

**BIOLOGY DEPARTMENT**  
**COURSE DESCRIPTIONS**  
**FALL 2013**

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|---------------------------|------------|-------------|-------|
| <b><u>Biology 100</u></b> | Ocean Life | (3 credits) | Parks |
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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.

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| <b><u>Biology 121</u></b> | 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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|---------------------------|-------------------------------------|-------------|---------|
| <b><u>Biology 211</u></b> | <b>Introduction to Neuroscience</b> | (3 credits) | Russell |
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MW 8:00-9:20                      105 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 with numerous opportunities to participate in class discussions using remote personal response systems (“clickers”) throughout the course. The purchase and use of “clickers” is not mandatory, but is strongly recommended.

Prerequisites: High school biology and chemistry

Class size: 100

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| <b>Biology 216</b> | Anatomy and Physiology I | (4 credits) | Sweet |
| 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 with reference to 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, interactive computer experiments and non-invasive experiments on human subjects.

Textbook: VanPutte, Regan & Russo, Seeley's Anatomy & Physiology (9<sup>th</sup> ed.)

Prerequisites: Bio 121-123 or equivalent

Grading: Weekly laboratory reports, Midterm & Final, plus weekly quizzes

Class size: 120

Frequency of Offering: Fall semesters

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|------------------------|-----------------|-------------|---------|
| <b>Biology 300-001</b> | 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

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| <b>Biology 300-002</b> | Dance, Exercise and Brain Function | (3 credits) | Tunur |
|                        | TTh 11:00-12:20                    | 101 SLOC    |       |

Description: This one-term special topic course will discuss the role the brain plays in the planning and coordination of movement as well as the effects of movement on brain function. A goal of the course will be to compare and contrast the effects of exercise and dance on brain health, cognitive function, and well-being. We will explore the underlying cellular, chemical, and neural mechanisms involved in the beneficial effects of movement on learning and memory, mood regulation and the relief of symptoms associated with neurodegenerative diseases, among others.

Course format will include lectures, activities involving participation of the class, presentations and discussions of original research papers.

Prerequisites: Bio 211 or Psy 223

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

Lecture 001 MW 12:45-2:05 001 LSC  
Laboratory 002 F 12:45-3:45 308 LSC  
Laboratory 003 F 9:30-12:30 308 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 (9<sup>th</sup> ed.), McGraw Hill.  
Rust, A Guide to Anatomy & Physiology Lab (2<sup>nd</sup> ed.), Southwest Educational Enterprises.  
Sebastiani & Fishbeck, Mammalian Anatomy the Cat (2<sup>nd</sup> 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/Russell

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, 3<sup>rd</sup> ed., by Alberts et al. (Garland Publishing, 2010)

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/Althoff

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 evolution, phylogenetics, animal behavior, population ecology, community ecology and ecosystems. Ecology and Evolution is part of the required core curriculum of the Biology Department.

Textbooks: *Evolution*, Bergstrom and Dugatkin, custom text (Norton);  
*SimUText Ecology*, custom text, (SimUText publishing)

Prerequisites: 121/123 or equivalent Exams: Four plus a final

Class size: 250 Frequency of Offering: Fall semesters

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**Biology 355**                      General Physiology                      (3 credits)                      Tupper  
TTh    8:00-9:20                      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, 11<sup>th</sup> Edition, 2008.

Prerequisites: Bio 121/123; Che 106, 107

Class Size: 60

Frequency of Offering: Each semester

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

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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**Bio 400-001/FSC 440/Bio 600-001/FSC 640**                      Principles of Toxicology                      (3 credits)  
J. Hewett & K. Sweder

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, CHE 275 and CHE 285.

Textbook: Casarett & Doull's *Essentials of Toxicology*, 2<sup>nd</sup> Edition.

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**Biology 400-002/PSY 496**                      Neuroscience & Society (3 credits)                      S. Hewett

TTh    3:30-4:50                      126 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 "neurotechnologies", 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.

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

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**Biology 400-003/600-003**      Developmental Neuroscience      (3 credits)      Lewis

TTh    2:00-3:20      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.

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**Biology 400-004/600-004**      Animal Communication      (3 credits)      Parks

MW    3:45-5:05      126 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.

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**BIO 400-006/600-006**      Evolutionary Mechanisms      (3 credits)      Friedman

TTh    9:30-10:50      011 LSC

Description: This course focuses on the core processes and mechanisms involved in evolution, extending to molecular evolution and evolutionary genetics and genomics. Topics include: mutation and neutral evolution, population genetic variation, quantitative genetics, molecular evolution, natural selection, adaptation, and speciation. It will address evidence for evolution at the phenotypic, genetic/genomic level and at the molecular level.

Prerequisites: Bio 326 & Bio 345

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**BIO 400-007/600-007**      Human Disease Genomics      (3 credits)      Dorus

TTh    11:00-12:20      126 LSC

Description: Rapid advances in the sequencing and analysis of human, non-human primate and Neanderthal genomes has revolutionized the manner in which the molecular basis of human disease is being investigated. This seminar course will introduce students to influential genomic studies of relevance to the etiology and epidemiology of human disease. We will also discuss recent insights into the genetic basis of human adaptation and its potential relevance to disease predisposition. Seminar format including lectures, discussions, student presentations and writing assignments.

Prerequisite: BIO 326 and BIO 327

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| <b>BIO 400-008/600-008</b> | Biology of Aging | (3 credits) | Korol |
|                            | MW 3:45-5:05     | 011 LSC     |       |

Description: Aging is an intrinsic property of all living organisms. However, the way in which aging manifests itself varies quite broadly within and between species. To understand the complex nature of aging and its place in the life cycle, this course will review topics related to the biology of aging across many levels of analysis from molecule to cell to system to organism. Classic and contemporary aging research will be evaluated from a variety of experimental models. In the process we will dispel some of the myths of aging even as they relate to basic scientific findings and evaluate how the conventional wisdom on aging issues obtained through the media and other public sources reflects and influences basic research findings.

Organization of the course includes lectures, discussion, quizzes, and a variety of written assignments. While there are no specific prerequisites, completion of at least one of the following classes is highly recommended: Bio 327 Cell Biology, Bio 326 Genetics, Bio 355 General Physiology.

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| <b>BIO 400-010/600-010</b> | Laboratory in Microscopy Methods<br>for Life Scientists | (3 credits)       | Silver |
|                            | M & 2:15-3:15   | 214 LSC (Lecture) |        |
|                            | W 2:15-5:15   | 316 LSC (Lab)     |        |

Description: This course presents the theory and practice of modern light microscopy, including the fundamentals of image formation and applications in the biological and biomedical sciences, and reviews microscopy methods and analog and digital image capture.

Prerequisite: Bio 327

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| <b>Biology 419</b> | Jr/Sr Thesis Seminar | (1 credit) | Belote/Segraves |
|                    | 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 Program. 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 431/631** Population Genetics (3 credits) Starmer

MWF 9:30-10:25 200 LSC

Description: Models of population growth, Hardy-Weinberg equilibrium, X-linkage and two loci, subdivision, inbreeding and finite populations, quantitative characters, selection migration, mutation, the fundamental theorem, stochastic processes and requisite mathematics.

Prerequisites: BIO 326, 327, 345 and MAT 295; or permission of instructor

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**Biology 447** Immunobiology (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 cytotoxicity. 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 448** Evolutionary Medicine (3 credits) Segraves

TTh 3:30-4:50 105 LSC

Description: Applying evolutionary principles to strengthen the prevention and treatment of human diseases. Can we cure the common cold? How and why do some emerging diseases become pandemic whereas others remain localized? Topics include management of diseases to decrease transmission rates and virulence, the germ theory of disease, antibiotic resistance, human evolution, the history of medicine, and epidemiology. Diseases such as malaria, influenza, HIV/AIDS, and cholera will be used as examples. In-class discussions and simulations will supplement lecture.

Textbooks: TBA

Class size: 50 Frequency of offering: Fall semesters

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**Biology 453** Ecology Lab (2 credits) Frank

W 12:45-4:45 306 LSC

Description: The course will introduce students to a variety of habitats in the Upstate New York area. We will use field experiments to examine general ecological theory. The course will require several field trips and considerable analysis of data collected on those trips.

Textbook: None

Prerequisites: Bio 345

Examinations: None, but 6-7 laboratory reports

Class size: 10 Frequency of Offering: Every other Fall semester

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| <b>Biology 460</b> | Research in Biology | (1-4 credits) | Faculty |
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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.

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|------------------------|--------------------|-------------|-------|
| <b>Biology 462/662</b> | 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. This includes the application of recombinant DNA methodology to the study of gene function, mechanisms regulating gene and protein expression, epigenetics and an overview of the molecular basis of human diseases. An emphasis will be placed on the application of high-throughput genomic, transcriptomic and proteomic approaches to study genome regulation and function.

Prerequisites: BIO 326 and BIO 327

Class size: 42

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| <b>Biology 463/663</b> | Molecular Biotechnology                          | Surabhi Raina |
|                        | (4 credits; 3 of these count towards lab credit) |               |
| 001 LecMWF 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 will fulfill additional laboratory experience (3 credits) & the communications skills requirement.

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

001 LecT 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: 24

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**Biology 475/675**                      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, 2<sup>nd</sup> Edition, 2010, Fitzgerald Press.

Examinations: Lab quizzes and notebook

Class size: 24

Frequency of Offering: Each fall semester

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

MWF                      9:30-10:25                      001 LSC

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.

Textbook: Stryer: *Biochemistry*, 7th ed. (2012).

Prerequisites: Two semesters of organic chemistry. Cell Biology desirable

Exams: Four per semester. No comprehensive final; no make-up exams given.

Class size: 120

Frequency of Offering: Each fall semester

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

Proposal & 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 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 565**                      Cellular Physiology                      (3 credits)                      Sweet  
TTh    2:00-3:20                      011 LSC

Description: This is a lecture course that will take a more in-depth look at cells and their functions. Emphasis will be placed on animal cell physiology. Topics will include: cell membranes (and particularly neuronal membranes), cytoskeleton, organelle structure and function, regulation of gene expression, cell adhesion and the extracellular matrix, intercellular signaling, signal transduction and specialized sensory cells.

Textbook: H. Lodish et al., *Molecular Cell Biology*, (7th ed.), 2012, Freeman & Co.

Prerequisites: 2 years of biology and organic chemistry

Grading: Class participation, 3 exams & a primary resource-based term paper

Class size: 20

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**Bio 600-001/FSC 640/Bio 400-001/FSC 440**                      Principles of Toxicology    (3 credits)  
J. Hewett & K. Sweder

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, CHE 275 and CHE 285.

Textbook: Casarett & Doull's *Essentials of Toxicology*, 2<sup>nd</sup> Edition.

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**Biology 600-003/400-003**      Developmental Neuroscience      (3 credits)      Lewis

TTh    2:30-3:20      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.

Prereqs: Bio 326, Bio 327; Bio 503 &/or Bio 211 highly recommended.

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**Biology 600-004/400-004**      Animal Communication      (3 credits)      Parks

MW    3:45-5:05      126 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.

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**Biology 600-006/400-006**      Evolutionary Mechanisms      (3 credits)      Friedman

TTh    9:30-10:50      011 LSC

Description: This course focuses on the core processes and mechanisms involved in evolution, extending to molecular evolution and evolutionary genetics and genomics. Topics include: mutation and neutral evolution, population genetic variation, quantitative genetics, molecular evolution, natural selection, adaptation, and speciation. It will address evidence for evolution at the phenotypic, genetic/genomic level and at the molecular level.

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**BIO 600-007/400-007**      Human Disease Genomics      (3 credits)      Dorus

TTh    11:00-12:20      126 LSC

Description: Rapid advances in the sequencing and analysis of human, non-human primate and Neanderthal genomes has revolutionized the manner in which the molecular basis of human disease is being investigated. This seminar course will introduce students to influential genomic studies of relevance to the etiology and epidemiology of human disease. We will also discuss recent insights into the genetic basis of human adaptation and its potential relevance to disease predisposition. Seminar format including lectures, discussions, student presentations and writing assignments.

Prerequisite: BIO 326 and BIO 327

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| <b>BIO 600-008/400-008</b> | Biology of Aging | (3 credits) | Korol |
|                            | MW 3:45-5:05     | 011 LSC     |       |

Description: Aging is an intrinsic property of all living organisms. However, the way in which aging manifests itself varies quite broadly within and between species. To understand the complex nature of aging and its place in the life cycle, this course will review topics related to the biology of aging across many levels of analysis from molecule to cell to system to organism. Classic and contemporary aging research will be evaluated from a variety of experimental models. In the process we will dispel some of the myths of aging even as they relate to basic scientific findings and evaluate how the conventional wisdom on aging issues obtained through the media and other public sources reflects and influences basic research findings.

Organization of the course includes lectures, discussion, quizzes, and a variety of written assignments. While there are no specific prerequisites, completion of at least one of the following classes is highly recommended: Bio 327 Cell Biology, Bio 326 Genetics, Bio 355 General Physiology.

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|----------------------------|---|-------------------|--------|
| <b>BIO 600-010/400-010</b> | Laboratory in Microscopy Methods<br>for Life Scientists | (3 credits)       | Silver |
|                            | M & 2:15-3:15   | 214 LSC (Lecture) |        |
|                            | W 2:15-5:15   | 316 LSC (Lab)     |        |

Description: This course presents the theory and practice of modern light microscopy, including the fundamentals of image formation and applications in the biological and biomedical sciences, and reviews microscopy methods and analog and digital image capture.

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|--------------------|------------------------------|---------------|---------|
| <b>Biology 610</b> | Graduate Research Laboratory | (1-3 credits) | Faculty |
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Description: Work in research laboratories to acquire skills and techniques. May be repeated for a maximum of 6 credits.

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

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 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. This includes the application of recombinant DNA methodology to the study of gene function, mechanisms regulating gene and protein expression, epigenetics and an overview of the molecular basis of human diseases. An emphasis will be placed on the application of high-throughput genomic, transcriptomic and proteomic approaches to study genome regulation and function.

Prerequisites: BIO 326 and BIO 327

Class size: 42

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**Biology 663/463**      Molecular Biotechnology (4 credits)      Surabhi 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?

Prerequisites: BIO 326 & 327

Class size: 24

\*This course will fulfill additional laboratory experience & the communication skills requirement.

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|------------------------|-----------------------|-------------|----------|
| <b>Biology 665/465</b> | 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 communication skills requirement.**

Prerequisites: BIO 326 & 327                      Class size: 48

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|------------------------|------------------|-------------|------|
| <b>Biology 675/475</b> | 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, 2<sup>nd</sup> Edition, 2010, Fitzgerald Press.

Examinations: Lab quizzes and notebook

Class size: 24                      Frequency of Offering: Each fall semester

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|--------------------|-----------------------|---------------|---------|
| <b>Biology 688</b> | 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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| <b>Biology 690</b> | 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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|---------------------------|----------------------------|--------------|---------|
| <b><u>Biology 705</u></b> | Graduate Research Seminars | (0-1 credit) | Hall    |
|                           | T                          | 3:30-4:20    | 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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|---------------------------|-------------------------------------|------------------|
| <b><u>Biology 997</u></b> | <b>Masters Thesis</b> (1-6 credits) |                  |
| <b><u>Biology 999</u></b> | <b>Dissertation</b>                 | (1-15 credits)   |
| <b><u>GRD 998</u></b>     | <b>Degree in Progress</b>           | (0 credit hours) |

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3/26/13