Biology

Chair: Dorothy Lobo, Department of Biology

The Biology curriculum is designed to give students a basic diversified background in the life sciences and prepare them for graduate work, professional school (medicine, dentistry, podiatry, chiropractic, etc.), laboratory work in government and industry, and careers in teaching.

National Biological Honor Society: Beta Beta Beta, Chi Eta Chapter, requires completion of at least ten credits of biology and a 3.2 or better GPA in biology courses.

Department Honors can be earned in Biology based on the following criteria being met:
- Achieving a 3.3 or better overall GPA with a 3.5 or better GPA in biology courses;
- Completing two additional courses at the 300 or 400 level;
- Completing six credits of faculty-directed research and presenting a research thesis.

Programs

Majors
- B.S. in Biology (http://catalog.monmouth.edu/undergraduate-catalog/science/biology/biology-bs)
- B.S. in Biology and Education with Endorsement in Elementary Education (http://catalog.monmouth.edu/undergraduate-catalog/science/biology/biology-education-bs-endorsement-elementary-education)
- B.S. in Biology with a Concentration in Molecular Cell Physiology (http://catalog.monmouth.edu/undergraduate-catalog/science/biology/biology-bs-concentration-molecular-cell-physiology)

Minor
- Biology (http://catalog.monmouth.edu/undergraduate-catalog/science/biology/biology-minor)
- Global Sustainability (http://catalog.monmouth.edu/undergraduate-catalog/science/biology/global-sustainability-minor)

Faculty

Jason E. Adolf, Associate Professor. B.S., Roger Williams University; M.S., University of Hawai’i; Ph.D., University of Maryland. Specializes in phytoplankton ecology and physiology, Harmful Algal Blooms (HABs) and real-time continuous water quality monitoring in the coastal ocean.
jadolf@monmouth.edu

Pedram Daneshgar, Associate Professor. B.A., University of Delaware; M.S., Saint Joseph’s University; Ph.D., University of Florida. Research interests include community and ecosystem ecology of coastal systems including dunes and mangroves, impacts of invasive plant species, and diversity maintenance mechanisms of grasslands.
pdaneshg@monmouth.edu

Ellen Doss-Pepe, Lecturer. B.S., University of Scranton; Ph.D., Rensselaer Polytechnic Institute. Specializes in biochemistry, protein folding and misfolding, and protein degradation. Current interests include the relationship of protein misfolding and degradation as underlying causes of neurodegenerative diseases and the roles of antioxidant proteins in cells during oxidative stress and neurodegeneration.
edoss@monmouth.edu

Bernadette Dunphy, Specialist Professor. Co-Director of the Pre-Professional Health Advising Committee. P.T., D.P.T., University Medicine and Dentistry, NJ. Specializes in physical therapy, sports medicine, and anatomy and physiology. Current interests are integration of clinical skills and case study work with teaching Physiology and Anatomy as well as preparing students for graduate health programs.
bdanphy@monmouth.edu

Keith Dunton, Assistant Professor. B.S., M.S., Ph.D., Stony Brook University. Current research interests are focused on the ecology, management, and conservation of marine fisheries with a specialized focus on species of concern.
kdunton@monmouth.edu

Ivan Gepner, Associate Professor. B.A., Rutgers University; M.A., Ph.D., Princeton University. Specializes in genetics and developmental biology. Current interests include computer applications in biology, especially computer modeling and simulation of natural phenomena.
gepner@monmouth.edu

Martin J. Hicks, Assistant Professor. B.A., San Diego State University; Ph.D., University of California, Irvine. Specializes in genetics, gene therapy and RNA molecular biology. Current research is focused on the generation and genetic delivery of RNA and protein therapeutics to the tumor microenvironment in brain cancer.
mhicks@monmouth.edu

Cathryn Kubera, Assistant Professor. B.S., Cornell University; Ph.D., University of Pennsylvania. Specializes in cell and molecular biology and neuroscience. Current research interests include cell signaling regulation of proliferation, migration, integration and cell death during brain development.
ckubera@monmouth.edu

Kathryn Ann Lionetti, Associate Professor. B.S., Ph.D., State University of New York at Stony Brook. Specializes in microbiology and molecular biology. Current interests include recombinant DNA technology, apoptosis, and applications of molecular biology in clinical diagnostic procedures and emerging viral diseases.
lionetti@monmouth.edu

Dorothy Lobo, Associate Professor and Chair. Co-Director of the Pre-Professional Health Advising Committee. B.A., Immaculate College; Ph.D., The Catholic University of America. Specializes in cell and molecular biology, and signal transduction pathways. Current research includes the regulation of stress signaling pathways during cell proliferation and programmed cell...
death, and the use of crafts and models for teaching molecular biology.
dlobo@monmouth.edu

James P. Mack, Professor. B.S., Monmouth University (Monmouth
College); M.S., William Paterson College; Ed.D., Teachers College,
Columbia University. Specializes in anatomy and physiology. Current
research includes alternative treatment for multidrug-resistant
bacterial infections in health care settings including MRSA, MSSA,
Pseudomonas aeruginosa, E. coli (ESBL), and Enterococcus (VRE).
mack@monmouth.edu

Tiffany Medley, Lecturer. B.S., University of Delaware; M.S., N.J. Institute
of Technology and Rutgers University; Ph.D., City University of New
York. Specializes in environmental policy, estuarine ecology, and
ecosystem restoration. Current research includes evaluating the
abundance and health of wild oysters in the Hudson River Estuary.
tmedley@monmouth.edu

Michael Palladino, Professor.
Vice Provost for Graduate Studies. B.S., The College of New Jersey
(Trenton State College); Ph.D., University of Virginia. Specializes in
male reproductive biology and cell and molecular biology. Current
research includes antimalarial properties of male reproductive
organs, and cellular and molecular responses to ischemia and
hypoxia in the mammalian testis.
mpalladi@monmouth.edu

Karen Pesce, Lecturer. B.A., B.S., M.S., Seton Hall University; Ph.D.,
Rutgers University. Specializes in environmental microbiology.
Current research interests include microbial community analysis
and characterization of novel biodegradative genes from polluted
environments.
kpesce@monmouth.edu

Megan Phifer-Rixey, Assistant Professor. B.S., Duke University; Ph.D.,
University of Pennsylvania. Specializes in evolutionary genomics
with an emphasis on the genetics of adaptation and speciation.
Current research includes genomic and functional approaches to
understanding environmental adaptation in wild house mice.
mphiferr@monmouth.edu

Dennis Rhoads, Professor. B.A., University of Delaware; Ph.D., University
of Cincinnati. Specializes in biochemistry and neuroscience. Current
research on neurobiology of alcohol and drug abuse.
drhoods@monmouth.edu

Sean Sterrett, Assistant Professor. B.Sc., Butler University; M.S., Ph.D.,
Warnell School of Forestry and Natural Resources, University of
Georgia. Specializes in wildlife biology, ecology, management and
conservation with a concentration on reptiles and amphibians.
Current interests include diamondback terrapin ecology and
management on the Jersey Coast and influence of "Big Night"
volunteer effort to mitigate road mortality of migrating amphibians.
ssterret@monmouth.edu

Jeffrey Weisburg, Specialist Professor. B.A., Ph.D., Cornell-Weill Graduate
School of Biomedical Sciences. Specializes in anatomy and
physiology and immunology. Current research involves the use
of nutraceuticals and food derivatives that have pharmacological
properties for treat cancers of the oral cavity and leukemia.
jweiss@monmouth.edu

Courses

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Prerequisite(s)</th>
<th>Term Offered</th>
<th>Course Type(s)</th>
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<tbody>
<tr>
<td>BY-101</td>
<td>Issues and Methods of Biology</td>
<td>3</td>
<td>SC-100</td>
<td>All Terms</td>
<td>None</td>
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<tr>
<td>BY-102</td>
<td>Applications in Biotechnology</td>
<td>3</td>
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<td>NS</td>
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<td>BY-103</td>
<td>Environmental Science</td>
<td>3</td>
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<td>BY-104</td>
<td>Human Biology</td>
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<td>BY-105</td>
<td>Introductory Biology and Human Development</td>
<td>3</td>
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<td>NS</td>
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<td>BY-106</td>
<td>The Brain - Highs and Lows</td>
<td>3</td>
<td>SC-100</td>
<td>Spring Term</td>
<td>None</td>
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<tr>
<td>BY-107</td>
<td>Microbiology in Health and Disease</td>
<td>4</td>
<td></td>
<td>All Terms</td>
<td>None</td>
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</table>

BY-101: Major concepts in biological science and their importance in current society. Methods and approaches to questions in biology. Cannot be used in satisfaction of a major requirement in the Biology program.

BY-102: Introduction for non-science majors. The focus is on basic principles of biotechnology along with an exploration of associated ethical issues. The laboratory component serves to familiarize students with scientific practice.

BY-103: Examines society’s effects on the natural environment and current efforts to address environmental issues in a sustainable manner. Stresses the interdisciplinary nature of environmental issues, and that resolution of environmental problems sustainably involves the application of sound scientific information, but at the same time involves social, political, cultural, and economic values as well.

BY-104: Introductory course for non-science majors. Focus is on basic structure and function of human body systems and diseases of these systems. The laboratory component serves to familiarize students with scientific practice.

BY-105: An introductory-level survey of biology with an emphasis on human biology that includes human development, aging, genetics and other topics selected to support the social work program. An introduction to neurobiology will be provided with applications in mental health. Not for credit toward a major in biology. For Social Work majors only.

BY-106: An introductory neurobiology course designed for non-science majors. The focus is the study of the human brain from the highs of intelligence and creativity to the lows of depression. The brain will also be examined for its roles in drug usage, from the highs of euphoria to the lows of dependence. Topics will include the interplay between genetic and environmental influences that shape the brain and its responses. Not for credit toward a major in Biology.

BY-107: Microorganisms pathogenic for man; emphasizing etiology, modes of transmission and control. Laboratory includes proper collection of specimens, aseptic technique, cultivation, identification, and disposal of microbes. Three hours of class, two hours of laboratory per week.
BY-108  Evolution and the History of Life on Earth  Credits: 3
Term Offered: Spring Term
Course Type(s): NS
Examines evolution both as a process and as a phenomenon. Students will examine how evolutionary processes occur in time, both very short and geological time scales, and how both are studied. Students will review the history of life on earth with emphasis on major lineages such as vertebrates, mollusks, insects and plants, as well as basic geological processes and continental drift during these time periods. Bacterial evolution will be examined in the context of the importance of understanding natural selection and evolution and their impacts on society and medicine. Emphasis will be placed on understanding evolution of groups and processes often cited in creationist arguments, to help students be prepared to enter civil discourse as informed citizens. Evidence of evolutionary change from the fossil record and DNA sequences of organisms will be compared and reviewed.

BY-109  Introduction to Biodiversity and Evolution  Credits: 4
Term Offered: All Terms
Course Type(s): NS
An introductory course for biology majors. Focus is on evolution, phylogeny, taxonomy, origin and diversity of life, physiology of plant and animal systems, and ecological principles. Three hours of lecture and two hours of laboratory per week. Limited to students who are majors in Biology, Chemistry, Mathematics, Computer Science and Software Engineering.

BY-110  Introduction to Cell and Molecular Biology  Credits: 4
Term Offered: All Terms
Course Type(s): NS
For biology majors and other students needing an introduction to the cellular and molecular levels of biology. Includes an introduction to cell structure and function, biochemistry and metabolism, bioenergetics, genetics and cell division, and molecular biology. Three hours of lecture and two hours of laboratory per week. Limited to majors in Biology, Chemistry, Clinical Science, Medical Laboratory Science, Mathematics, Computer Science, Software Engineering, Criminal Justice, Health Studies, and Health and Physical Education.

BY-111  Anatomy and Physiology I  Credits: 4
Term Offered: All Terms
Course Type(s): NS
Study of human systems: structure, function and integration, including chemical and cellular base, integumentary, skeletal, muscular and nervous systems. Laboratory covers human anatomy, microscopy of tissues and organs, and physiological study of living organisms. Three hours of lecture, two hours of laboratory per week. Open to Health Studies, Health Promotion, Health and Physical Education, and Nursing majors only. This course is a non-major level Biology course and cannot be used to fulfill the Biology minor. Students pursuing professional graduate health programs should register for BY-212. Students who have taken BY-112 are not eligible to take BY-212.

BY-112  Anatomy and Physiology II  Credits: 4
Prerequisite(s): BY-111 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): NS
Study of human systems: structure, function and integration, including special senses, digestive, endocrine, cardiovascular, lymphatic and immunity, respiratory, urinary and reproductive. Laboratory covers human anatomy, microscopy of tissues and organs, and physiological study of living organisms. Three hours of lecture, two hours of laboratory per week. Open to Health Studies, Health Promotion, Health and Physical Education and Education, and Nursing majors only. This course is a non-major level Biology course and cannot be used to fulfill the Biology minor. Students pursuing professional graduate health program should register for BY-212. Students who have taken BY-112 are not eligible to take BY-212.

BY-113  Introduction to Structure and Function of Living Systems  Credits: 3
Term Offered: Fall Term
Course Type(s): None
Examines the characteristics of living organisms. Intended primarily for future elementary teachers to provide them with a better understanding of the life sciences they will teach. Content will focus on the structure and function of cells, tissues and organs and life processes. There is an emphasis on understanding heredity, including patterns of inheritance of traits and the molecular basis of heredity, and growth and development. This is an activity-centered/lab course to demonstrate scientific inquiry (questioning, developing hypotheses, gathering data, and drawing reasonable conclusions) and how to use resources and research material in science. BY-113 does not count towards the Biology major or minor requirements.

BY-114  Unity and Diversity of Life  Credits: 3
Term Offered: Fall Term
Course Type(s): None
Intended primarily for future elementary school teachers to provide them with a better understanding of the life sciences they will teach. Examining the interdependence and individuality of organisms in ecosystems, populations and communities and how these organisms change over time due to life cycles, mutations, adaptations and natural selection. Classification of organism will also be covered. This is an activity-centered/lab course to demonstrate scientific inquiry (questioning, developing hypotheses, gathering data, and drawing reasonable conclusions) and how to use resources and research material in science. BY-114 does not count towards the Biology major or minor requirements.

BY-116  The Biology of Nutrition, Aging, and Anti-Aging Nutrition  Credits: 3
Term Offered: Summer Term
Course Type(s): None
Discussions of the theories of aging and the role of nutrition in delaying aging and preventing degenerative disease. Analysis of the scientifically sound, medically reliable evaluation of widely promoted nutritional supplements, including the anti-aging nutrients: vitamins, minerals, amino acids, nucleic acid derivatives, lipids and derivatives, pharmaceuticals and chemicals (BHA, BHT, DMSO, etc.) and other supplements (L-Carnitine, ginseng, etc.)
An introductory microbiology course designed for non-science majors. Students will investigate microbiology in everyday living. Topics will include the role microbes have in health, disease, the environment, and food and beverage production. Attention will be devoted to microbiology related current issues. Students will learn the impact microbes have in society so that they develop awareness, knowledge of and appreciation of microbiology.

BY-198 Special Topics in Biology (100 Level)  Credits: 1-3
Term Offered: Fall Term
Course Type(s): MC, ME
An intensive study of a particular subject or problem in biology to be announced prior to registration. May be conducted in a lecture, seminar, or laboratory format. If there is a prerequisite it will be announced in the course schedule.

BY-201 Introduction to Biotechnology  Credits: 3
Prerequisite(s): By-110 passed with a grade of C- or higher
Term Offered: Spring Term
Course Type(s): MC, ME, MEBP
Introduction to recent advances in biotechnology: the use of living organisms to create products, applications or processes that improve the quality of life for humans and other species. Presents historical and modern applications of biotechnology that impact our everyday lives. An overview of current developments and applications of microbial, agricultural, animal, marine and forensic biotechnology, bioremediation, and medical biotechnology will be presented. Regulatory agencies and policies that govern the biotechnology industry will be discussed, and students will also learn to formulate opinions about ethical, legal and social issues associated with biotechnology.

BY-202 Human Biology and Health  Credits: 3
Prerequisite(s): By-113 and By-114 both passed with a grade of C- or higher
Term Offered: Spring Term
Course Type(s): None
Intended primarily for future elementary school teachers to provide them with a better understanding of the life sciences they will teach. This course will concentrate on basic physiology of the human body looking at the different organ systems. There will be an emphasis on understanding regulation and behavior, such as how the body responds to external stimuli and controls the internal environment. Personal health including nutrition, human disease, microbiology, immunology and substance abuse will be examined. This is an activity-centered/lab course to demonstrate scientific inquiry (questioning, developing hypotheses, gathering data, and drawing reasonable conclusions) and how to use resources and research material in science. By-202 does not count towards the Biology major or minor requirements.

BY-205 Zoology  Credits: 3
Prerequisite(s): By-109 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): None
Provides an introductory survey of vertebrate and invertebrate zoology. Topics covered include taxonomy and classification, anatomy and physiology, behavior and ecology, and evolutionary relationships of the major phyla of the animal kingdom.

BY-209 Environment and Human Health  Credits: 3
Prerequisite(s): By-109 and By-110, both passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): MC, MEBP
Human activities are adversely affecting ecosystems throughout the world. Some of these changes may be deleterious to human health. The purpose of this course is to provide students with an understanding of the relationship between the environment and human health. Specific topics that will be covered are the importance of biodiversity to human health, the relationships between global warming and vector-borne diseases, microbial evolution and resistance of pathogenic organisms, persistent pollutants and toxicity, and the effect of environmental disasters on human health. A focus of this course will be to integrate several areas of biology including microbiology, toxicology, and environmental science.

BY-210 Forensic Genetics and DNA Analysis  Credits: 3
Prerequisite(s): By-110 and CJ-211
Term Offered: Spring Term
Course Type(s): None
Focus on fundamental principles of DNA and genetic analysis and their applications in forensics. Designed for criminal justice majors who have had an introduction to Mendelian and molecular genetics and to DNA structure, but who need more background in the underlying biology of forensic DNA analysis and interpretation. Sources of DNA will be presented along with methods for DNA extraction, amplification of DNA by polymerase chain reaction, analysis of restriction fragment length polymorphisms and short tandem repeats. Open only to Criminal Justice majors.

BY-211 Physiology with Anatomy I  Credits: 4
Prerequisite(s): By-110, CE-111, and CE-112 all passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): None
Lecture and laboratory course Study of Human Systems: Their structure, function and integration. Laboratory covers gross human anatomy and physiology. Three hours of lecture and two hours of laboratory per week. Open only to Biology, Chemistry, Medical Lab Science, Clinical Lab Science, Health, and Psychology majors. Students who have taken BY-211 are not eligible to take BY-111.

BY-212 Physiology with Anatomy II  Credits: 4
Prerequisite(s): By-110, By-211, CE-111, and CE-112 all passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): None
Lecture and laboratory course Study of Human Systems: Their structure, function and integration. Laboratory covers gross human anatomy and physiology. Three hours of lecture and two hours of laboratory per week. Open only to Biology, Chemistry, Medical Lab Science, Clinical Lab Science, Health, and Psychology majors. Students who have taken BY-212 are not eligible to take BY-112.

BY-214 Botany  Credits: 3
Prerequisite(s): By-109 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): None
Characteristics of the major plant groups, principles of plant taxonomy, considerations of evolutionary and ecological relationships. Two hours of class, two hours of laboratory per week.
BY-216 Introduction to Genetics  Credits: 4
Prerequisite(s): BY-110 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): MEBP
Focuses on one of the core concepts of biology; the flow, exchange, and storage of hereditary information. Topics will include principles of classical and molecular genetics, including transmission, arrangement, and alteration of genetic information; structure, function, and regulation of the genetic material; biological variation resulting from recombination, mutation, and population genetics; applications to human heredity. Two 80-minute lectures and one 3-hour lab per week.

BY-220 Environmental Biology and Policy  Credits: 3
Prerequisite(s): BY-109
Term Offered: All Terms
Course Type(s): ME, SUS
Focuses on human use of natural resources and the environment and the problems and impacts that result from those uses. By taking an interdisciplinary perspective, students will gain an understanding of the scientific, political and socioeconomic factors that underlie resolution of these problems.

BY-221 Introduction to Global Sustainability  Credits: 3
Term Offered: Fall Term
Course Type(s): MEBP, SUS
Introduces students to the global, environmental, economic and social foundations of sustainability and the policy and scientific challenges involved with accommodating population growth, development, and resources used while assuring that future generations will have the natural and economic resources to support an enhanced quality of life. An emphasis will be placed on understanding of sustainability principles from multiple perspectives and cross-disciplinary application of sustainable practices. Also listed as PS-223.

BY-223 General Microbiology  Credits: 4
Prerequisite(s): BY-110 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): MEBP
Morphology, taxonomy, physiology, genetics, and control of microorganisms; history of microbiology. Three hours of class, three hours of laboratory per week.

BY-250 Research in Molecular Cell Physiology  Credits: 1-3
Prerequisite(s): BY-110 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): EX5, MC
Faculty-student collaborative research lab course designed to introduce students to the research process. Students will work in small groups under faculty supervision to conduct research on a project in molecular cell physiology determined by the directing faculty member. Students will be involved in the research process by developing hypotheses, planning and carrying out experiments using modern lab techniques, analyzing data, and evaluating resource information. Research may be extended in detail in BY-450. Limited to sophomore Biology majors.

BY-250A Research in Molecular Cell Physiology  Credits: 3
Prerequisite(s): BY-110
Term Offered: Summer Term
Course Type(s): MC
Faculty-student collaborative research lab course designed to introduce students to the research process. Students will work in small groups under faculty supervision to conduct research on a project in molecular cell physiology determined by the directing faculty member. Students will be involved in the research process by developing hypotheses, planning and carrying out experiments using modern lab techniques, analyzing data, and evaluating resource information. Research may be extended in detail in BY-450. Limited to sophomore Biology majors. (BY-250A is for students who do not need experiential education credit. Students who need experiential education credit should register for BY-250.)

BY-251 Field Research Methods in Marine Science  Credits: 3
Prerequisite(s): BY-109, CE-111, and CE-111L, all passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): MEBP
Provides students with hands on experience in marine and coastal research by working on-board small research vessels under real field conditions. Students become familiar with the use and application of standard marine science instruments and sampling devices, as well as data handling, management and analysis techniques.

BY-262 Primate Behavior, Evolution, and Ecology  Credits: 3
Term Offered: Spring Term
Course Type(s): NS
The study of primatology, which examines the lifeways, biology, and behavior of our closest living relatives. Various topics will be explored including taxonomy and classification, diet, behavior, grouping patterns, locomotion, and land usage patterns of monkeys, apes and prosimians. These topics will be explored within the frameworks of natural selection, sexual selection, and evolution. Also listed as AN-262.

BY-290 Open Water Scuba Certification Course  Credits: 2
Term Offered: Spring Term
Course Type(s): OUTDR
The Open Water Scuba Certification course entails completion of the Professional Association of Diving Instructors (PADI) Open Water Diver course, the world's most popular scuba course. Completion of this course leads to PADI scuba certification as an open water diver. Limited to 8 students. Skills course: Outdoor Pursuits (Individual). This is a pass/fail course. Also listed as PE-290.

BY-298 Special Topics in Biology (200 Level)  Credits: 1-3
Term Offered: All Terms
Course Type(s): MC, ME
An intensive study of a particular subject or problem in biology to be announced prior to registration. May be conducted in a lecture, seminar, or laboratory format. Please note: when Scuba is offered as BY 298 it does not carry a course type of MC. If a prerequisite is required it will be announced in the course schedule.
BY-299  Independent Study in Biology  Credits: 1-3
Term Offered: All Terms
Course Type(s): None
Principles of independent study and research; critical review of published work on a designated topic in the biological sciences or original research; preparation of a research paper or review article in publishable format or oral presentation of research results. Laboratory or field work arranged as needed. Requires submission and approval of an "Application for Independent Study" (an e-form is available on WEBAvisor) with a faculty mentor. To take this course, students need prior permission of the directing professor and department chair and Sophomore or higher standing in Biology (Total of all independent study credits to be counted towards the degree may not exceed six, unless approved by the Dean).

BY-301  Vertebrate Histology  Credits: 3
Prerequisite(s): BY-205 passed with a grade of C- or higher
Term Offered: Fall Term
Course Type(s): MC
Microscopic structure of vertebrate cells, tissues, and organs, emphasizing microscopic anatomy of the human body. Laboratory identification of vertebrate tissues. Two hours of class, three hours of laboratory per week.

BY-303  Biological Oceanography  Credits: 3
Prerequisite(s): BY-205 and BY-214 both passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): MEBP
Biological Oceanography provides an introduction to the biology of life in the sea. Biological Oceanography emphasizes the fundamental oceanographic processes that control the distribution and abundance of living organisms in the sea. Two hours of lecture and two hours of lab per week.

BY-305  Ichthyology  Credits: 3
Prerequisite(s): BY-205 and BY-214 both passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): MEBP
A survey of all extant group of fishes, including sections on evolution, taxonomy, form and function, biogeography, behavior, and ecology. Laboratory component will include required dissections. Some field trips may be scheduled outside of class time. Two hours of lecture and two hours of lab per week.

BY-310  Biochemistry and Lab  Credits: 4
Prerequisite(s): CE-242 passed with a grade of C- or higher; and EN-101 and EN-102 or permission of the instructor
Term Offered: All Terms
Course Type(s): MEBP, WT
A survey of the major principles of biochemistry with attention to the structures and functions of proteins, carbohydrates and fats; the major pathways for metabolism of proteins, carbohydrates and fats; and the biochemical basis of DNA replication and gene expression. Laboratory provides hands-on experience in selected biochemical techniques with an emphasis on protein characterization. Designed to provide practice and critique in effective writing and appropriate writing style and format.

BY-314  Topics in Horticulture  Credits: 3
Term Offered: All Terms
Course Type(s): MC, ME, MEBP
Principles and practices of plant culture; practical experience through greenhouse projects; the horticulture industry and career possibilities; field trips to places of horticultural interest. Two hours of class, three hours of laboratory per week. Field trips arranged.

BY-317  Tropical Island Ecology  Credits: 3
Term Offered: Spring Term
Course Type(s): EX5, ME, MEBP, NS
A field course focusing on investigations of plants, animals, and natural ecosystems of the Bahamas with emphasis on marine ecosystems, island ecology, resource management, and sustainable development.

BY-324  Applied Microbiology  Credits: 4
Prerequisite(s): BY-223 passed with a grade of C - or higher
Term Offered: Spring Term
Course Type(s): MC, ME, MEBP
Microorganisms of food, water, soil, dairy products, industrial processes, disease, and genetic engineering. Three hours of class, three hours of laboratory per week.

BY-341  Marine Biology  Credits: 4
Prerequisite(s): BY-205 and BY-214, both passed with a grade of C- or higher
Term Offered: Fall Term
Course Type(s): None
Biota of the oceans and inshore waters with an emphasis on ecology, functional morphology, and marine and estuarine habitats. Basic oceanography is also included. Marine biology is a laboratory course supported by lectures and field projects. Field trips outside of class time may be required.

BY-342  Coastal Zone Management  Credits: 3
Prerequisite(s): BY-220 passed with a grade of C- or higher, and EN-101 and EN-102
Term Offered: Spring Term
Course Type(s): ME, WT
Focus on the impact of increased demand on the coastal environment based on the theme that management of an environment for multiple purposes requires an understanding of the effects of use and exploitation throughout that environmental system and how decisions can be made in an effective, equitable manner.

BY-360  The Business of Biotechnology: From the Bench to the Market  Credits: 3
Prerequisite(s): Limited to junior or senior biology majors or other students with approval by the course faculty. BY-110 or BY-201 completed with a grade of C- or higher. For Business majors: BY-102, BY-110, or BY-201, completed with a grade of C- or higher
Term Offered: Fall Term
Course Type(s): MC
Tomorrow’s biotechnology leaders require a breadth of cross-functional knowledge to face the scientific, regulatory, and financial challenges for developing biotech companies in the 21st century. This course will provide students with a strategic overview of the business of biotechnology, exploring the integration of science, technology, the regulatory framework, financial requirements, and market forces that drive the industry. The course will introduce students to basic aspects of molecular biology related to product development in the biopharmaceutical industry, and the regulatory and financial requirements for drug development, placing emphasis on real-world application and the challenges of bringing new biotechnology drugs to market for the treatment of human disease. Limited to junior or senior biology majors or other students with approval by the course faculty. BY-110 or BY-201 completed with a minimum grade of C- or higher is required. For Business majors BY-102, BY-110, or BY-201, completed with a minimum grade of C- or higher are required.
BY-370 Cell Biology Credits: 3
Prerequisite(s): BY-310 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): None
In-depth study of biology at the cellular and subcellular levels. Integrates principles of biochemistry into an understanding of cell structure and physiology.

BY-375L Laboratory in Molecular and Cellular Biology Credits: 3
Prerequisite(s): BY-310 passed with a grade of C- or higher, and EN-101 and EN-102 or permission of the instructor
Term Offered: All Terms
Course Type(s): MEBP, RD, WT
Designed to introduce biology majors to basic laboratory techniques used in molecular and cellular biology. Students will develop proficiency in modern techniques in molecular and cellular biology including micro pipetting, bacterial culturing and sterile technique, solution preparation, DNA extraction, restriction digestion of DNA, DNA sub cloning, gel electrophoresis of nucleic acids and proteins, nucleic acid blotting and analysis with molecular probes, DNA sequencing, polymerase chain reaction (PCR), immunological techniques for analysis of proteins, mammalian cell culture and transfection, and DNA sequence analysis on the Internet. The use of traditional and Internet information resources for molecular and cellular biology will also be emphasized. The presentation of data in both oral and written form will be emphasized. Partially fulfills the reasoned oral discourse requirement for biology and biology/molecular cell physiology.

BY-388 Cooperative Education: Biological Sciences Credits: 1-4
Prerequisite(s): 6 credits in Biology, overall G.P.A. of 2.00 and Junior standing or higher
Term Offered: All Terms
Course Type(s): EX2
Provides an opportunity for students to fulfill the Experiential Education requirement by pursuing a short-term cooperative work experience in biology or for students who, are currently employed in a biological or medical field, to integrate the work with a related academic component. May be repeated for credit. This is a pass/fail course. Departmental approval is required to take this course.

BY-389 Internship in Biological Science Credits: 1-3
Prerequisite(s): Overall GPA of 2.00; Junior status, at least six credits of biology courses and departmental approval
Term Offered: All Terms
Course Type(s): EX1
Complements the practical experience gained by students at internship sites, such as hospitals, clinics, private practices, research laboratories, environmental agencies, museums, botanical gardens, and zoos with a significant set of academic goals. May be repeated once for credit. This is a pass/fail course.

BY-395 Seminar in Marine and Environmental Biology Credits: 3
Term Offered: Spring Term
Course Type(s): MEBP, RD
A seminar-style course for juniors in the Marine and Environmental Biology and Policy (MEBP) major.

BY-398 Special Topics in Biology (300 Level) Credits: 1-3
Prerequisite(s): BY-110
Term Offered: All Terms
Course Type(s): MC, ME
An intensive study of a particular subject or problem in biology to be announced prior to registration. May be conducted in a lecture, seminar, or laboratory format. If a prerequisite is required it will be announced in the course schedule.

BY-399 Independent Study in Biology Credits: 1-3
Term Offered: All Terms
Course Type(s): None
Principles of independent study and research; critical review of published work on a designated topic in the biological sciences or original research; preparation of a research paper or review article in publishable format or oral presentation of research results. Laboratory or field work arranged as needed. Requires submission and approval of an "Application for Independent Study" an e-form is available on WEAdvisor) with a faculty member. Students must have prior permission of the directing professor and department chair; and Junior standing in Biology to take this class. (Total of all independent study credits to be counted towards the degree may not exceed six, unless approved by the Dean.)

BY-404 Animal Behavior Credits: 3
Prerequisite(s): PY-103 or BY-103 or above, passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): None
Why and how animals(vertebrates and invertebrates) do the things they do. Emphasizes rules governing the evolution of behavior rather than mere description of how animals behave. Focus includes behavioral ecology, habitat selection, feeding strategies, predator-prey tactics, mating systems and strategies, social behavior (conflict and cooperation) and population dynamics. The course begins with an historical overview and ends with the evolution of human behavior. Also listed as PY-404.

BY-404L Animal Behavior Laboratory Credits: 1
Prerequisite(s): BY-311 and BY-320 passed with a grade of C or higher
Co-requisite(s): BY-406
Term Offered: Spring Term
Course Type(s): None
Methods in the study of animal behavior. Projects on instinctive behavior, early experience, learning, dominance relationships, territoriality, behavioral ecology, and sociobiology. One all-day field trip and an independent project will be required.

BY-406 Introduction to Neurosciences Credits: 3
Prerequisite(s): 6 credits of Biology or Chemistry courses
Term Offered: Spring Term
Course Type(s): MC, ME
The organization of the nervous system in terms of its anatomy, physiology, neurochemical correlates, and evolution; behavioral processes such as attention, sleep, motivation, instinct, learning, and languages.

BY-406L Neurosciences Laboratory Credits: 1
Co-requisite(s): BY-406
Term Offered: Fall Term
Course Type(s): MC
Human and animal neuroanatomy; surgical techniques, including lesion, stimulation, and perfusion; histology; drug and hormone administration; physiological recording techniques. Three hours per week.

BY-410 Molecular Biology Credits: 3
Prerequisite(s): BY-310 or BY-423 passed with a grade of C- or higher, or CE-331 passed with a grade of C- or higher
Term Offered: Spring Term
Course Type(s): None
Provides a detailed examination of the central dogma of molecular biology - DNA replication, transcription, reverse transcription, and translation - in viruses, prokaryotes, and eukaryotes. Standard techniques of biotechnology used to study molecular biology will be emphasized. Additional topics, including eukaryotic chromosome structure and regulation of gene expression, will also be discussed.
BY-412  Vertebrate Physiology and Laboratory  Credits: 3
Term Offered: Spring Term
Course Type(s): MC
Comparative vertebrate physiology, with emphasis on osmotic regulation, nutrition, circulation, respiration, and muscle physiology. One hour of class, four hours of laboratory per week.

BY-420  Ecosystems Analysis  Credits: 3
Prerequisite(s): BY-205, BY-214 and BY-440 all passed with a grade of C- or higher and Senior standing in the MEBP major
Term Offered: Spring Term
Course Type(s): EX5, MEBP
Applied ecology course combining lectures, hands-on field and laboratory activities, and focused data collection and analysis to allow students to understand techniques used by scientists and managers in order to provide information necessary to perform key functions associated with ecosystem management.

BY-423  Genetics  Credits: 4
Prerequisite(s): BY-110 passed with a grade of C- or higher and at least Junior status
Term Offered: All Terms
Course Type(s): MEBP
Lecture of classical and molecular genetics; applications in human heredity; structure and function of genetic material and gene regulation, laboratory exercises using Drosophila, bacteria, and bacterial viruses as experimental material. Three hours of lecture, three hours of laboratory per week.

BY-424  Evolution  Credits: 3
Prerequisite(s): BY-109 and BY-110, both passed with a grade of C- or higher
Term Offered: Spring Term
Course Type(s): MC, ME, MEBP
Synthetic theory of evolution, including sources of genetic variability, Hardy-Weinberg, natural selection, genetic drift, balanced polymorphism, molecular evolution, speciation and the origin of life. Three hours of class per week.

BY-425  Principles of Developmental Biology  Credits: 4
Prerequisite(s): BY-110 and BY-423
Term Offered: Spring Term
Course Type(s): None
The study of major morphological changes during development and the analysis of causative factors. Model organisms used in the study of development include: sea urchin, nematode worm, Drosophila, frog, and mouse. Topics include: fertilization, growth, differentiation, morphogenesis, regeneration, and tissue interactions. The genetic control of development will be emphasized.

BY-427  Cancer Biology  Credits: 3
Co-requisite(s): BY-370 or BY-410
Term Offered: All Terms
Course Type(s): MC
Course will provide students with a foundation in the molecular biology of cancer. Topics include the genetic and molecular changes that lead to transformation, oncogenes, tumor suppressors, viruses, angiogenesis, metastasis, tumor immunology, and clinical trials and treatments. Primary literature and review articles, as well as field work, will be used to understand advances in cancer biology and treatment.

BY-431  Immunology  Credits: 3
Prerequisite(s): BY-110 passed with a grade of C- or higher
Term Offered: Spring Term
Course Type(s): MC
Components of the immune system; biological individuality and the recognition of "foreignness"; structure of antibodies; cellular immunity and graft rejection; blood group antigens; the immune system and cancer development; immunogenetics; clinical and experimental applications. Two hours of class, two hours of laboratory per week.

BY-440  Ecology  Credits: 4
Prerequisite(s): BY-205 or BY-214, and BY-220 all passed with a grade of C- or higher, and EN-101 and EN-102 and Senior standing
Term Offered: Fall Term
Course Type(s): MEBP, WT
Lecture and laboratory course examining the concepts of ecology and evolutionary biology, the interaction of organisms and their environment, population ecology, community ecology, and ecosystems dynamics. 3 hours of lecture and 3 hours of lab/field work per week.

BY-442  Natural Resource Conservation and Management  Credits: 3
Prerequisite(s): BY-220 and BY-440, both passed with a grade of C- or higher, and EN-101 and EN-102
Term Offered: All Terms
Course Type(s): ME, MEBP, SUS, WT
The principles of ecology and resource management are used to analyze contemporary environmental problems and highlight legislative, technological, and methodological solutions to environmental problems that move us toward a sustainable society.

BY-450  Research in Molecular Cell Physiology  Credits: 1-3
Prerequisite(s): BY-310 passed with a grade of C- or higher
Term Offered: All Terms
Course Type(s): EX5, MC
A faculty-student collaborative research lab course. Students will work in small groups under faculty supervision to conduct comprehensive research on a project in molecular cell physiology determined by the directing faculty member. Students will experience all aspects of the research process, from developing hypotheses, planning and carrying out experiments using modern lab techniques, and analyzing data, to preparing research results for publication. May be taken to extend research initiated in BY-250. May be repeated for a maximum of six credits. Limited to Junior or Senior biology majors.

BY-450A  Research in Molecular Cell Physiology  Credits: 3
Prerequisite(s): BY-310
Term Offered: Summer Term
Course Type(s): MC
A faculty-student collaborative research lab course. Students will work in small groups under faculty supervision to conduct comprehensive research on a project in molecular cell physiology determined by the directing faculty member. Students will experience all aspects of the research process, from developing hypotheses, planning and carrying out experiments using modern lab techniques, and analyzing data, to preparing research results for publication. May be taken to extend research initiated by BY-250A. (Students who do not need experiential education credit should register for BY-450A. Students who need experiential education credit should register for BY-450.) This course is repeatable for credit. Limited to Junior or Senior biology majors.
BY-475  Endocrinology  Credits: 3
Prerequisite(s): BY-310 or twelve credits in Biology
Term Offered: Spring Term
Course Type(s): MC, ME
Introduction to biochemical, molecular, and physiological aspects of the vertebrate endocrine system and mechanisms by which hormones maintain homeostasis in animals, including humans. Topics to be studied include: molecular structures; biochemical properties and interactions of different categories of hormones and their receptors; major endocrine systems that regulate reproduction, growth, development, and metabolism; neuroendocrinology; and pathophysiology of the endocrine system. Hormones and organs that influence processes such as calcium homeostasis, digestion, salt balance, carbohydrate metabolism, and sex differentiation and development will be examined. Endocrine regulation of male and female reproductive organs and reproduction will also be discussed, including the hormonal control of fertilization, implantation, placental function, pregnancy, parturition, lactation, and contraception.

BY-488  Cooperative Education: Biological Sciences  Credits: 1-3
Prerequisite(s): 6 credits in Biology, overall GPA of 2.00, and Junior standing
Term Offered: Spring Term
Course Type(s): EX2
Provides an opportunity for students to fulfill the experiential education requirement by pursuing a short-term cooperative work experience in biology or who are currently employed in a biological or medical field to integrate the work with a related academic component. May be repeated for credit. Departmental approval is required to take this course.

BY-489  Internship in Biological Science  Credits: 3
Prerequisite(s): 6 credits in Biology, Junior standing and a minimum G.P.A. of 2.00
Term Offered: All Terms
Course Type(s): EX1
Complements the practical experience gained by students at internship sites, such as hospitals, clinics, private practices, research laboratories, environmental agencies, museums, botanical gardens, and zoos with a significant set of academic goals. May be repeated once for credit. Departmental approval is required to take this course. This is a pass/fail course.

BY-495  Senior Seminar  Credits: 1
Prerequisite(s): completion of 90 credits; for Biology majors only
Term Offered: All Terms
Course Type(s): RD
A seminar course with presentations by guest scientists as well as students. Gauges students' abilities to draw upon a broad background of coursework and experience to organize, present, discuss, and evaluate topics of current interest in biology.

BY-498  Special Topics in Biology (400 Level)  Credits: 1-3
Term Offered: All Terms
Course Type(s): MC, ME
An intensive study of a particular subject or problem in biology to be announced prior to registration. May be conducted in a lecture, seminar, or laboratory format. If a prerequisite is required it will be announced in the course schedule.