BIOLOGY DEPARTMENT
COURSE DESCRIPTIONS
FALL 2014

UNDERGRADUATE COURSES

Biology 105 Technology Inspired by Nature (3 credits) Althoff

MW 2:15-3:35 001 LSC

Description**:** Explore how the biological world may provide solutions for many of the technological problems faced by society. We will examine the ways that organisms function and interact, and apply this knowledge towards understanding and creating technological advances. The course will be loosely organized around topics such as flight, communication and networking, swarm intelligence, computing, agriculture, chemical engineering, energy production, and medicine. Students will develop an appreciation of biology, how it is studied, and its importance to human society. This is a lecture course.

Textbook: none
Prerequisites: none
Class size: 250
Frequency of Offering: Every other Fall semester

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 211 **Introduction to Neuroscience** (3 credits) Russell

MW 12:45-2:05 105 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

Biology 216 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 (9th 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 300-002 Dance, Exercise and Brain Function (3 credits) Tunur

TTh 11:00-12:20 237 Sims

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

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 (9th 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

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, 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

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

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, 11th Edition, 2008.
Prerequisites: Bio 121/123; Che 106, 107 Class Size: 60
Frequency of Offering: Each semester

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

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.

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

TTh 12:30-1:50 156 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.

Biology 400-005/600-005 Model Organism Genetics (3 credits) Belote

TTh 12:30-1:50 214 LSC

Description: The shared evolutionary history of all life makes it possible to use genetically tractable organisms to study fundamental aspects of cell and developmental biology, as well as to explore the molecular basis of many human diseases. This course will focus on six of the most common model genetic systems (yeast, worms, fruit flies, zebrafish, mouse and mustard weed), examining the unique genetic features of each, and how they are being used to investigate such topics as animal and plant development, cell growth and cancer, neurological disease, behavior, and aging. The format of this seminar course includes lectures, student presentations, discussions, quizzes and writing assignments.

Prerequisites: BIO 326 and BIO 327

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

TTh 9:30-10:50 011 LSC

Description: This lecture 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.

Textbook: *Evolutionary Analysis*, 5th ed., Herron and Freeman.
Prerequisites: Bio 326 & Bio 345

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

BIO 400-008/600-008 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.

BIO 400-010/600-010 Laboratory in Microscopy Methods for Life Scientists (3 credits) Silver

M **&** 2:15-3:15 316 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

Biology 417 Animal Behavior & Evolutionary Biology (3 credits) Pitnick

001 Lecture	T	11:00-12:20	**306** LSC
002 Lab	T	12:30-4:30	306 LSC

Description: This lecture and laboratory course focuses on understanding the process of evolution by natural and sexual selection with a special emphasis on the evolution of adaptive animal behavior. Topics we will cover may include: natural selection, behavior genetics, mechanisms of behavior, communication, predator-prey interactions, sexual reproduction, mating systems, and social behavior. Laboratory exercises will provide direct experience for some of these concepts. In addition, students are required to develop, conduct and present the results of an independent research project. Throughout the course we will consider how the study of evolution and animal behavior can help us understand human behavior. This course is an upper-level biology lab course appropriate for junior and senior biology majors, and will count towards the "laboratory courses" and "communication skills courses" required for biology majors.

Textbook: None
Exams: None
Coursework: Participation in group discussions and in field and laboratory research projects, development and execution of independent research project, writing a grant proposal and four scientific manuscripts, and oral presentations of research plans and results from independent research project.
Prerequisites: Bio 345 or permission of instructor
Class size: 18

Biology 419 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 435 Genetics Laboratory (3 credits) Hall

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, 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: 20

Biology 447 Basic 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 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

Biology 451 Ecology (2 credits) Frank

MW 12:45-2:05 011 LSC

Description: Integrated examination of plants and animals in their natural environments with an emphasis on terrestrial ecosystems: evolutionary ecology and the ecology of populations, communities, and ecosystems. Aspects of applied ecology; human population growth, land use, pollution, and global climate change.

Textbook: *Principles of Terrestrial Ecosystem Ecology,* F.C. Chapin III, P.A. Matson, H.A. Mooney.
Prerequisite: Bio 345
Class size: 40 Frequency of Offering: Every other year

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

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.

Biology 461 Experience in Biology (0 credits) Faculty

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.

Frequency of Offering: Each semester

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. 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.

Textbook: *Genetics: a molecular approach*
Prerequisites: BIO 326 and BIO 327
Class size: 42

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

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 will fulfill additional laboratory experience (3 credits) & the communications skills requirement.

Biology 465/665 Molecular Biology Lab (3 credits) Surabhi 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 laboatory 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

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, 2nd Edition, 2010, Fitzgerald Press.
Examinations: Lab quizzes and notebook
Class size: 24 Frequency of Offering: Each fall semester

Biochemistry 475 General Biochemistry I (3 credits) Borer/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

Biology 490 Independent Study (1-6 credits) Faculty

Proposal & permission of instructor required.

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.

Biology 499 Biology Thesis (1-3 credits) Faculty

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

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.

Biology 499 Biology Thesis (1-3 credits) Faculty

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

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: 25

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GRADUATE COURSES

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.

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

TTh 12:30-1:50 156 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.

Biology 600-005/400-005 Model Organism Genetics (3 credits) Belote

TTh 12:30-1:50 214 LSC

Description: The shared evolutionary history of all life makes it possible to use genetically tractable organisms to study fundamental aspects of cell and developmental biology, as well as to explore the molecular basis of many human diseases. This course will focus on six of the most common model genetic systems (yeast, worms, fruit flies, zebrafish, mouse and mustard weed), examining the unique genetic features of each, and how they are being used to investigate such topics as animal and plant development, cell growth and cancer, neurological disease, behavior, and aging. The format of this seminar course includes lectures, student presentations, discussions, quizzes and writing assignments.

Prerequisites: BIO 326 and BIO 327

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

TTh 9:30-10:50 011 LSC

Description: This lecture 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.

Textbook: *Evolutionary Analysis*, 5th ed., Herron and Freeman.

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

BIO 600-008/400-008 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.

BIO 600-010/400-010 Laboratory in Microscopy Methods for Life Scientists (3 credits) Silver

M **&** 2:15-3:15 216 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.

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.

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

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.

Textbook: *Genetics: a molecular approach*
Prerequisites: BIO 326 and BIO 327
Class size: 42

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.

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 laboatory 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

Biology 675/475 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

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.

Biology 705 Graduate Research Seminars (0-1 credit) Segraves

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

Biology 997 **Masters Thesis** (1-6 credits)
Biology 999 **Dissertation** (1-15 credits)

GRD 998 **Degree in Progress** (0 credit hours)

5/12/14