BIOLOGICAL SCIENCES (BIOL)

BIOL-145 Introductory Biology

BIOL-145AB Introductory Biology: 'Animal Bodies, Animal Functions'
Not Scheduled for This Year. Credits: 4
How are animal bodies built to deal with living on earth? In this course we will study the function of cells, organs, and organ systems that have evolved to help animals make their way through the physical and chemical environment. In lecture and in lab, we will consider the common needs of animals -- needs such as feeding, breathing, and reproducing -- and the diverse solutions they have devised. A range of life, from unicellular organisms to animals with backbones (including mammals), will be considered.
Applies to requirement(s): Math Sciences
S. Bacon
Restrictions: This course is limited to first-years and sophomores.
Coreq: BIOL-145ABL.

BIOL-145BT Introductory Biology: 'Biology Today'
Fall. Credits: 4
In this student-centered course, we will explore some of the core concepts, language, and frameworks used in the discipline of biology. This course will help students develop and hone an important skill-set, including experimental design, scientific writing and problem solving. In lecture, we will learn biology by investigating topics that affect everyone, learning about the impacts of social stress on mammalian cardiovascular systems, the promise and peril of gene editing, and the evolution of human skin color, for example. All course objectives will be met through active learning exercises in lecture, readings, discussions, and hands-on work in the laboratory.
Applies to requirement(s): Math Sciences
R. Brodie
Coreq: BIOL-145BTL.

BIOL-145EX Introductory Biology: 'Exploring Biodiversity'
Spring. Credits: 4
In this course, we will take a leap back in time to the origins of life, discuss the evolution of major organismal lineages, and investigate biology processes at different scales, from cellular to ecological. Through the lectures, labs, and in-class discussions, students will be able to explain how scientific knowledge is generated. In lab, students will explore biological diversity, cellular dynamics, and evolutionary and ecological processes, with a focus on gaining skills in scientific inquiry, including hypothesis development, experimental design, collecting and analyzing results, and scientific writing.
Applies to requirement(s): Math Sciences
C. Drummond
Coreq: BIOL-145EXL.

BIOL-145GW Introductory Biology: 'A Green World'
Fall. Credits: 4
This course examines the plant life in the woods and fields around us, the exotic plants in our greenhouses, and the plants we depend on for food. We will study plants living in surprising circumstances, settling into winter, escaping from gardens, reclaiming farmland, cooperating with fungi and insects, and fighting for their lives. We will find that plants challenge some conventional, animal-based assumptions about what matters to living things. In labs, students will seek to answer questions about how plants grow in nature, by studying plant structure and function, ecology, and evolution.
Applies to requirement(s): Math Sciences
A. Frary
Restrictions: This course is limited to first-year students.
Coreq: BIOL-145GWL.

BIOL-145LC Introductory Biology: 'Locomotion'
Fall. Credits: 4
One of the most intriguing features of animals is the range of ways in which they are able to move. From running and jumping to climbing, swimming and flying, different forms of locomotion have allowed animals to exploit most of earth's habitats. In this course we will study the anatomy, physiology, biomechanics and biochemistry underlying different types of animal movement. While some of our focus will be on humans, we will take advantage of a wide range of mainly vertebrate animal models to understand the evolution and function of the musculoskeletal system and how it is used during locomotion.
Applies to requirement(s): Math Sciences
G. Gillis
Restrictions: This course is limited to first-years and sophomores.
Coreq: BIOL-145LCL.

BIOL-160 Integrated Introduction to Biology and Chemistry
Fall. Credits: 4
This 8-credit course serves as a gateway to both the biology and chemistry core curricula. The course introduces and develops fundamental concepts in chemistry while also exploring the diverse range of strategies adopted by living systems to survive in different environments. This course prepares students for further study in chemistry (Chemistry 201) and/or biology (Biology 200). Students must register for both Biology 160 and Chemistry 160 as well as a single lab section (listed under Chemistry 160L). Recommended for students interested in completing pre-health requirements or advanced study in biochemistry or neuroscience.
Applies to requirement(s): Math Sciences
J. Andras, A. van Giessen
Restrictions: This course is limited to first-year students.
Coreq: CHEM-160 and CHEM-160L.
Notes: Students must co-enroll in BIOL-160 and CHEM-160 for a total of 8 credits; three 50 minute lectures, three 75 minute lectures, and one three-hour laboratory per week.

BIOL-200 Introductory Biology II: How Organisms Develop
Spring. Credits: 4
Developmental biology is a topic full of fantastic questions: how does a single egg transform into an organism with many cells and tissue types? What controls gene expression? What is the interplay between environmental signal and plant hormones? In this course plant and animal development will be studied at the level of genes, cells and tissues, in model organisms such as sea urchins, ferns, chicks and lilies. The laboratory is at the heart of the course, and classwork is designed around the live material students will meet each week.
Applies to requirement(s): Math Sciences
R. Fink, A. Frary
Prereq: BIOL-145 or BIOL-160, or NEURO-100. Coreq: BIOL-200L.

BIOL-206 Local Flora
Spring. Credits: 4
This course offers plant identification and natural history, emphasizing native and introduced trees and wildflowers. On- and off-campus field trips.
Applies to requirement(s): Meets No Distribution Requirement
A. Frary
Prereq: 4 credits in the department.

BIOL-209 Science Communication
Not Scheduled for This Year. Credits: 4
In this course, we will evaluate the practices that best support a shared understanding of facts and enable trustworthy storytelling. We will read peer-reviewed literature on the benefits, challenges, and equity considerations of using various presentation formats and platforms. Students will analyze and then practice science-sharing methods targeting professionals and general audiences.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive, Writing-Intensive
A. White
Prereq: 4 credits in the department.

BIOL-210 Molecular Genetics
Fall and Spring. Credits: 4
A comprehensive study of the fundamental principles of classical and molecular genetics. Topics will include genetic inheritance, the central dogma, gene and protein expression and regulation, the genetic and molecular basis for disease, and modern techniques such as genomics, bioinformatics, and gene therapy. The laboratory component will illustrate and analyze these topics through selected experimental approaches.
Applies to requirement(s): Math Sciences
R. Lijek, C. Woodard
Prereq: BIOL-200 and CHEM-150. Coreq: BIOL-210L.
Advisory: Students are not allowed to take this course in the same semester as BIOL-220 Cell Biology. Also, students who previously took BIOL-230 Molecular Genetics and Cell Biology should not enroll in this course.

BIOL-220 Cell Biology
Fall. Credits: 4
The aim of this course is to understand the fundamental unit of life--the cell--at the molecular level. We will consider the assembly and structure of cellular membranes, proteins, organelles, and the cytoskeleton, as well as their roles in cellular processes including the capture and transformation of energy, catalysis, protein sorting, motility, signal transduction, and cell-cell communication. Emphasis will be placed upon the diversity of cellular form and function and the cell biological basis for disease. The laboratory portion of this course will illustrate and analyze these phenomena through selected biochemical, genetic, and microscopy-based approaches.
Applies to requirement(s): Math Sciences
A. White
Prereq: BIOL-200 and CHEM-150. Coreq: BIOL-220L.
Advisory: Students are not allowed to take this course in the same semester as BIOL-210 Molecular Genetics. Also, students who previously took BIOL-230 Molecular Genetics and Cell Biology should not enroll in this course.

BIOL-223 Ecology
Fall. Credits: 4
This ecology course will cover the fundamental factors controlling the distribution and abundance of organisms, including interactions with the abiotic environment, fitness and natural selection, population growth and dynamics, species interactions, community dynamics, and diversity. We will address variation across space and time. The course will combine observational, experimental, and mathematical approaches to some of the applications of ecological theory, including conservation, disease dynamics, and biological control.
Applies to requirement(s): Math Sciences
M. Hoopes
Prereq: BIOL-145 or BIOL-160 and at least one semester of Calculus or Statistics. Coreq: BIOL-223L.
Advisory: Because the course uses quantitative methods, students must have experience with calculus or statistics; high school level courses are sufficient.
Notes: BIOL-223 and/or BIOL-226 must be taken for the Biology major.

BIOL-226 Evolution: Making Sense of Life
Spring. Credits: 4
Evolution is central to our understanding of Biology; it helps us explain both the diversity and commonality in organismal form, function and behavior that have been generated over 3 billion years of life on Earth. We will discuss the mechanisms of evolution within populations and between species, examine some branches of the tree of life and learn how the tree is generated, discuss how phenotypes arise from genotypes and interactions with the environment, and how development is central to understanding evolution. Some themes include the evolution of symbiosis, sex, and human evolution, as well as the crucial role that evolutionary principles play in society including agriculture, medicine, and even the judicial system.
Applies to requirement(s): Math Sciences
P. Brennan
Prereq: BIOL-200, BIOL-210, BIOL-220, BIOL-223 or BIOL-230. Coreq: BIOL-226L.
Notes: BIOL-223 and/or BIOL-226 must be taken for the Biology major. Instruction is a flipped classroom style. Students will be expected to watch videos before class and do active learning in the classroom. Students are expected to work in groups, as well as view about half the lectures before class.

BIOL-234 Biostatistics
Not Scheduled for This Year. Credits: 4
The statistics sections of biology articles have become so technical and jargon-filled that many biologists feel intimidated into skipping them or blindly accepting the stated results. But how can we ask relevant questions or push the boundaries of knowledge if we skip these sections? Using lectures, data collection, and hands-on analysis in R, this course will connect statistics to biology to help students develop a gut instinct for experimental design and analysis. We will explore sampling bias and data visualization and review methods and assumptions for the most common approaches with examples from current biological literature and our own data.
Applies to requirement(s): Math Sciences
The department
Prereq: 8 credits in Biological Sciences or ENVST-200. Coreq: BIOL-234L.

BIOL-236 Topics in Biological Sciences

BIOL-236HA Topics in Biological Sciences: 'Human-Animal Interaction'
Spring. Credits: 4
Every day we see two vastly different species -- human and dog -- successfully interacting, living, and working together. Simultaneously, the wild world is changing and shrinking as humans spread into land that was once dedicated to wild-living animals, humans are forced to interact with different species in new ways. To maintain species diversity, we must understand the relationships that develop and how to create best policies and practices. In this class, we will learn about the human-animal bond, the interaction between human psychology, animal behavior, and the life sciences and the complex and evolving relationship between conservation, policy, and human-animal interactions.
Crosslisted as: PSYCH-259HA
Applies to requirement(s): Social Sciences
L. Robinson
Prereq: PSYCH-100 or AP Psychology.

BIOL-241 Comparative Animal Physiology
Spring. Credits: 4
Animals share needs such as eating, breathing, moving and reproducing. Yet their solutions to meeting these needs are incredibly diverse, constrained as they are by each group's evolutionary history and by the specific demands of the environment in which they live. By looking at the range of solutions animals have devised to navigate life on earth, we will explore fundamental themes in physiology including homeostasis and the relationship between structure and function. Using lectures, readings and discussions, students will gain an appreciation for the remarkably diverse ways in which animals have evolved to overcome the fundamental challenges of life.
Applies to requirement(s): Math Sciences
S. Bacon, G. Gillis
Prereq: BIOL-145, BIOL-160, or NEURO-100, and BIOL-200. Coreq: BIOL-241L.

BIOL-249 The Naturalist Habit
Fall. Credits: 4
In this course, we will explore the rich natural history of our region, focusing on organisms in their natural habitat and contemplating questions and approaches we might employ to better understand them and the ways in which they live. We will place particular emphasis on developing the habits of close and curious observation and coupling those habits with the skills and methods of scientific hypothesis development, experimental design, and field ecology.
Applies to requirement(s): Math Sciences
J. Andras
Prereq: Any 100-level Biology course (145 or 160) and BIOL-200.
Notes: Class meetings will consist almost entirely of field trips to local natural areas, where we will spend most of our time outdoors. Field trips will proceed in all safe weather (e.g. cold, rain, wind, etc.), and attendance is mandatory. BIOL-249 counts as a 200-level course with lab.

BIOL-295 Independent Study
Fall and Spring. Credits: 1 - 4
In this class, students will acquire hands-on experience in diverse aspects of the research process in any field of Biology, from familiarizing themselves with a research topic, generating interesting questions, designing experiments, acquiring technical skills, collecting and analyzing data, to writing and/or presenting their results. To inquire about enrollment, students should fill out the application survey available on the departmental website or on my.mtholyoke. The application is generally available between registration and the end of exams, and faculty meet after exams to place students in labs for the following semester. Decisions depend on lab capacity. A single credit requires an average of 3 hrs of work per week. (Note: Some faculty may require a set weekly meeting time for a portion of this class.)
The department
Instructor permission required.
Notes: Note: Any student conducting an independent laboratory research project for course credit in a department, program, or laboratory covered by the College's chemical hygiene plan must participate in a safety training session before beginning research.

BIOL-301 Regenerative Medicine: Biology and Bioethics
Not Scheduled for This Year. Credits: 4
What is regenerative medicine? What is the science that drives new medical therapies using stem cells? We will study the biology of adult, embryonic, and induced pluripotent stem cells, as well as the legal, ethical, and moral implications of using these cells in medical therapies. Each member of the class will participate in a staged debate on these issues for an introductory biology class.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive
R. Fink
Instructor permission required.
Prereq: BIOL-210, BIOL-220, or BIOL-230 and instructor permission.
Advisory: To obtain permission for BIOL-301 please email Professor Fink a list of courses you have taken in biology, ethics, medicine and/or reproductive technologies, and include your reasons for wanting to take this course.

BIOL-307 Vertebrate Anatomy
Fall. Credits: 4
We will study the structure, function and evolution of the diversity of structures that allow vertebrates, including humans, to perform basic functions. We will connect these functions with day-to-day challenges for vertebrates, and we will discuss functional disruption such as disease and trauma. Students are expected to work in groups, as well as view most lectures before class. Class time will be used for active discussion and occasional guest lectures. During lab time, we will dissect many vertebrates and comfort with working with preserved and often smelly specimens is a must. This class requires memorization of many structures in a functional context.
Applies to requirement(s): Math Sciences
R. Keefe
Prereq: 8 credits at the 200 level in Biology. Coreq: BIOL-307L.

BIOL-315 Behavioral Ecology
Not Scheduled for This Year. Credits: 4
In this course, students learn to view and understand animal behavior within an evolutionary context. The mechanistic side of behavior is investigated and students explore how behavioral traits originate and evolve over time. Students will integrate their knowledge of how organisms work with an appreciation of why they work the way they do. At the end of the course, students will understand basic concepts in behavioral biology and know many of the experiments that have facilitated our understanding of this field. They will be able to construct hypotheses and design experiments that address behavioral phenomena. The laboratory portion of this course is based on individual projects.
Applies to requirement(s): Math Sciences
Other Attribute(s): Writing-Intensive
R. Brodie
Prereq: 8 credits of 200-level work from Biological Sciences Coreq: BIOL-315L.
Advisory: BIOL-223 or BIOL-226 strongly recommended.

BIOL-319 Immunology with Laboratory
Not Scheduled for This Year. Credits: 4
The immune system protects the sterile interior of our bodies from the vast diversity of microbes in the outside world, adapting and improving from each encounter. How does it achieve this remarkable feat? This course will investigate the cells, organs, and biochemical signals that comprise innate and adaptive immune systems, as well as how they interact to identify and remove foreign pathogens. Emphasis will be placed on the human immune response to infectious diseases, with examples from clinical case studies and experimental models. The laboratory portion will provide experience with the foundational techniques of immunology research. Additional topics may include: autoimmunity, allergy, vaccination, transplantation, cancer, immune deficiency, and pathogen evasion strategies.
Applies to requirement(s): Math Sciences
R. Lijek
Restrictions: This course is open to juniors and seniors
Prereq: BIOL-210, BIOL-220, or BIOL-230. Coreq: BIOL-319L.

BIOL-321 Conference Course
Selected topics from areas emphasized in the department according to needs of particular students. Study in small groups or by individuals.

BIOL-321AD Conference Course: 'Substance Use Disorder: Addiction and Drug Memory Formation'
Not Scheduled for This Year. Credits: 4
In this course, we will review the contribution of memory processes to substance use disorder. We will review primary research literature and case studies that explore the neuronal plasticity that underlie drug addiction and long-term memory formation. After reviewing the scientific literature, we will examine the overlap between memory and addiction-related behaviors of rodents. This course will enable students to relate changes in neuronal structure and function to drug-associated behavioral changes.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive
A. White
Prereq: BIOL-200, BIOL-210, BIOL-220, or BIOL-230.

BIOL-321BE Conference Course: 'Inquiries in Behavioral Ecology'
Spring. Credits: 4
In this student-centered project-based course, students will design their own animal behavior investigation and prepare a web-based presentation, teaching module, or manuscript. At the end of the course, students will improve their understanding of basic concepts in behavioral biology and develop a deep understanding of the scientific literature in their area of inquiry. We will work on skills that promote supportive research environments, and explore inclusive approaches to science communication.
Applies to requirement(s): Math Sciences
Other Attribute(s): Writing-Intensive
R. Brodie
Prereq: 8 credits of 200-level work from Biological Sciences.
Advisory: BIOL-223 or BIOL-226 strongly recommended.

BIOL-321BX Conference Course: 'The Diverse Biology of Sex'
Fall. Credits: 4
Sex evolved multiple times in nature and is the most common way to reproduce in eukaryotes. This class will explore the diversity of sexual strategies that have resulted in over 500 million years of evolutionary history, diving deeply into mechanisms of sexual differentiation, and the resulting phenotypes. The second half of the class will focus on an exploration of sexual systems that rely primarily on two mating types: female and male. We will discuss the origin of this sexual binary, its usefulness and limitations, the common misunderstandings that are pervasive in modern culture, and how we can better engage with the nuance of biological complexity. We will discuss sex and gender and how they are viewed across disciplinary boundaries. Students will take weekly quizzes on the reading material, keep a journal with their questions and insights, and prepare a capstone presentation on a topic of their choosing.
Applies to requirement(s): Math Sciences
P. Brennan
Prereq: BIOL-223 or BIOL-226.
Advisory: Gender Studies students are welcome to contact the instructor to seek permission.

BIOL-321CE Conference Course: 'Local Community Ecology'
Not Scheduled for This Year. Credits: 4
This field-based lab course will explore local community ecology and biodiversity using our own Mount Holyoke campus in winter as a "living lab." We will explore local community patterns in study sites, identify plant and animal species, and develop research projects that investigate ecological processes and community interactions. Students will learn basic statistical programming using the R environment to analyze collected and available data for independent or group research papers/presentations. Lecture topics will include species/sign identification in winter, study design, niche and neutral theory, eco-evolutionary processes, predator-prey and host-pathogen dynamics, and human impacts on biodiversity. We will discuss the value of biodiversity and threat of climate change from different global perspectives.
Applies to requirement(s): Math Sciences
M. Hoopes
Prereq: Ecology (BIOL-223) or Evolution (BIOL-226).
Notes: Outdoor lab during winter -- please dress appropriately. BIOL-321CE counts as a 300-level course with lab.

BIOL-321EC Conference Course: 'Invasion Ecology'
Not Scheduled for This Year. Credits: 4
Invasive species have become a common focus for land managers and gardeners around the world because some invasive species have decimated local biodiversity. What can we learn about these species, their interactions with local communities, and the dynamics of invasions that will help us manage diversity in a changing world? We will discuss the science and politics behind invasive species and explore the secrets of their success their impacts. This course will include a whole class project or group research projects based on current issues in the literature or local invasive species.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive, Writing-Intensive
M. Hoopes
Prereq: 8 credits above BIOL-200 with BIOL-223 or BIOL-226 or ENVST-200.

BIOL-321EL Conference Course: 'Extreme Life'
Not Scheduled for This Year. Credits: 4
This course will focus on biological systems that push the limits of structural and physiological possibility. For example, midges flap their wings at up to 1000 Hz; bar-headed geese migrate over Mount Everest; deep-sea fish withstand pressures near 300 atmospheres; certain frogs can allow their body temperatures to drop below 0 degrees Celsius. Through readings and discussions we will explore the diverse mechanisms that underlie how organisms reach extreme levels of performance and survive in extreme environments.
Applies to requirement(s): Math Sciences
G. Gillis
Prereq: BIOL-220 or 230 and one additional Biological Sciences course above 200.

BIOL-321FD Conference Course: 'Foundations in Immunology Laboratory'
Spring. Credits: 4
We are surrounded by microbes, both harmful and beneficial. Your immune system keeps you alive by efficiently distinguishing between helpful and harmful and eliminating harmful foreign invaders. It does this in a remarkably adaptive and tightly controlled way. In this laboratory, we will focus on foundational mechanisms of cellular immunology and immunological laboratory techniques including antibody isolation and purification, SDS-PAGE, Western blotting, enzyme-linked immunoassay (ELISA) disease detection and histology.
Applies to requirement(s): Math Sciences
R. Vik, The department
Prereq: BIOL-210, BIOL-220, or BIOL-230.

BIOL-321GE Conference Course: 'Genomics and Bioinformatics'
Fall. Credits: 4
In this course we will examine the structure of genomes and how they evolve, and explore methodologies that rely on genomic and transcriptomic sequencing data. Through in-class discussions we will dive into a number of topics that can be evaluated by sequence analysis such as large-scale mutations in genome structure that impact trait evolution (e.g., gene/genome duplications), the effects of environment on trait expression, identifying genomic loci associated with adaptation, potential environmental impacts of microbial community makeup, and personal genomics. For each topic, we will discuss why genomic and transcriptomic sequencing data are useful and how the data are analyzed. In lab we will gain familiarity with molecular wet-lab techniques and basic bioinformatic skills to conduct selected genomic and transcriptomic analyses.
Applies to requirement(s): Math Sciences
C. Drummond
Prereq: 8 credits at the 200 level in Biological Sciences. Coreq: BIOL-321GEL. Advisory: BIOL-230, BIOL-210, or BIOL-226 strongly recommended. If you believe you have taken equivalent courses in other departments, please contact the instructor for permission.

BIOL-321GT Conference Course: 'Advances in Gene Therapy'
Spring. Credits: 4
The first human gene therapy clinical research in the United States took place in 1990. Since then, there have been significant advances in gene therapy development, but there have also been problems, setbacks and even tragedies. Students in this seminar will read, present, discuss, and write about the primary literature covering both the history and the most recent advances in human gene therapy. Potential topics include early gene therapy attempts, types of vectors and delivery systems, gene therapy for genetic diseases, the use of gene therapy in cancer treatment, and ethical issues surrounding gene therapy.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive
C. Woodard
Prereq: BIOL-210 or BIOL-230.

BIOL-321HG Conference Course: 'Molecular Genetics and Human Genetic Disorders'
Fall. Credits: 4
Mendel's principles of genetic inheritance underpin all the inheritance patterns that we observe and the traits they govern. However, in nature, not all is as it first appears. Many traits seem to diverge from Mendelian genetics until we understand those inheritance patterns more deeply. In this course, we will explore the depths of genetic inheritance by first understanding the mechanisms of these seeming "exceptions of Mendelian inheritance". We will then understand how the molecule of DNA behaves in the nucleus to allow for gene expression and how we study DNA in the lab. Finally, we will discuss human genetic disorders that occur because of deviations in gene expression or DNA behavior but are rooted in Mendelian genetic principles. The capstone experience of the course is a student-group project exploring experimental approaches for diagnosing or treating a human genetic disorder.
Applies to requirement(s): Math Sciences
T. Mennella
Prereq: BIOL-200 and BIOL-210, or BIOL-220 or BIOL-230.

BIOL-321ME Conference Course: 'Molecular Ecology'
Spring. Credits: 4
Over the past quarter century, molecular genetic methods have become increasingly important in ecological research. In this course, we will examine contemporary molecular genetic tools and learn how they can be used to answer ecological questions. Topics will include: reconstruction of ancestral relationships; measuring the size, diversity, and spatial structure of populations; characterization of migration and dispersal patterns; and identification of sensitive or threatened species and populations. We will explore these themes through foundational texts and current scientific literature, and we will analyze molecular genetic datasets in class to gain familiarity with available techniques.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive, Writing-Intensive
J. Andras
Prereq: BIOL-230 (or BIOL-210), and BIOL-223 or BIOL-226.

BIOL-321PB Conference Course: 'Plant Biogeography'
Spring. Credits: 4
What roles do ecology and evolution play in shaping where, when, and how plants are geographically distributed? In this course, we focus on this question by examining plant geographic patterns on both global and local scales. We explore how abiotic and biotic factors affect historical, present, and potential future plant distributions. Together we engage primary literature on topics such as island biogeography, climate change effects on species persistence, and contemporary influences of humans on the movement of plants. In lab we use analytical tools such as phylogenetics and ecological niche modeling to investigate the intersections between plant evolution, geography, and climate change.
Applies to requirement(s): Math Sciences
C. Drummond
Prereq: 8 credits at the 200 level in Biological Sciences or equivalent.

BIOL-321PR Conference Course: 'Pregnancy and the Placenta'
Not Scheduled for This Year. Credits: 4
Pregnancy is a stunning feat of physiology. It is a conversation between two bodies -- parental and fetal -- whose collective action blurs the very boundaries of the individual. In this course we will explore such questions as: what is pregnancy, and how does the ephemeral, essential organ known as the placenta call pregnancy into being? How is pregnancy sustained? How does it end? We will consider the anatomy of reproductive systems and the hormonal language of reproduction. We will investigate the nature of "sex" hormones, consider racial disparities in pregnancy outcome, and weigh the evidence that the intrauterine environment influences disease susceptibility long after birth.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive
S. Bacon
Prereq: 8 credits at the 200 level in Biological Sciences.

BIOL-321RB Conference Course: 'Race and Biology'
Not Scheduled for This Year. Credits: 4
In this student-centered, discussion-based seminar, we will explore current hypotheses about the evolution of human variation, trace the history of how biology has been used in the construction of racial ideologies, and delve into the impacts of racial categorization on human health. We will investigate these themes through readings, videos, class discussions, student expert panels, and research papers. Students taking this course will improve their ability to: engage constructively in scholarly discussions; use verbal and written discourse to explore themes in science; use new knowledge to understand current issues; critically evaluate media information using evidence from scientific studies; and communicate new knowledge.
Applies to requirement(s): Math Sciences
R. Brodie
Prereq: 4 credits of Biological Sciences at the 200 level.

BIOL-321VX Conference Course: 'Outsmarting Pathogens'
Not Scheduled for This Year. Credits: 4
Smallpox, a disfiguring infection called "one of the most devastating diseases known to humanity" by the World Health Organization, was eradicated from the planet through immunization. Polio paralyzed 350,000 children a year until immunization reduced infection by 99%. Why have we succeeded in immunizing against these pathogens but not HIV or the common cold? Students in this seminar will discuss primary literature in immunology, microbiology, and epidemiology to learn how vaccines outsmart pathogens. Study of biological mechanisms will be complemented with exploration of the socioeconomic factors that influence vaccine development and usage. Students' independent research will connect their interests and current events to course concepts.
Applies to requirement(s): Math Sciences
R. Lijek
Prereq: BIOL-230 or both BIOL-210 and BIOL-220.

BIOL-322 Comparative Biomechanics
Not Scheduled for This Year. Credits: 4
The main objective of this course is to explore organismal structure and function via an examination of the basic physical principles that guide how living things are constructed and how organisms interact with their environment. We will use the combined approaches of the biologist and engineer to study the impact of size on biological systems, address the implications of solid and fluid mechanics for animal design, survey different modes of animal locomotion, and learn how biologists working in diverse areas (e.g., ecology, development, evolution, and physiology) gain insight through biomechanical analyses.
Applies to requirement(s): Math Sciences
G. Gillis
Prereq: 8 credits from Biological Sciences except BIOL-200.

BIOL-323 Plant Growth and Development
Fall. Credits: 4
This course is a study of the higher plant, its structure, organization, and development. We will examine the endogenous and environmental factors influencing plant growth and reproduction. Topics include anatomy, hormones and their mode of action, tropisms, photomorphogenesis, and flowering.
Applies to requirement(s): Math Sciences
A. Frary
Prereq: BIOL-200 and two other courses at the 200-level in Biological Sciences.

BIOL-325 Plant Diversity and Evolution
Not Scheduled for This Year. Credits: 4
This course explores the tremendous diversity of the plant kingdom, emphasizing the local flora. Evolutionary relationships are discussed on the basis of comparisons of reproductive biology, morphology, anatomy, cell structure, and molecular biology.
Applies to requirement(s): Math Sciences
C. Drummond
Prereq: 8 credits at the 200 level in Biological Sciences.
Notes: Offered alternate years.

BIOL-327 Microbiology
Spring. Credits: 4
We share planet Earth with an unimaginable number of "invisible" microbial life forms. In this course we will explore the structure, metabolism, genetics, and ecology of microbes, most prominently bacteria. Other microbes, including archaea, eukaryotic microbes, and viruses will also be considered. Whenever possible, the relationship between microbes and humans will be highlighted. Other goals will be for students to become comfortable with scientific primary literature and to hone their communication skills through discussions and written assignments. Finally, the laboratory portion of this course will highlight classic and modern techniques in microbiology.
Applies to requirement(s): Math Sciences
A. Camp
Prereq: BIOL-210, BIOL-220, or BIOL-230. Coreq: BIOL-327L.

BIOL-328 Human Physiology
Fall. Credits: 4
In this class we will learn about the functions of human organ systems and their relationships with each other in health and disease, at both the cellular and tissue levels. We will study the mechanisms that regulate a variety of organ systems and learn how these mechanisms respond to the changing needs of the individual. Because a purely reductive approach often misses important determinants of body function, we will also consider how human health and disease unfold in a person's particular social and cultural context.
Applies to requirement(s): Math Sciences
S. Bacon
Prereq: BIOL-220, BIOL-230, or BIOCH-311. Coreq: BIOL-328L.

BIOL-331 Conservation Biology
Not Scheduled for This Year. Credits: 4
This course focuses on advanced ecological theory applied to conservation. Class will combine lectures and discussions of primary scientific literature. Because Conservation Biology is an applied discipline, we will explore the nuances of management effects in different situations as well as the role of humans in the decline of biodiversity. This year this course will not have a separate lab section or count as a lab course, but the course will still include a large final project that can be collaborative and community-based.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive
M. Hoopes
Prereq: BIOL-223, BIOL-226, BIOL-315, or ENVST-200.

BIOL-333 Neurobiology
Not Scheduled for This Year. Credits: 4
Description: We will study the electrical and chemical signals underlying the generation of the nerve impulse and synaptic transmission. We will then explore neuroanatomy, diseases of the brain and the neuronal circuits underlying learning and memory and sensory perception.
Applies to requirement(s): Math Sciences
A. White
Restrictions: This course is open to juniors and seniors
Prereq: 4 credits from Chemistry or Physics and BIOL-210, BIOL-230. Coreq: BIOL-333L.
Notes: Preference given to seniors

BIOL-337 Symbiotic Interactions
Spring. Credits: 4
From mutualism to parasitism, symbiotic interactions are a universal feature of life. In this seminar we will study the mechanisms underlying symbiotic interactions and consider their significance for the ecology and evolution of organisms. Through foundational texts and current scientific literature, we will explore some of the most spectacular and important examples of contemporary symbioses - from infectious diseases to coral reefs, to infectious diseases, to the vast communities of microbes that live on and in our bodies - and we will learn how symbiosis is responsible for major milestones in the history of life, such as the origin of the eukaryotic cell, the emergence of land plants, and the evolution of sex.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive, Writing-Intensive
J. Andras
Prereq: BIOL-223 or BIOL-226.

BIOL-340 Eukaryotic Molecular Genetics
Fall. Credits: 4
In this course we will examine the role of molecular genetic analysis in the study of phenomena such as human disease (e.g., cancer), animal development, and gene regulation. We will also discuss new techniques for genomic analysis, including the science as well as the health, legal, ethical and moral issues involved. There will be group discussions of original research articles and review articles.
Applies to requirement(s): Math Sciences
C. Woodard
Prereq: BIOL-200 and one of the following: BIOL-210, BIOL-220, or BIOL-230.
Coreq: BIOL-340L.

BIOL-351 Research Methods: Peer Review
Not Scheduled for This Year. Credits: 4
Peer review is the process by which scientists evaluate the integrity of each other's work. It is the backbone of science that justifies public confidence in our work and drives decisions about which research gets published and funded. Just as peer review is integral to science, teaching students how to peer review is integral to their education. This seminar will demystify the review process and give students hands-on experience reviewing manuscripts related to their interests. By critiquing other scientists' work, students will improve their own ability to design experiments, analyze and present data, communicate and see themselves as scientists.
Applies to requirement(s): Math Sciences
Other Attribute(s): Speaking-Intensive, Writing-Intensive
R. Lijek
Restrictions: This course is open to juniors and seniors
Prereq: BIOL-230 or both BIOL-210 and BIOL-220.
Advisory: Students may not take BIOL-321VX concurrently with this course.

BIOL-395 Independent Study
Fall and Spring. Credits: 1 - 8
In this class, students will acquire hands-on experience in diverse aspects of the research process in any field of Biology, from familiarizing themselves with a research topic, generating interesting questions, designing experiments, acquiring technical skills, collecting and analyzing data, to writing and/or presenting their results. To inquire about enrollment, students should fill out the application survey available on the departmental website or on my.mtholyoke. The application is generally available between registration and the end of exams, and faculty meet after exams to place students in labs for the following semester. Decisions depend on lab capacity. A single credit requires an average of 3 hrs of work per week. (Note: Some faculty may require a set weekly meeting time for a portion of this class.)
The department
Instructor permission required.
Notes: NOTE: See safety training restrictions in description of Biological Sciences 295

BIOL-399 Biology Journal Club/Data Hub
Not Scheduled for This Year. Credits: 1
Reading and understanding research reports from the primary scientific literature is an essential skill for any scientist. Likewise, critiquing experimental proposals and freshly-minted data is one of the core components of the pursuit of science. Using the Biology Department Seminar series as a springboard, this course seeks to familiarize students with the process of understanding, appreciating, and critiquing scientific manuscripts. Additionally, drawing on projects being proposed and executed under the auspices of Biology 395, this course seeks to help students develop comfort discussing 'fresh' scientific data. This course will provide a valuable way to connect with active scientists, both developing and experienced, from within and beyond Mount Holyoke.
Applies to requirement(s): Meets No Distribution Requirement
C. Drummond
Prereq: 8 credits in Biological Sciences.
Notes: Repeatable for credit. Credit/no credit grading only. Reading materials will be drawn primarily from research and review articles in the primary scientific literature. Data will be presented by students actively engaged in research projects. We will discuss data and readings as a group in class meetings.