

**BIOLOGY DEPARTMENT**  
**COURSE DESCRIPTIONS**  
**FALL 2018**  
**1191**

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<b><u>Biology 105</u></b>	Technology Inspired by Nature	(3 credits)	Althoff
	MW 2:15-3:35	105 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  
**Class size:** 100

**Prerequisites:** none  
**Frequency of Offering:** Every other Fall semester

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<b><u>Biology 121</u></b>	General Biology I	(4 credits)	Wiles
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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)                      Jones

MW 12:45-2:05 011 LSC

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

Prerequisites: High school biology and chemistry

Class size: 45

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**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 and the role of anatomical form in these processes. Topics include skeletal & muscle structure & function; neural & integumentary systems. Exercises will include laboratory demonstrations of organ/system models, histology, interactive computer experiments and non-invasive experiments on human subjects.

Textbook: VanPutte, Regan & Russo, Seeley's Anatomy & Physiology (11<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><u>Biology 221</u></b>	<b>Peer Led Team Learning</b>	(2 credits)	Snyder
001	T	11:00-11:55	126 LSC
002	Th	9:30-10:25	011 LSC

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

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<b><u>BIO 300</u></b>	<b>Current topics in Biotechnology</b>	( 3 credits)	Phillips
	TTh	11:00-12:20	106 LSC

**Description:** What is going on in biotechnology, in the real world, right now? This course is a literature-driven exploration of current topics and methodologies employed in multiple fields of biotechnology research. The particular subjects and technologies discussed will vary from semester to semester, including optogenetics, nanotechnology, immunotherapy, microbiomes, aging, neurobiology and gene editing. **This course fulfills the communications skills requirement.**

**Prerequisite:** Grade of C or better in BIO 121

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<b><u>BIO 316</u></b>	<b>Anatomy &amp; Physiology I for Biology Majors</b>	(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 microscopy, virtual physiology experiments and other activities appropriate for a 300-level course.

**Textbooks:** VanPutte, Regan & Russo, Seeley's Anatomy & Physiology (11<sup>th</sup> ed.), McGraw Hill.

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

**Prerequisites:** Bio 121-123 or equivalent

**Grading:** Weekly quizzes and midterm and final exams. Understanding of laboratory material will be evaluated with 3 laboratory practicals. Class size: 48 Frequency of

**Offering:** Fall semesters

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<b><u>Biology 327</u></b>	Cell Biology	(3 credits)	Erdman/Silver
TTh	11:00-12:20	Gifford Auditorium	

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

Textbook: *Essential Cell Biology*, 4th ed., by Alberts et al. (Garland Publishing, 2013); Turning Technologies Response Card "Clicker".

Prerequisites: BIO 121, CHE 106.      Class size: 350      Frequency of Offering:  
Every Fall semester

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<b><u>Biology 345</u></b>	Ecology & Evolution	(3 credits)	Friedman/Becklin
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 material will cover evolutionary processes, natural selection and adaptation, phylogenetics, population ecology, community ecology and ecosystems. Ecology and Evolution is part of the required core curriculum of the Biology Major.

Textbooks: Online readings & activities will be assigned.

Prerequisites: 121/123 or equivalent

Class size: 239

Exams: three

Frequency of Offering: Fall semesters

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<b><u>Biology 355</u></b>	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, 13<sup>th</sup> Edition, 2012.

Prerequisites: Bio 121/123; Che 106, 107

Frequency of Offering: Each semester

Class Size: 108

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**Biology 360**      Biology Laboratory Assistant      (1 credit)      TA/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      3:45-5:05      134 LSC

Textbook:      None

Prerequisites: Permission of instructor in advance.

Examinations:      None

Grade:      A-F based upon participation & performance

Frequency of Offering: Each semester

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

MW      3:45-5:05      214 LSC

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

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

Class size: 10

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

TTh      2:00-3:20      156 LSC

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

Class size: 10

Jrs. & Srs. Only

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

TTh                      2:00-3:20      300 LSC

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

Class size: 10                      Jrs. & Srs. Only

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

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

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

Prerequisite: BIO 345                      Jrs. & Srs. Only

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**Biology 400-008**    Biology of Marine Mammals                      (3 credits)                      Parks

MW 2:15-3:35      214 LSC

Description: This course provides an introduction to the biology and conservation of cetaceans, pinnipeds, sirenians and marine otters. Topics covered in the course include taxonomy, evolution, anatomical and physiological adaptations, foraging and reproductive behavioral ecology, and major conservation concerns in marine mammals.

Prerequisite: BIO 345                      Class size: 30

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**BIO 400/600-010**    Microbes in Biotechnology (3 credits)                      Phillips

TTh    2:00-3:20    106 LSC

Description: Microbes can do things you never imagined! They can treat disease, change your DNA, clean up human pollution, run on electricity and much, much more. This topics-driven course covers genetic, biochemical, molecular and biotechnological aspects of microbes. Readings are drawn primarily from current scientific literature devoted to the many applications of microbes (including bacteria, archaea, fungi and viruses) in multiple fields of biotechnology. **This course fulfills the communications skills requirement.**

Prerequisites: Grade of C or better in BIO 326 **AND** BIO 327

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**Biology 417**                      Animal Behavior Laboratory                      (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. Laboratory exercises provide direct experience in how to ask scientific questions, develop hypotheses, design and run experiments, analyze data, and communicate results both orally and in the form of manuscripts for peer-reviewed journals. In addition, students are required to develop and conduct an independent research project outside of class time, the results of which will be the subject of a 'term paper.' 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 group research projects, development and execution of an independent research project, writing a grant proposal and four scientific manuscripts, and two oral presentations of research plans and results from independent research project.

Prerequisites: Bio 345 or permission of instructor

Class size: 18

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**Biology 419**                      Jr/Sr Thesis Seminar                      (1 credit)                      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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<b><u>Biology 435</u></b>	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 cerevisiae*), fruit flies (*Drosophila melanogaster*), nematodes (*Caenorhabditis elegans*), and mustard plants (*Arabidopsis thaliana*). Experiments will include gene mapping, phenotypic analysis, transformation, complementation, population genetics, and an introduction to molecular biology.

Prerequisites: BIO 326 and 327

Textbook: None required, but a general genetics textbook would be a useful reference.

Class size: 24

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<b><u>Biology 447</u></b>	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 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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<b><u>Biology 457/657</u></b>	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.

**PREREQS:** BIO 327, and CHE 275, and MAT 285

Textbook: Casarett & Doull's *Toxicology: The basic science of poisons*, 8th Edition.

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<b>Biology 459/659</b>	Plants & People	(3 credits)	Coleman
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TTh 12:30-1:50 011 LSC

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

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

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<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.

Frequency of Offering: Each semester

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<b>Biology 461</b>	Experience in Biology	(0 credits)	Faculty & R. Raina
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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













