BIOLOGY DEPARTMENT
COURSE DESCRIPTIONS
FALL 2015

Biology 106 Ocean Life (3 credits) Parks

MW 2:15-3:35 001 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
Class size: 250
Prerequisites: none
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) Faculty

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

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	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 (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

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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

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

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: 250 Frequency of Offering: Fall semesters

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, 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 400-002/600-002 Experimental Designs & Interpretations in Biology (3 credits) Gold

MW 12:45-2:05 011 LSC

Description: This seminar will discuss how historical ideas and data, even when no longer believed to be correct, shape the way current research is performed. The course will include multiple presentations and papers.

Textbook (Required): *Origins of Neuroscience*, by Stanley Finger.

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 400/600-004 Molecular Ecology (3 credits) Althoff

TTh 12:30-1:50 156 LSC

Course Description: The use of molecular techniques to survey genetic variation has revolutionized the study of ecology and evolution. In this course, students will read the primary literature, analyze data, and discuss the conceptual and empirical basis for the application and interpretation of genetic data as it pertains to ecology and evolution. A broad range of taxonomic groups will be surveyed as well how molecular ecology is used in both basic and applied aspects of biology. The seminar style course will include lectures, discussions, and student presentations.

Prerequisite: BIO 345

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

TTh 12:30-2:50 214 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 400-008,009/600-008,009 Global Change Ecology Lab (3 credits) Frank/Fridley

-008	Lec	M	12:45-1:40	306 LSC
-009	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

Biology 416/616 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.

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 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 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 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

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

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

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

TTh 12:30-1:50 011 :SC

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

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

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

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 and DNA replication. Genome architecture, gene function, 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 transcriptomic, epigenetic 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 (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.**

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 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 472/672 Advanced Light Microscopy (3 credits) Silver

001 M 2:15-3:15 316 LSC (Lecture)
002 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. Meets with FSC 470/670

Prerequisite: Bio 327

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: CHE 325
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 form & 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 496 Neuroscience & Society (3 credits) S. Hewett/Woellert

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 "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.

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

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: 12

Biology 600-002/400-002 Experimental Designs & Interpretations in Biology (3 credits) Gold

MW 12:45-2:05 011 LSC

Description: This seminar will discuss how historical ideas and data, even when no longer believed to be correct, shape the way current research is performed. The course will include multiple presentations and papers.

Textbook (Required): *Origins of Neuroscience*, by Stanley Finger.

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

TTh 12:30-2:50 214 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 600-008,009/400-008,009 Global Change Ecology Lab (3 credits) Frank/Fridley

-008	Lec	M	12:45-1:40	306 LSC
-009	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

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.

Biology 616/416 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 624/Neu 613/Csd 753/ Psy 778/Ben 613 Readings in Neuroscience (0-3 credits) 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.

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 657/457 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
Textbook: Casarett & Doull's *Essentials of Toxicology*, 2nd Edition

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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.

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

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

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) 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

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.

Class size: 48

Biology 672/472 Advanced Light Microscopy (3 credits) Silver

001 M 2:15-3:15 316 LSC (Lecture)
002 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. Meets with FSC 470/670

Prerequisite: Bio 327

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) Faculty

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)

3/12/15