region.
Equivalent to MAR 459L. Additional fees may exist.
Academic Level: Undergraduate
Corequisites: BIO 459

BIO 470 Topics in Health Biology (3 Credit Hours)
This upper-level seminar course explores an advanced topic in health biology such as: human health, evolutionary perspectives on human health. Topics vary by semester. Recent topics include: <p>Evolutionary Perspectives on Human Health: This is an upper-level course designed to provide students with an appreciation for the contributions of evolutionary biology to medicine and public health. We will begin with a series of lectures which cover fundamental principles in evolutionary biology (and ecology), followed by a discussion of their relevance to topics such as antibiotic resistance and emerging infectious disease. For the remainder of the semester, the course will function primarily as a seminar in which students will lead class discussions about topics of their choosing, drawing upon the evolutionary (and ecological) literature.
May be repeated for credit.
Academic Level: Undergraduate

BIO 480 Topics in Physiology (3 Credit Hours)
This upper-level seminar course explores an advanced topic in animal physiology such as biomechanics and muscle physiology. Students explore the primary literature and conduct presentations on relevant topics. Topics vary by semester. Recent topics include: Endocrinology and Carbohydrate Metabolism: This upper-level seminar course explores advanced topics in human physiology. The first portion of the course will examine the regulatory mechanisms of carbohydrate metabolism and its connection to obesity and diabetes mellitus. Students will then query the primary literature and lead journal-club style presentations on research with an emphasis on the role of obesity in association with metabolic syndrome, cardiovascular disease and type II diabetes. Excretion: Volume Regulation and Salt Balance: Comparative study of essential functions of excretion, volume regulation, and ionic balance in various taxa, including humans, other mammals, invertebrates, fish, and diverse animals from various habitats. Control mechanisms and phsyiological processes from the molecular to the organismal level will be considered. Appropriate for upper level students interested in pre-med, pre-vet, biological science and marine biology. The Autonomic Nervous System In Health and Disease: The course examines both central and peripheral autonomic regulation with particular emphasis on thier roles in coordinating bodily functions to ensure homeostatis and adaptive responses to stress. Discussion will focus on disorders originating from primary autonomic impairment and those that indirectly affect autonomic function. (Prereq: BIO 208 or BIO 245 minimum grade C-) Biomechanics: This course covers a variety of topics from molecules and cells to fish, plants and mammals. The course uses comparative biomechanics to study activities and organisms. The course has direct relevance to fields as diverse as human/biomedical applications and the effects of winds and waves on plants and animals. Muscle Physiology: This course focuses on the physiology of muscle contraction with an emphasis on adaptations in different species, under various conditions and challenging environments. Students explore the primary literature and conduct presentations throughout the course. Cardiovascular and Autonomic Control: This course examines both central and peripheral autonomic regulation of the cardiovascular system with particular emphasis on its role in maintaining homeostasis and adaptive responses to stress and disease. Students will review the current medical literature and conduct presentations, in a journal club format, throughout the course. Microbiota-Gut-Brain Axis: This seminar course explores advanced topics in human physiology. The course begins with a review of the basic anatomy and physiology of the gastrointestinal tract (GI tract/gut) and the regions of the brain that communicate with and influence the gut. The class will then examine the most common bacterial phyla found in the gut and their proposed functions, with an emphasis on support of digestion, host defense against pathogens and development and maintenance of the intestinal immune system. The class will also discuss factors that affect gut microbiome diversity and how imbalance (dysbiosis) is linked to increased risk of disease, including neurobehavioral and neurological disorders. Subsequent to the initial microbiome discussion, students will read and critique the evidence-based research and lead oral presentations (journal-club style) on pertinent topics of interest. Particular emphasis will be placed on research associated with the ability of the microbiome to maintain health and prevent disease. This 400-level course meets the Med-Bio program degree requirements, the minor in Human Nutrition requirements, as well as the core curriculum critical thinking requisite.
May be repeated for credit.
Academic Level: Undergraduate

BIO 495 Advanced Biological Science Internship (3-12 Credit Hours)
An internship is a high impact learning experience where knowledge and theory from students' program of study are integrated with shadowing, volunteering, or paid employment with a private company, not-for-profit organization or government agency toward the intentional development of transferable knowledge, skills and abilities and practical application of professional competencies. The semester prior to the internship, Academic and Career Advising Center staff assist students with preparing their application materials and searching and applying for Biological Sciences-related internships within the local community, stateside or abroad, as well as with defining learning objectives, educational and career goals, and professional deliverables to be met throughout the course of training and practice. During the semester of the internship, under the mentorship of a dedicated professional who has the education and/or background and expertise of the students' discipline of study, students immerse in a remote, hybrid or in-person professional setting. Through guidance, support and regular feedback from the mentor and the internship course instructor, students strive to satisfactorily learn and practice their internship position and achieve their learning objectives. Students follow a course curriculum including: 40 contact hours at the host site per credit hour registered; participation in classes, meetings or workshops as scheduled by the course instructor; timely completion of homework assignments in support of student learning outcomes, professional readiness and career exploration; and end of semester evaluations. Internships culminate in a letter grade determined by the above criteria. Written pre-approval of the internship by the course instructor and Academic Director is required.
May be repeated for credit.
Academic Level: Undergraduate

BIO 501 Practicum in Science Education (2 Credit Hours)
This is a graduate level course designed for students who are teaching introductory undergraduate science laboratories for the first time. The course will include discussions, workshops, guest speakers and classroom observations focused on exploring best practices in lab instruction.
Academic Level: Graduate

BIO 502 Human Gross Anatomy (6 Credit Hours)
An in-depth study of the structure and relationship of the various organ systems of the human body. The course is divided into 4 major sections; upper extremity; back and lower extremity; head and neck; and thorax, abdomen and pelvis. This course provides an overview of human embryology organogenesis. Examination of cadavera is emphasized throughout the entire course, with a strong emphasis placed on the musculoskeletal system. Students will learn anatomical terminology and 3-dimensional anatomy to integrate with clinical correlations, utilizing diagnostic images. The laboratory utilizes prosections, anatomical models, skeletal materials, and cross sections. 6.000 Credit Hours
Academic Level: Graduate
Corequisites: BIO 502L

BIO 502L Human Gross Anatomy Lab
Academic Level: Graduate
Corequisites: BIO 502

BIO 503 Research Methods (3 Credit Hours)
This graduate course is designed to help students learn how to conduct research in a rigorous and quantitative manner by outlining the steps in experimental design. The design process emphasizes hypotheses development from observations by creating explanatory models. Formal hypotheses formulation and methods will be covered. Statistics appropriate to the different hypotheses and data will be discussed in detail. Students are expected to develop a research plan suitable for submission to a grant-funding agency to show mastery of the material.
Academic Level: Graduate

BIO 504 Neuroscience (4 Credit Hours)
A study of the structure and function of the human central and peripheral nervous systems, including vascular components, connective tissue support and special senses. Students are expected to develop a solid foundation of the knowledge and skills of nervous systems as a background to their clinical practice. Neurological control of movement and musculature is emphasized. Laboratory includes clinical correlations as well as opportunity to study 3 dimensional anatomical models, gross specimens and diagnostic imaging. 4.000 Credit Hours
Academic Level: Graduate

BIO 506 Parasitology (4 Credit Hours)
A survey of selected protozoan and helminthes parasites which cause disease in man. Host-parasite relations, parasite morphology, and physiology, parasite life history, host injuries, means of control, and prevention of parasitic diseases are discussed. In the laboratory parasites are identified and studied. Preserved, stained, and living materials will be used. A survey of live parasites from a vertebrate host will also be included.
Academic Level: Graduate
Corequisites: BIO 506L

BIO 506L Parasitology Lab
Academic Level: Graduate
Corequisites: BIO 506

BIO 510 Graduate Seminar (1 Credit Hours)
For this seminar, graduate students and faculty will choose journal articles from the current literature to read and discuss. Participants will lead the discussion on a rotating basis. It is anticipated that topics will be chosen from throughout the field of biology. High achieving, advanced undergraduates will be allowed to attend on a case by case basis and at the discretion of the faculty member in charge of the seminar.
May be repeated for credit.
Academic Level: Graduate

BIO 515 Indep Study-Biological Science (1-9 Credit Hours)
May be repeated for credit.
Academic Level: Graduate

BIO 516 Responsible Conduct Research (1 Credit Hours)
This seminar-style course aligns with the National Institute of Health (NIH), National Science Foundation (NSF), and United States Department of Agriculture (USDA) requirements for training in the responsible conduct of research. It provides graduate students with a comprehensive overview of the ethical and regulatory framework for scientific research. Topics include: research and reporting misconduct, research security and export control towards ensuring national security, data and research integration, data management, conflicts of interest, authorship, plagiarism, mentoring, peer review, intellectual property, working with human and animal subjects, reproducibility, and the responsible use of artificial intelligence (AI) in research.
Equivalent to MAR 516.
Academic Level: Graduate

BIO 517 Conservation Genetics (3 Credit Hours)
This course will consider genetic diversity as a fundamental aspect of the earth's biodiversity, as recognized by the World Conservation Union, and as a key factor contributing to the development of long-term wildlife management strategies. The course will focus particularly on how genetic diversity is measured, the factors controlling it, how it relates to population viability, and how managers can work to maintain or improve it in both captive and wild populations. Additional time will be spent on population and species-level delineation of management units, and the utility of genetics for answering basic questions in wildlife biology and forensics. This course is offered at the graduate level concurrent with BIO 307.
Academic Level: Graduate

BIO 519 Scientific Literacy and Literature Review (3 Credit Hours)
Scientific Literacy and Literature Review is a graduate-level course designed to strengthen students' ability to critically engage with scientific literature in the marine, biological, and environmental sciences. In addition to learning the content of specific papers, this course emphasizes how to read, interpret, and evaluate research articles with precision and confidence. Students will learn to dissect the structure of scientific writing, assess methodologies, interpret data, and identify biases and limitations. Through guided practice, peer discussion, and reflective writing, students will develop the skills to synthesize findings across studies and articulate informed critiques. The course also supports students in navigating the transition into graduate-level scholarship. Weekly topics and assignments are designed to help students build a scientific identity, manage literature alongside lab work, and understand the role of reading in thesis development, publishing, and professional growth. By the end of the semester, students will be able to select a peer-reviewed paper and defend its quality, demonstrating mastery of both analytical reading and scholarly judgment.
Equivalent to MAR 519.
Academic Level: Graduate

BIO 535 Animal Behav/Behav Ecology (4 Credit Hours)
Academic Level: Graduate
Corequisites: BIO 535L

BIO 535L Animal Behav/Behav Ecology Lab
Academic Level: Graduate
Corequisites: BIO 535

BIO 542 Medical Biology Topics (3 Credit Hours)
This is an upper-level seminar course exploring in detail an advanced topic in medical biology such as medicinal chemistry and new medical breakthroughs. The specific topic of the seminar varies by semester. Recent topics include: <p>Neurobiology of Pain and Analgesia: Students will explore the neurobiological mechanisms of pain through the reading and analysis of historical and recent papers of interest. Beginning with the basic definition of pain and clinical pain conditions, this course will examine animal and human models of acute and chronic pain and the information we have learned from using these models in research. The basic anatomical pathways and neurochemical mediators involved in pain transmission and descending will be discussed, along with modifications that occur in the transition from acute to chronic pain. Mediators of peripheral and central sensitization will be examined and their relationship with allodynia, hyperalgesia, and chronic pain will be discussed. In addition, mechanisms of analgesia, including placebo analgesia, will be explored along with potential strategies for the development of therapies for the prevention and treatment of chronic pain. Students will present original research papers and write a final paper reviewing one of the topics covered in class. In addition, students will critically analyze an original research article and write a review of that article as if it were submitted as a manuscript to a journal for possible publication.
May be repeated for credit.
Academic Level: Graduate

BIO 550 Biological Science Topics (3 Credit Hours)
This upper-level seminar course explores an advanced topic in environmental biology such as: resource ecology, wildlife biology or environmental physiology. Three credits of 300 level Biology (C- or higher) required. Topics vary by semester. <p>Developmental Neurobiology: The objective of this course is to provide an overview of neural development. Fundamental principles of neural development will be exemplified by key experiments and observations from past and recent literatures. In addition to lectures by the course Instructor, students will present on selected topics and participate in discussions.
May be repeated for credit.
Academic Level: Graduate, Undergraduate

BIO 551 Seminar in Science Education (1 Credit Hours)
This is a graduate level course designed to bring together both novice and experienced instructors who are teaching introductory undergraduate science laboratories. The course will be run primarily as an interactive seminar using the "Teaching Circle" model, in which a small group of instructors make a commitment to work together to explore issues around the quality of their teaching and their students' learning.
May be repeated for credit.
Academic Level: Graduate

BIO 570 Cellular and Molecular Biology (3 Credit Hours)
This course explores all aspects of cell and organelle function at the molecular level. It emphasizes protein function in major cellular processes including gene expression, protein sorting, intracellular transport, cell movement, and cell signaling. Lectures are formatted to encourage student-led discussions and include student presentations and critical analysis of primary research articles.
Academic Level: Graduate

BIO 590 Research and Thesis (1-18 Credit Hours)
This course is for post-baccalaureate students who wish to undertake directed research toward their MS degree. The project topic will be negotiated to meet the interests of both the student and instructor.
May be repeated for credit.
Academic Level: Graduate

BIO 595 Thesis Writing/Data Analysis (1-9 Credit Hours)
This course is for students enrolled in the Masters of Science program who have accomplished the following requirements: completed 4 semesters of graduate study as a full-time student; successfully passed all classes required for their program with a grade of B- or better; have completed 36 credits of graduate level courses. Thesis continuation tuition fee will apply each semester. Note: for students using campus facilities, a separate student services fee will also apply.
May be repeated for credit. *Additional fees may exist.*
Academic Level: Graduate

BIO 597 Independent Study (1-9 Credit Hours)
In this course students pursue studies under the supervision of a faculty sponsor. Students may engage in study of topics which are not part of the regularly offered courses. A carefully prepared written plan of study and evaluation approved in advance by the instructor is required.
Academic Level: Undergraduate, Graduate