# BIOLOGY DEPARTMENT
# COURSE DESCRIPTIONS
# FALL 2017
# 1181

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**Biology 106** Ocean Life (3 credits) Parks

MWF 11:40-12:35 001 LSC

Description: Marine science sits at the intersection of research, technology, conservation and exploration. This
course provides an introduction to the biology of the diverse organisms that live in the ocean, applications of cutting edge technology to their study, recent scientific discoveries, and the science behind current global conservation issues.

Textbook: TBA Prerequisites: none
Class size: 200 Frequency of Offering: Every other Fall semester

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**Biology 121** General Biology I (4 credits) Wiles & Staff

Lecture - Monday AND Wednesday 10:35-11:30 am OR 12:45-1:40 pm Giff Aud
Lab – One 3-hour section per week (simultaneous lab and discussion)

Description: Required entry-level course for biology majors and the first of a two-course sequence comprising a survey of essential biological concepts ranging from the molecular level to global ecology. Two lectures and 1 combined lab/recitation section per week. Students in Biology 121 will explore the nature of science and the diversity of organisms within a framework of major themes including the flow and regulation of energy and information within living systems, and the central and unifying concept of evolution. Efforts will be made to relate key concepts to model organisms for research and practical examples such as diseases and environmental issues.

**Required Materials**:
Textbook: Campbell Biology General Biology I and II, Custom Edition for Syracuse University, available at SU bookstore only.
Exams: 4 per semester (3 on Monday evenings, 1 during final exam week) - multiple choice; essays, quizzes, papers and reports in lab/recitation groups.
Class size: 800 limit Frequency of Offering: Each fall semester

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**Biology 200** Special Topics in Research (3 credits) Sloane/Wiles

Description: This course will prepare students to engage with scientific research. In a format similar to upper-division and graduate level seminars, first and second year students will learn how to read and understand scientific papers, including those reporting on research performed in labs at Syracuse University. Students will have the opportunity to interact with members of laboratories on campus and explore possibilities for undergraduate research.

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**Biology 211** Introduction to Neuroscience (3 credits) Jones

MW 12:45-2:05 011 LSC

Description: This course is an introduction to the mammalian nervous system, with emphasis on the structure and function of the human brain. Students interested in the Neuroscience Integrated Learning Major should know that this course is one of two possible entry-level required courses for that major. Topics include the cell biology and function of nerve cells and associated cells such as glia, selected sensory systems, and control of movement. Discussion of brain diseases and brain pathology will be used to illustrate brain function and structure concepts. Two lectures/week will be taught using Team Based Learning and students will spend most of class time working in teams to solve case study problems as well as engage in other team learning activities that promote deeper understanding of basic neuroscience concepts.

Prerequisites: High school biology and chemistry
Class size: 45

**Biology 216** Anatomy and Physiology I (4 credits) Sweet

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|---|---|---|---|---|
| Lecture: | 001 | MW | 12:45-2:05 | 001 LSC |
| Labs: | 002 | W | 8:00-10:00 | 308 LSC |
| | 003 | W | 10:35-12:35 | 308 LSC |
| | 004 | T | 8:00-10:00 | 308 LSC |
| | 008 | T | 10:20-12:20 | 308 LSC |
| | 010 | W | 3:45-5:45 | 308 LSC |
| Recitations: | 005 | Th | 5:00-6:20 | 300 LSC |
| | 006 | F | 12:45-2:05 | 300 LSC |
| | 007 | M | 8:00-9:20 | 300 LSC |
| | 009 | Th | 5:00-6:20 | 011 LSC |
| | 011 | F | 12:45-2:05 | 214 LSC |

Description: An introduction to the structure and function of human tissues, organs and systems. The course is designed with an emphasis on physiological functions and the role of anatomical form in these processes. Topics include skeletal & muscle structure & function; neural & integumentary systems. Exercises will include laboratory demonstrations of organ/system models, histology, interactive computer experiments and non-invasive experiments on human subjects.

Textbook: VanPutte, Regan & Russo, Seeley's Anatomy & Physiology ($10^{th}$ ed.)
Prerequisites: Bio 121-123 or equivalent
Grading: Weekly laboratory reports, Midterm & Final, plus weekly quizzes
Class size: 120 Frequency of Offering: Fall semesters

**Biology 221** **Peer Led Team Learning** (2 credits) Snyder

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|---|---|---|---|
| 001 | T | 11:00-11:55 | 126 LSC |
| 002 | Th | 9:30-10:25 | 126 LSC |

Course Description: A course that relates educational research literature on students and learning to classroom applications in problem solving activities. Students are prepared to be peer leaders of a small, problem-solving group of students by attending weekly one-hour meetings and participating in Blackboard and in-class discussion groups. Peer leaders are then responsible for holding a 1-hr problem solving session each week and keeping record of attendance for their group sessions.

**BIO 316** Anatomy & Physiology I for Biology Majors (4 credits) Sweet

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|---|---|---|---|---|
| Lecture | 001 | MW | 12:45-2:05 | 001 LSC |
| Laboratory | 002 | F | 12:45-3:45 | 308 LSC |
| Laboratory | 003 | F | 8:25-11:25 | 308 LSC |

Description: Anatomy and Physiology I, for Biology and Biochemistry majors only. The course incorporates a three-credit laboratory that can be applied to the Biology major, unlike BIO 216. A combined laboratory and recitation section will meet on Fridays. Laboratory exercises include a cat dissection, microscopy, virtual physiology experiments and other activities appropriate for a 300-level course.

Textbooks: VanPutte, Regan & Russo, Seeley's Anatomy & Physiology (10th ed.), McGraw Hill.

Rust, A Guide to Anatomy & Physiology Lab (2nd ed.), Southwest Educational Enterprises.

Sebastiani & Fishbeck, Mammalian Anatomy the Cat (2nd ed.) Morton Publishing Company.

Prerequisites: Bio 121-123 or equivalent

Grading: Weekly quizzes and midterm and final exams. Understanding of laboratory material will be evaluated with 2-3 laboratory practicals. Class size: 48 Frequency of Offering: Fall semesters

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**Biology 327** Cell Biology (3 credits) Erdman/Silver

TTh 11:00-12:20 Gifford Auditorium

Description: Cell structure, molecular biology of eukaryotic cells, cytoskeletal organization and function, cell division cycle, membrane structure and function, cell-cell interactions, cell differentiation and regulation.

Textbook: Essential Cell Biology, 4th ed., by Alberts et al. (Garland Publishing, 2013); Turning Technologies Response Card "Clicker".
Prerequisites: BIO 121, CHE 106. Class size: 350 Frequency of Offering: Every Fall semester

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**Biology 345** Ecology & Evolution (3 credits) Fridley/Friedman/Frank

TTh 9:30-10:50 001 LSC

Description: A broad survey course designed to introduce the student to the topics of ecology and evolutionary biology. The lectures will cover evolutionary processes, natural selection and adaption, phylogenetics, population ecology, community ecology and ecosystems. Ecology and Evolution is part of the required core curriculum of the Biology Department.

Textbooks: *Evolution: Making Sense of Life*, by Zimmer and Emlen (Roberts & Co. Publishing);
*SimUText Ecology*, custom text, (SimUText publishing)
Prerequisites: 121/123 or equivalent Exams: Four
Class size: 239 Frequency of Offering: Fall semesters

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**Biology 355** General Physiology (3 credits) Tupper

TTh 11:00-12:20 105 LSC

Description: A lecture course on the physiology of higher animals including circulation, regulation of body fluids, nervous system, sensory systems, muscle, cardiac function and digestion.

Textbook: *Human Physiology*, Vander, Sherman & Luciano, 13th Edition, 2012.
Prerequisites: Bio 121/123; Che 106, 107 Class Size: 108
Frequency of Offering: Each semester

**Biology 360** Biology Laboratory Assistant (1 credit) TBA

Description: Students who have completed an upper-division 3-credit hour lab may receive one credit hour for assisting in the teaching of laboratories. This opportunity is especially appropriate for students considering teaching careers. May be repeated once for credit.

M 3:45-4:40 134 LSC

Textbook: None
Prerequisites: Permission of instructor in advance.
Examinations: None
Grade: A-F based upon participation & performance
Frequency of Offering: Each semester

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**Biology 400-001/600-001** Seminar in Epigenetics of Human Health & Disease (3 credits) MacDonald

MW 3:45-5:05 214 LSC

Description: The epigenome encodes information above and beyond the sequence of DNA, acting at the interface between genes and the environment. This course will explore how epigenetic modifications influence our health and modify our risk of disease, including neurodevelopmental and neurodegenerative disorders, heart disease, and obesity. Seminar format including lectures, discussions, student presentations, and various writing assignments.

Prereqs: BIO 326 & 327; BIO 443 or 462 recommended. Jrs. & Srs. Only.
Class size: 15

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**Biology 400/600-002** Isotopic Approaches in Global Change Ecology (3 credits) Becklin

TTh 2:00-3:20 156 LSC

Description: Natural changes in atmospheric composition and climate have had major impacts on individual organisms and ecosystem functioning over geologic time. In addition to these natural changes, human activities have dramatically altered the functioning of current ecosystems, and this is only expected to increase into the future. For this course, we will discuss basic research addressing the effects of climate and atmospheric changes on both current and ancient ecosystems, with specific emphasis on studies that use stable isotope chemistry to evaluate ecological and physiological responses of biota. Al part of this course, students will learn fundamental principles of isotope behavior and chemistry n natural systems, critically evaluate scientific studies that apply isotope chemistry to global change questions, and conduct authentic isotope research to learn basic methods of isotope sample preparation and data interpretation.

Class size: 15 Jrs. & Srs. Only

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**Biology 400/600-003** Seminar in Cell Biology & the Cytoskeleton (3 credits) Langford

TTh 2:00-3:20 300 LSC

Description: Seminar course will cover the cell biology of the neuronal cytoskeleton in health and disease. Topics will include studies of brain diseases that affect learning and memory such as Alzheimer's Disease. The primary focus will be on the actin cytoskeleton and the molecular motors of the myosin family. Advances in imaging techniques that allow real-time observation of cell migration and dynamics of the actin cytoskeleton will be presented. Topics will include cell migration, synaptic plasticity and axonal transport. Seminar format including lectures, discussions of current papers, student presentations, and various writing assignments.

Class size: 10 Jrs. & Srs. Only

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**Biology 400-004,005** Ecosystem Ecology Lab (3 credits) Frank/Fridley

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|---|---|---|---|---|
| -004 | Lec | M | 12:45-1:40 | 306 LSC |
| -005 | Lab | W | 12:45-4:45 | 306 LSC |

Description: In this course students will learn to measure plant, soil, and ecosystem properties associated with global warming, the spread of invasive species, deforestation, and environmental pollution. Lab activities focus on monitoring trees and shrubs in the campus Climate Change Garden, including measurements of photosynthesis and leaf behavior, root growth, and associated animal and microbial relations. Students will also develop models of forest growth by collecting data in natural forest stands in nearby Green Lakes State Park. Students will develop an understanding of the scientific method by conducting group projects that involve data analysis and class presentations.

Prerequisite: BIO 345 Jrs. & Srs. Only

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**Biology 419** Jr/Sr Thesis Seminar (1 credit) Althoff

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|---|---|---|
| T | 5:00-6:00 | 106 LSC |

Description: Seminar course with student presentations on their research projects. Open to all science students planning to write a biology-related thesis on their research project. Required of students in the Distinction in Biology and Biotechnology Programs. May be repeated for credit up to four times.

Level of Presentation: Junior-Senior. Class size: Varies Frequency of Offering: Every semester

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**Biology 422** Bioinformatics for Life Scientists (3 credits) Welch

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|---|---|---|---|---|
| 001 | Lecture | M | 12:45-1:40 | 214 LSC |
| 002 | Lab | W | 5:15-9:15 | 105 LSC |

Description: Bioinformatics and how to apply it to biological research. As a lab course emphasis will be on the hands-on use of bioinformatics tools to solve relevant biological problems.

Prerequisite: BIO 326.

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**Biology 435** Genetics Laboratory (3 credits) Hall

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|---|---|---|---|
| 001 Lec | T | 2:00-3:20 | 208 LSC |
| 002 Lab | Th | 2:00-5:00 | 208 LSC |

Description: Students will gain experience in genetic methods and analyses using various model organisms, such as budding yeast (*Saccharomyces cerevisae*), fruit flies (*Drosophila melanogaster*), nematodes (*Caenorhabditis elegans*), and mustard plants (*Arabidopsis thaliana*). Experiments will include gene mapping, phenotypic analysis, transformation, complementation, population genetics, and an introduction to molecular biology.

Prerequisites: BIO 326 and 327
Textbook: None required, but a general genetics textbook would be a useful reference.
Class size: 24

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**Biology 437/637** Developmental Neuroscience (3 credits) Lewis

TTh 3:30-4:50 214 LSC

Description: A seminar format course including discussions, student presentations and writing assignments that provides an introduction to the Developmental Neuroscience primary research literature. We will cover general principles of how a functioning nervous system is made in developing animals. Topics will be focused mainly on the central nervous system with many examples drawn from vertebrate model systems. Specific topics will potentially include how neural tissue is made, how the spinal cord is patterned, how nerve cells (neurons) acquire distinct fates, and how neurons know when and where to extend their axons.

Prerequisites: Bio 326, Bio 327; Bio 503 &/or Bio 211 highly recommended. Jrs. & Srs. only

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**Biology 447** Basic Immunology (3 credits) Fondy

TTh 2:00-3:20 105 LSC

Description: Humoral and cell-mediated immunity. Antigens and T-cell receptor structure, function, and diversity. Cells and tissues of the immune system. Cytokines, cytokine receptors, and immune regulation. Major histocompatibility loci, tolerance, and cell-mediated cytoxicity. Vaccines.

Textbook: *Kuby Immunology*, 7th Ed., Owen, Punt, Stranford. Freeman & Co.
Examinations: Three 1-hour exams
Prerequisites: Bio 326 and 327 Class size: 108

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**Biology 457/657** Principles of Human Toxicology (3 credits) J. Hewett

MWF 9:30-10:25 011 LSC

Description: This course will examine the interactions between chemical, physical or biological substances and mammalian systems that result in adverse changes in physiological function. Concepts in chemistry, biochemistry, cell biology, and anatomy and physiology will be applied to the study of absorption, distribution, biometabolism and elimination of toxic agents, or poisons. In addition, general molecular mechanisms by which poisons act will be examined, including the processes of genotoxicity and carcinogenesis. Several general classes of poisonous agents, including pesticides, herbicides, and heavy metals, will be discussed in some detail. Finally, students will learn about important concepts in exposure risk assessment and the government agencies that regulate use of and exposure to chemicals in our food and environment. Additional work will be required of graduate students.

PREREQ: BIO 327, and CHE 275, and MAT 285
Textbook: Casarett & Doull's *Essentials of Toxicology*, 2nd Edition.

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**Biology 458/658** Seminar in Animal Communication (3 credits) Parks

MW 2:15-3:35 214 LSC

Description: This course covers the general principles of animal communication systems across modalities (visual, auditory, chemical and tactile) and taxa (invertebrates to mammals). Topics include the mechanisms of signal production and reception, behavioral functions of communication signals, and the role of economics and evolution in shaping communication systems. Seminar format including lectures, discussions, student presentations and writing assignments. **This course satisfies the communication skills requirement.**

Jrs. & Srs. only

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**Biology 459/659** Plants & People (3 credits) Coleman

TTh 12:30-1:50 011 LSC

Description: Plants are critical for sustaining life on Earth. They sequester carbon dioxide and convert solar energy to forms that can be used, acting as key agents against climate change. In addition they are a key source of food, clothing and fuel. This course will focus on how plants function individually, and as they interact with their environment. The course goals are to gain an understanding of basic plant biology at the molecular level, to understand the role of plants in the environment and in society, and to use this information to make informed opinions and decisions about current environmental issues including air pollution, land conservation, climate change and genetic modification. As plants are a model system for molecular genetics, cell biology and biochemistry research, this class is an excellent elective for students interested in these areas.

Prerequisites: Bio 121 & 123; or AP equivalent Class size: 40

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**Biology 460** Research in Biology (1-4 credits) Faculty

Description: Bio 460 is intended for Biology Majors who wish to participate in either a laboratory or field research project. **Bio 460 replaces independent study or experience credit courses for research purposes**. Student research projects will incorporate use of the scientific method, experimentation, data analysis, data presentation and interpretation, and the responsibilities of scientific integrity.

To enroll in Bio 460, the student must seek a sponsor who is willing to direct an appropriate project. Typically, the sponsor will assign the student to some aspect of an existing, larger research project. In consultation with the sponsor, the student will submit a petition with the Department Undergraduate Secretary which states the nature of the project, the expectations regarding time commitment (3 hrs. per week per credit hr.), and the means of evaluation.

The grading procedure for Bio 460 will generally be based on 1) the faculty member's evaluation of overall student performance, and 2) examination of required laboratory records or notebooks. Evaluation may also include 3) a report written by the student which documents the experience and results in scientific format. Students can enroll in Bio 460 more than once, but the total credit hours applied to the Biology Major requirements cannot exceed 4 hours.

Frequency of Offering: Each semester

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**Biology 461** Experience in Biology (0 credits) Faculty & R. Raina

Description: Internship or work experience supervised by a faculty mentor. Projects may include experimentation, data analysis, presentation, and responsibilities of scientific integrity. Development and analysis of business plans or intellectual property in **biotechnology-focused** companies, agencies or law firms is also possible. Biotechnology Majors only.

Frequency of Offering: Each semester

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**Biology 462/662** Molecular Genetics (3 credits) Dorus

MWF 10:35-11:30 011 LSC

Description: This course will provide a broad introduction to the study of gene and genome function, including transcription, translation, DNA replication, recombination and prokaryotic and eukaryotic mechanisms of inheritance. Gene and genome architecture, mechanisms of gene regulation, epigenetics and the molecular basis of human disease will be discussed. An emphasis will be placed on the application of high-throughput genomic, transcriptomic and epigenomic approaches to systems level analyses of genome biology.

Textbook: *Genetics: a molecular approach*
Prerequisites: BIO 326 and BIO 327
Class size: 40

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**Biology 463/663** Molecular Biotechnology (4 credits; 3 of these count towards lab credit) S. Raina

001 Lec MWF 11:40-12:35 011 LSC
002 Lab Th 12:30-3:45 206 LSC

Description: Molecular Biotechnology is the first course of a two-course Biotechnology series. The second course, Applied Biotechnology, will be offered in the spring. These courses complement each other, but one is not required for the other.

These courses will introduce students to the molecular and genetic principles and processes involved in biotechnology. Lectures will include topics such as the genetic modification of microbial, plant, & animal cells, forensic biotechnology, and important medical, industrial, agricultural and environmental applications of biotechnology. Labs will cover many of the methods routinely used in biotechnology labs.

This course will address questions such as: What is biotechnology, how is it done, and how is it being used today? How can biotechnology impact the lives of humans and other animals, plants, and the environment? What are the issues that biotechnology raises about the role of science and technology in society and ethical issues related to Biotechnology?

Prerequisites: BIO 326 & 327 Class size: 24

***This course fulfills additional laboratory experience (3 credits) & the communications skills requirement.**

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**Biology 465/665** Molecular Biology Lab (3 credits) S. Raina

001 Lec T 11:00-11:55 011 LSC
002 Lab T 12:30-4:30 206 LSC
003 Lab W 12:45-4:45 206 LSC

Description: This laboratory course will teach basic experimental techniques including DNA isolation, restriction endonuclease cleavage of DNA, gene cloning, tissue culture techniques, construction of transgenic plants, gene expression analysis, and other techniques central to Molecular Biology. While learning basic techniques in recombinant DNA technology, students will learn to apply scientific method to address questions in molecular biology. ***This course fulfills the communications skills requirement.**

Prerequisites: BIO 326 & 327 Class size: 48

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**Biochemistry 475** General Biochemistry I (3 credits) Welch/Castañeda

MWF 9:30-10:25 001 LSC (Exams on Mondays 7-9 pm: 9/25, 10/16, 11/20)

Description: The molecular logic of life. Chemistry of water and the amino acids. Weak inter-atomic interactions. Amino acids and peptides. Primary, secondary, tertiary and quaternary structures of proteins. Protein function: enzyme mechanisms, kinetics and regulation. Flow of genetic information. DNA structure, replication, repair, recombination. RNA synthesis and processing. Protein synthesis and the genetic code. Recombinant DNA technology. Metabolic pathways of glycolysis and respiration, and application of thermodynamic principles to them.

Textbook: TBD
Prerequisites: CHE 325
Exams: Four per semester. No comprehensive final; no make-up exams given.
Class size: 200 Frequency of Offering: Each fall semester

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**Biology 475** Biochemistry Lab (4 credits) Chan

MW 1:00-5:00 207 LSC

Description: Experiments on proteins, enzymes, fatty acids, nucleic acids which illustrate modern biochemical techniques applied to the chemistry of living cells. Among the techniques employed are: electrophoresis; amino acid sequence determination; gel filtration; thin layer chromatography; enzyme isolation; enzyme kinetics; spectrophotometric assays; preparative ultra-centrifugation; preparation and analysis of tissue fractions; sucrose gradient centrifugation; base composition of nucleic acids. Careful recording of data is emphasized. Data are analyzed and discussed in class.

Textbook: *Fundamental Laboratory Approaches for Biochemistry*, Ninfa & Ballonite, 2nd Edition, 2010, Fitzgerald Press.
Examinations: Lab quizzes and notebook
Class size: 24 Frequency of Offering: Each fall semester

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**Biology 490** Independent Study (1-6 credits) Faculty

Proposal form & permission of instructor required.

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**Biology 495** Distinction Thesis in Biology (1-3 credits) Faculty

Description: This course is for students preparing a thesis in partial fulfillment of the requirements for the Distinction in Biology Program. It normally will be taken by Distinction students in the semester prior to graduation. Proposal & permission required.

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**Biology 496/ Psychology 496** Neuroscience & Society (3 credits) S. Hewett

TTh 3:30-4:50 214 LSC

Description: Capstone course offered by the College of Arts & Sciences for the Integrated Neuroscience major. This course explores how neuroscientific research reflects and shapes social attitudes and ideological agendas. Topics to be discussed include brain imaging, marketing, media, ethical implications of "neuro-technologies", and the remodeling of social problems such as addiction, violence and grief. Throughout the semester there will be guest lectures by neuroscientists, media specialists, philosophers and artists. Class discussion will be shaped by weekly readings in neuroscience, popular media, and/or scientific studies. Additionally, when appropriate we will explore the history of neuroscience with a focus on how previous generations shaped modern neuroscientific thought.

Prereqs: Bio 211 or PSY 223. Permission of instructor.

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**Biology 499** Biology Thesis (1-3 credits) Faculty

Description: Writing of an honors thesis by senior Biology majors. Proposal & permission required.

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**Biology 600-001/400-001** Seminar in Epigenetics of Human Health & Disease (3 credits) MacDonald

MW 3:45-5:05 214 LSC

Description: The epigenome encodes information above and beyond the sequence of DNA, acting at the interface between genes and the environment. This course will explore how epigenetic modifications influence our health and modify our risk of disease, including neurodevelopmental and neurodegenerative disorders, heart disease, and obesity. Seminar format including lectures, discussions, student presentations, and various writing assignments.

Prereqs: BIO 326 & 327; BIO 443 or 462 recommended.
Class size: 15

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**Biology 600/400-002** Isotopic Approaches in Global Change Ecology (3 credits) Becklin

TTh 2:00-3:20 156 LSC

Description: Natural changes in atmospheric composition and climate have had major impacts on individual organisms and ecosystem functioning over geologic time. In addition to these natural changes, human activities have dramatically altered the functioning of current ecosystems, and this is only expected to increase into the future. For this course, we will discuss basic research addressing the effects of climate and atmospheric changes on both current and ancient ecosystems, with specific emphasis on studies that use stable isotope chemistry to evaluate ecological and physiological responses of biota. Al part of this course, students will learn fundamental principles of isotope behavior and chemistry n natural systems, critically evaluate scientific studies that apply isotope chemistry to global change questions, and conduct authentic isotope research to learn basic methods of isotope sample preparation and data interpretation.

Class size: 15

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**Biology 600/400-003** Seminar in Cell Biology & the Cytoskeleton (3 credits) Langford

TTh 2:00-3:20 300 LSC

Description: Seminar course will cover the cytoskeleton in health and disease. Topics will include human skin cell responses to fungal infections such as candidiasis and brain diseases that affect learning and memory. The primary focus will be on the actin cytoskeleton and the molecular motors of the myosin family. Advances in imaging techniques that allow real-time observation of cell migration and dynamics of the actin cytoskeleton will be presented. Topics will include cell migration, synaptic plasticity and axonal transport. Seminar format including lectures, discussions of current papers, student presentations, and various writing assignments.

Class size: 10

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**Biology 610** Graduate Research Laboratory (1-3 credits) Faculty

Description: Work in research laboratories to acquire skills and techniques. May be repeated for a maximum of 6 credits. Offered every semester.

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**Bio 624/Neu 613/Csd 753/ Psy 778/Ben 613** Readings in Neuroscience (0-3 credits) R. Jones/S. Hewett

TBA TBA TBA

Description: This is a literature-based team-taught course focusing on in depth discussions of either classical or recent papers of exceptional import. The purpose of this course is to provide ***neuroscience faculty*** with a readily available format to convey to graduate students important and/or cutting edge topics in molecular, cellular, systems, behavioral, and cognitive neuroscientific approaches to investigate basic, pre-clinical, translational, and clinical questions to unravel the relationship between brain and behavior. Students will complete readings assigned by each faculty member and participate in a discussion.

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**Bio/Ben/Cen/Che/Phy 635** Physical Cell Biology (3 credits) TBA

MW 2:15-3:35 414 Bowne

Description: This Soft Interfaces Integrative Graduate Education and Research Traineeship (IGERT) course will emphasize current quantitative advances in cell biology and cover topics such as the structure and dynamics of cell membranes, the dynamics of the cytoskeleton and molecular motors, DNA replication and repair, genome packing, gene regulation, and signaling pathways. The course will give biology and bioengineering students a more quantitative background for describing biological processes and give physics and chemistry students a strong introduction to biomolecules and cellular processes. The course will be offered every year in the Fall semester. It will typically be taken by IGERT students in their first semester of graduate studies but is open to all graduate students.

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**Biology 637/437** Developmental Neuroscience (3 credits) Lewis

TTh 3:30-4:50 214 LSC

Description: A seminar format course including discussions, student presentations and writing assignments that provides an introduction to the Developmental Neuroscience primary research literature. We will cover general principles of how a functioning nervous system is made in developing animals. Topics will be focused mainly on the central nervous system with many examples drawn from vertebrate model systems. Specific topics will potentially include how neural tissue is made, how the spinal cord is patterned, how nerve cells (neurons) acquire distinct fates, and how neurons know when and where to extend their axons.

Prerequisites: Bio 326, Bio 327; Bio 503 &/or Bio 211 highly recommended. Jrs. & Srs. only

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**Biology 657457** Principles of Human Toxicology (3 credits) J. Hewett

MWF 9:30-10:25 011 LSC

Description: This course will examine the interactions between chemical, physical or biological substances and mammalian systems that result in adverse changes in physiological function. Concepts in chemistry, biochemistry, cell biology, and anatomy and physiology will be applied to the study of absorption, distribution, biometabolism and elimination of toxic agents, or poisons. In addition, general molecular mechanisms by which poisons act will be examined, including the processes of genotoxicity and carcinogenesis. Several general classes of poisonous agents, including pesticides, herbicides, and heavy metals, will be discussed in some detail. Finally, students will learn about important concepts in exposure risk assessment and the government agencies that regulate use of and exposure to chemicals in our food and environment. Additional work will be required of graduate students.

PREREQ: BIO 327, and CHE 275, and MAT 285
Textbook: Casarett & Doull's *Essentials of Toxicology*, 2nd Edition.

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**Biology 658/458** Seminar in Animal Communication (3 credits) Parks

MW 2:15-3:35 214 LSC

Description: This course covers the general principles of animal communication systems across modalities (visual, auditory, chemical and tactile) and taxa (invertebrates to mammals). Topics include the mechanisms of signal production and reception, behavioral functions of communication signals, and the role of economics and evolution in shaping communication systems. Seminar format including lectures, discussions, student presentations and writing assignments. **This course satisfies the communication skills requirement.**

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**Biology 659/459** Plants & People (3 credits) Coleman

TTh 12:30-1:50 011 LSC

Description: Plants are critical for sustaining life on Earth. They sequester carbon dioxide and convert solar energy to forms that can be used, acting as key agents against climate change. In addition they are a key source of food, clothing and fuel. This course will focus on how plants function individually, and as they interact with their environment. The course goals are to gain an understanding of basic plant biology at the molecular level, to understand the role of plants in the environment and in society, and to use this information to make informed opinions and decisions about current environmental issues including air pollution, land conservation, climate change and genetic modification. As plants are a model system for molecular genetics, cell biology and biochemistry research, this class is an excellent elective for students interested in these areas.

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**Biology 662/462** Molecular Genetics (3 credits) Dorus

MWF 10:35-11:30 011 LSC

Description: This course will provide a broad introduction to the study of gene and genome function, including transcription, translation, DNA replication, recombination and prokaryotic and eukaryotic mechanisms of inheritance. Gene and genome architecture, mechanisms of gene regulation, epigenetics and the molecular basis of human disease will be discussed. An emphasis will be placed on the application of high-throughput genomic, transcriptomic and epigenomic approaches to systems level analyses of genome biology.

Textbook: *Genetics: a molecular approach* Class size: 42

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**Biology 663/463** Molecular Biotechnology (4 credits) S. Raina

001 Lec MWF 11:40-12:35 011 LSC
002 Lab Th 12:30-3:45 306 LSC

Description: Biotechnology I is the first course of a two-course Biotechnology series. The second course, Biotechnology II, will be offered in the spring. These courses complement each other, but one is not required for the other.

These courses will introduce students to the molecular and genetic principles and processes involved in biotechnology. Lectures will include topics such as the genetic modification of microbial, plant, & animal cells, forensic biotechnology, and important medical, industrial, agricultural and environmental applications of biotechnology. Labs will cover many of the methods routinely used in biotechnology labs.

This course will address questions such as: What is biotechnology, how is it done, and how is it being used today? How can biotechnology impact lives of humans and other animals, plants, and the environment? What are the issues that biotechnology raises about the role of science and technology in society and ethical issues related to Biotechnology?

Class size: 24

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**Biology 665/465** Molecular Biology Lab (3 credits) S. Raina

001 Lec T 11:00-11:55 011 LSC
002 Lab T 12:30-4:30 206 LSC
003 Lab W 12:45-4:45 206 LSC

Description: This laboratory course will teach basic experimental techniques including DNA isolation, restriction endonuclease cleavage of DNA, gene cloning, tissue culture techniques, construction of transgenic plants, gene expression analysis, and other techniques central to Molecular Biology. While learning basic techniques in recombinant DNA technology, students will learn to apply scientific method to address questions in molecular biology.

Class size: 48

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**Biology 688** Biological Literature (1-3 credits) Faculty

Description: Independent reading program carried out under the direction of a faculty member. Explicit permission must be obtained from a faculty member. Lectures and library problems designed to acquaint the student with current literature, techniques of searching scientific literature and preparation of reports using reference materials.

Prerequisites: Permission of instructor and submission of proposal

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**Biology 690** Independent Study (1-6 credits) Faculty

Description: This is a program of guided research, usually involving laboratory work.

Prerequisites: Since this course involves work done usually in faculty laboratories, arrangement must be made by the student with the faculty member who will supervise the research. The Proposal for Independent Study Courses must be made out, signed by the professor and taken to 110 LSC for department signature before registering. NOTE: This course should not be used for dissertation work.

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**Biology 700** ST: Plant Resource Dynamics (1-6 credits) Ritchie

Description: The ways that plants use their resources, such as carbon, water, nitrogen, phosphorus, has a huge impact on the form and function of plants in different environments, and on the dynamics of food webs and ecosystems. The evolution of plant physiology of photosynthesis, respiration and growth is set in the context of limiting supplies of resources, light and thermal energy, possibilities for benefits from resource exchange mutualists, and various risks, e.g., herbivory, climate extremes, disease, competition. This seminar-style course will explore these topics from an evolutionary and ecological perspective by reading recent literature and presenting syntheses.

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**Biology 705** Graduate Research Seminars (0-1 credit) J. Hewett

T 3:30-5:00 106 LSC

Description: Students present their thesis or dissertation research and critically evaluate the research presentations of other students.

Frequency of offering: every semester

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**Biology 997** **Masters Thesis** (1-6 credits)
**Biology 999** **Dissertation** (1-15 credits)
**GRD 998** **Degree in Progress** (0 credit hours) 3/23/17