

EMORY UNIVERSITY

BIOLOGY DEPARTMENT UNDERGRADUATE COURSES

3/26/2009

BIOLOGY 141 AND 142 ARE PREREQUISITES FOR ALL UPPER-LEVEL COURSES.
Only one cross-listed course that originates in another department
may be taken for the Biology degrees.

120. Concepts in Biology with Laboratory. *Spring.* This course reviews the principles of genetics, physiology, ecology, taxonomy, and evolution with special reference to contemporary life situations. **Intended for non-science majors.** This course does not fulfill requirements for medical and dental schools or for a biology major. No prerequisites.

141. Foundations of Modern Biology I (Cell Biology and Genetics), with Laboratory. *Fall.* The Biology 141 and 142 courses will provide a topic-driven overview of molecular, cellular, and developmental biology, along with genetics. The topics covered in class (cell structure and function, cell reproduction, and Mendelian genetics) will address major issues in human biology and medicine. The integrated lecture and laboratory will emphasize the basic principles in critical thinking involved in modern biological discovery. In lab, students will design and perform experiments using several important model systems. *Co-requisite: Chem. 141 (or 171).* **Biology 141 and 142 are required of all biology majors and should be taken during the freshman year, along with Chemistry 141 and 142.**

142. Foundations of Modern Biology II (Molecular Biology and Developmental Genetics), with Laboratory. *Spring.* This course expands on the fundamentals learned in Biology 141, providing a continuation of the topic-driven overview of molecular, cellular, and developmental biology, along with genetics. The topics covered in class (molecular genetics, population genetics and evolution, cellular metabolism and photosynthesis, signal transduction and development) will address major issues in human biology and medicine. The integrated lecture and laboratory will emphasize the basic principles in critical thinking involved in modern biological discovery. In lab, students will design and perform experiments using several important model systems. *Prerequisite: Biology 141; co-requisite: Chem. 142 (or 172).* **Biology 141 and 142 are required of all biology majors and should be taken during freshman year, along with Chemistry 141 and 142.**

190 Series. Freshman Seminars. *Fall and spring.* Variable topics. For Freshmen only. See current course atlas. No prerequisites.

205. Comparative Vertebrate Anatomy with Laboratory. This course provides comparative studies of phylogeny and anatomy of vertebrates from both an evolutionary and functional perspective. Cat and shark are dissected in laboratory. *Prerequisites: Biology 141 and 142.* (This course fulfills the Column B requirement for the biology degree programs and also meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.) (This course was formerly Biology 335.)

206. Biology of Parasites, with Laboratory. This course will introduce students to modern and classical parasitology (protozoan, helminthic, and arthropod parasites of medical significance) using microscopic evaluation, digital images, and preserved specimen dissections. Topics addressed include basic principles of parasitology, evolutionary trends, host-parasite ecological considerations, therapeutic measures, and control programs. *Prerequisites: Biology 141 and 142.* (This course meets the upper-level laboratory requirement for students under the

Fall 2006 biology and later degree programs.) (This course was formerly Biology 470.)

223. Developmental Biology. This course studies the fundamental principles that govern vertebrate and invertebrate development at the cellular, molecular, and organismal levels. *Prerequisites: Biology 141 & 142.* (This course fulfills the Column A requirement for the biology degrees.) (This course was formerly Biology 323.)

241/241-SAF. Evolutionary Biology. This course is a study of factors that cause genetic change and of the evolutionary consequences of such changes. Topics include population genetics, adaptation and natural selection, evolution of genes, proteins, and genomes, sexual selection, kin selection, speciation, and diversification of taxa. Emphasis on molecular, genetic, ecological, and evolutionary factors related to variation and adaptation to environment, and constraints on adaptation. This course is also taught as a summer study abroad program in conjunction with Biology 349-SAF. *Prerequisites: Biology 141 and 142.* (This course is co-taught by both the Biology and Environmental Studies Departments and fulfills the Column C requirement for the biology degree programs.) (Formerly Biology 341.)

247. Ecology. This course provides an overview of the principles of ecology and the study of relationships between organisms and their environments, ecosystems, communities, and populations. *Prerequisites: Biology 141 and 142 or permission of instructor.* (This course fulfills the Column C requirement for the biology degree programs and, if taken together with Biology 247LWR, also meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.) (This course was formerly Biology 347WR.)

247L. Ecology Laboratory. 2 credit hours. This course fulfills the WRITING REQUIREMENT for the GERs. This is the laboratory portion of the Ecology class. Field studies will be conducted in various natural areas in Georgia, including a week-end trip to the mountains. (This course, when taken together with Biology 247, meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.) (This course was formerly part of Biology 347WR.)

250. Cell Biology. This course covers advanced topics on the structure and function of cells at the molecular level. Topics include the relationship between structure and function, integration of cellular functions, compartmentalization of cellular functions, nuclear and cytoplasmic interactions, and intracellular and intercellular communications. *Prerequisites: Biology 141 and 142.* (This course fulfills the Column A requirement for the biology degrees.) (This course was formerly Biology 350.)

264. Human Genetics. Topics include population genetics, genetics of behavior, human origins, the genetics of immunity and of cancer, stem cell research, and human genomics. *Prerequisites: Biology 141 and 142.* (This course fulfills the Column A requirement for the biology degrees.) (This course was formerly Biology 364.)

301. Introductory Biochemistry I. Fall. (Same as Chemistry 301.) The Biology and Chemistry Departments cooperate in a two-semester biochemistry course and Biology 301/Chemistry 301 is the first semester portion of the course. This course gives an integrated approach to the synthesis, structure, and function of macromolecular biomolecules, including proteins, carbohydrates, DNA, and RNA. The evolution of structural and catalytic diversity at a molecular level will provide a theme that underpins specific examples that will include: the energetics of catalysis, protein structure and folding, enzyme kinetics and mechanisms, protein engineering, DNA structure and synthesis, RNA structure and synthesis, and genomic

organization and regulation. *Prerequisites: Biology 141 and 142; Chemistry 222. Recommended: Chemistry 300 or 331.* (This course is co-taught by the Biology and Chemistry Departments.)

302. Introductory Biochemistry II. *Spring.* (Same as Chemistry 302.) This course builds on principles developed in Biol 301/Chem 301 and will focus on how simple metabolic pathways expanded and were incorporated into more complex biochemical systems during the evolution of the eukaryotic genome. Aspects of molecular evolution, parasitic and symbiotic relationships, and compartmentalization will be developed from a metabolic perspective. Specific examples will include the evolution and integration of the mitochondrion and chloroplast genomes into the eukaryotic cell, and the role of compartmentalization in gene expression, energy regulation, and anabolic/catabolic regulation. *Prerequisites: Biology 141 and 142; Chemistry 222. Completion of Biology/Chemistry 301 is **strongly** recommended.* (This course is co-taught by the Biology and Chemistry Departments.)

320. Animal Behavior. (Same as Psychology 320.) This course provides an overview of major research areas in the field of animal behavior. The behavior of animals will be analyzed from an evolutionary and comparative perspective. Some of the topics included are orientation and migration, genetic and environmental influences on behavior, population regulation, courtship and mating strategies, and parental behavior. *Prerequisites: Biology 141 and 142.* (This course originates in the Psychology Department.)

323. Now 223. (Course number changed effective Fall 2008.)

324. Experimental Developmental Biology. This intensive laboratory course investigates development at the molecular, cellular, and systems levels. Working in groups, students design and perform experiments using current research techniques. *Prerequisites: Biology 141 and 142.*

325. Primate Social Psychology. (Same as Psychology 325/Anthropology 304.) Following a general introduction to primatology, the course will cover recent progress in the growing field of primate social behavior. Topics range from aggression and dominance to affiliation, sex, and peaceful coexistence. *Prerequisites: Biology 141 and 142. Psychology 320 is recommended.* (This course originates in the Psychology Department.)

329. Coastal Biology, with Laboratory. This is a lecture course emphasizing the basic principles of coastal ecology, the human impact on coastal ecosystems, and the diversity of invertebrates living in these ecosystems. Students complete the course with a ten-day laboratory at St. Simons's Island at the end of spring term. Due to the scheduling of the field portion, **seniors cannot enroll in this course.** *Prerequisites: Biology 141, 142, and permission of instructor.* (This course meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.)

330. Chemistry, Biology, and Molecular Modeling. (Same as Chemistry 330.) This course is designed to put to use what you already know about chemistry and biology and to extend it in two directions. On the one hand, we will examine the world around us as reflected by the media, the web, and encounters in your own lives. Thus, we'll examine issues around 'natural and unnatural molecules', the environment, disease, and society in the context of topics such as drugs, molecules from mars, aging, AIDS, bioterrorism, and crime in the courtroom. On the other hand, we will examine these ideas by means of computer graphics, the molecular structure of small molecules and proteins, and energy. *Prerequisites: Biology 141, 142 and*

Chemistry 171/172 or 221. (This course originates in the Chemistry Department.)

336. Human Physiology. This course is a study of human physiology emphasizing integrated body functions. Topics include respiration, circulation, contractility, osmoregulation, endocrinology, and neurophysiology. *Prerequisites: Biology 141 and 142 or permission of instructor.*

341. Now 241. (Course number changed effective Fall 2008.)

342. Investigative Evolution. This course consists of a combination of short topical lectures and intensive lab. Computer and field experiments introduce students to experimental approaches used by evolutionary biologists. Areas covered include population genetics, molecular evolution, and evolutionary ecology. *Prerequisites: Biology 141 and 142.*

345/345S. Conservation Biology. (Same as ENVS 345/345S.) This course focuses on the conservation of biodiversity and introduces students to ways that ecological and evolutionary principles can be used to conserve and protect species and ecosystems at risk. Specific topics include the causes and consequences of biodiversity, systematics, and endangered species, the demography and genetics of small populations, invasive species, habitat loss and fragmentation, design of reserves, and restoration ecology. *Prerequisites: Biology 141 and 142; or ENVS 120 or ENVS 131 or permission of instructor.* (This course originates in the Environmental Studies Department.)

346L. Biomolecular Chemistry Lab. (Same as Chemistry 346L: Bioanalytical Chemistry Lab.) Experiments in this course involve analysis and characterization of the major classes of biological compounds. One three-hour laboratory and one lecture per week. Additional laboratory training option available for two additional credits. *Prerequisites: Biology 141 and 142, Biology/Chemistry 301, or permission of instructor.* (This course originates in the Chemistry Department.)

347WR/347L. Now 247 and 247L. (Course numbers changed effective Fall 2008.)

348. Mechanisms of Animal Behavior. This course is a survey of current topics in neural development and neural basis of behavior. Emphasis is on research work that uses a combination of physiological, genetic, cellular, and molecular techniques to understand neural systems and their evolution and development. *Prerequisites: Biology 141, 142, Biology 336 or 360; Chemistry 141 and 142, or permission of instructor.*

349-SAF. Ecology of Invasions. The Departments of Biology and Environmental Studies offer a five week summer study abroad program of classroom and field study in ecology and evolutionary biology. The course will use a combination of in-class meetings and out of class field experience. There will be a one-week field excursion to sites near Cairns, including the Great Barrier Reef, Magnetic Island, Kurana Rainforest, and other sites. *Prerequisites: Biology 141 and 142; Environmental Studies 120, 131, and 132; Chemistry 142, or permission of instructor..* Contact the CIPA Program Coordinator at 404-727-7884 for more information. (This course is co-taught by both the Biology and Environmental Studies Departments.)

350. Now 250. (Course number changed effective Fall 2008.)

353. Genetics of Complex Traits. Many traits of biological importance are often “complex” in that they are controlled by more than one single gene and genetic analyses of these complex traits are often sophisticated. This course will study the fundamental principles and

methodology of quantitative genetics and expose students to current primary literature on current genetic analyses of complex traits such as human diseases. *Prerequisites: Biology 141 and 142, Biology 341, and Math 111/112 or 115/116.*

354. The Origin and Evolution of the Immune System. This course will study the origins and evolution of the immune system from different fields such as immunology, molecular biology, and evolution. *Prerequisites: Biology 141 and 142.*

360 [260]. Introduction to Neurobiology. (Same as NBB 301.) This course provides an introduction to cellular and integrative neurobiology. Topics include the electrochemical mechanisms for neuronal signaling, synaptic transmission, and the neural basis of behavior in invertebrates and vertebrates. *Prerequisites: Biology 141 and 142; Chemistry 141 and 142. Math 116 and Introductory Physics are strongly recommended.* (This course is co-taught by the Biology and NBB Departments. This course, taken together with **Biology 360L/NBB 301L** (Neurobiology Simulation Laboratory, **2 credit hours**), fulfills the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs and fulfills the Column B requirement for the biology degrees.) (This course will become Biology 260 in 2010.)

360L. Introduction to Neurobiology Lab. (Same as NBB 301L.) This **2-credit hour** course will explore topics in cellular and small network neuroscience by performing virtual electrophysiology experiments on the computer. The content of the course matches material covered in Biology 360/NBB 301 and will help students understand neurons and neuronal networks in greater depth. *Prerequisites: Biology 141 and 142. This course should be taken currently with or after Biology 360/ NBB 301.* (This course, taken together with Biology 360/NBB 301, meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs. This course will count as half an elective for the Biology and NBB majors.)

364. Now 264. (Course number changed effective Fall 2008.)

370. Introduction to Microbiology. This course provides an introduction to the concepts of microbial physiology, biochemistry, genetics, and evolution. *Prerequisites: Biology 141 and 142.* (This course, taken together with Biology 370L, meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.)

370L. Introduction to Microbiology Laboratory. 2 credit hours. Introduction to basic laboratory techniques in microbiology. Experiments dealing with the physiology, biochemistry, genetics, and molecular biology of microbes will be included. *Prerequisites: Biology 141 and 142.* Biology 370, taken concurrently or previously, is also required. (This course, taken together with Biology 370, meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.) (This course was formerly Biology 375.)

371. Ecology of the Tropics. Spring. **2 credit hours.** (Same as ENVS 371.) This course will explore the diverse biomes of the tropics. The focus will be on tropical forests and grasslands, with an emphasis on ecological processes, biodiversity, human impact on the tropics, indigenous peoples, and ethnobotany. *Prerequisites: Biology 141 and 142.* (This course is taught by Dr. Larry Wilson of Fernbank Science Center and is shared by the Biology and Environmental Studies Departments.)

372. Ecology of the Tropics - Field Course. Spring. **2 credit hours.** (Same as ENVS 372.) This field trip course will be taught during Spring Break week. It will be taught in the Amazon River lowland rainforests of southern Peru (Tambopata Research Station), famous for its huge

flocks of colorful Macaws. This field course will give the student a real hands-on rainforest experience complete with bromeliads, toucans, sloths, and the sounds of the night. Cost for the trip is approximately \$2500. *Prerequisites: Biology 141, 142, and students must be currently taking or have already completed Biology 371. Permission of instructor is also required.* (This course is taught by Dr. Larry Wilson of Fernbank Science Center and is shared by the Biology and Environmental Studies Departments.)

402/402S/402SWR. Neuroscience Live. This advanced seminar covers current topics of neuroscience research and the intellectual and experimental challenges involved. In this hands-on writing intensive seminar, students will learn how to read and critique research papers and how to write and prepare a research grant proposal. Students will also interact in a 'live' format with authors of the research papers. *Prerequisites: Biology 141 and 142; pre- or corequisite: NBB 301 or Biology 360.* (This course fulfills both a senior seminar requirement and a writing requirement.)

415. Cancer Biology and Oncogenes. This course will examine the biological mechanisms regulating cell growth, differentiation, and migration through a focus on the mechanisms by which cancers grow and spread. *Prerequisites: Biology 141, 142, and Math 111.*

425. Principles of Genetic Engineering. This course will look at the principles and techniques used in the cloning, characterization, and analysis of genes. Topics to be covered include restriction-modification systems, shotgun cloning techniques, clone characterization, DNA sequencing, transcriptional analysis, over expression of cloned genes, and blotting techniques. *Prerequisites: Biology 141 and 142, Chemistry 221, and Math 111.*

430/430S. Human Genome Project and Disease. This course covers human genome projects and is geared toward developing independent thinking through solving human genetic problems and critically reviewing literature on human diseases. *Prerequisites: Biology 141 and 142.* (This class was formerly Biology 470 and is NOT the same as the Human Genome: Promise and Perils (Biology 470) course.)

440S. Animal Communication. (Same as Psychology 440S.) This course will study the functions, evolution, and significance of animal communication systems in a wide taxonomic range from insects to primates. *Prerequisites: Biology 141 and 142.* (This course originates in the Psychology Department.)

441. Molecular Biology and Evolutionary Genetics. This course covers population genetics, molecular evolution, and genomics and is geared toward developing independent thinking by solving molecular biology and evolutionary genetics problems in natural populations. *Prerequisites: Biology 141 and 142.* (This class was formerly Biology 470.)

450. Computational Neuroscience. (Same as IBS 534). This course will look at the exploration of single neurons and biological neural networks with computer simulations. Each class consists of an introductory lecture followed by computer tutorials using the GENESIS software under UNIX. Specific topics include passive cable theory, compartmental modeling, voltage-gated and synaptic conductances, motor pattern generation, and cortical networks. *Prerequisites: Biology 141, 142, and 360 (or IBS 502 or equivalent). Permission of instructor is also required.* (This course originates in the Biology Department.)

455. Immunology and Disease. This course will explore the fundamental concepts of immunology and disease. The course will cover the basic principles of immunology and will use this knowledge to better understand the causes of pathogenesis during the course of infection

with micro parasites. We will consider the limitations of our current understanding of infectious diseases caused by viruses, bacteria, and unicellular eukaryotes by discussing recent articles from the literature on infections such as HIV/AIDS, tuberculosis, and malaria. *Prerequisites: Biology 141 and 142.* (This course was previously titled *Immunology and Epidemiology.*)

460S. Building Brains. (Same as NBB 460S.) This course will examine the experimental foundations underlying our understanding of the mechanisms regulating development of the nervous system. Topics will include neurogenesis, migration of neuronal precursors, axon guidance, programmed cell death, and the formation of synaptic connections. Through study of primary literature and texts, students will develop skills in identifying hypotheses and analyzing the logic of the experiments used to test these hypotheses. *Prerequisites: Biology 141 and 142.* (This course originates in the Biology Department.)

463S. Population Biology and Evolution of Disease. (Same as IBS 591.) This course will look at the immune response, infectious diseases, and cancers that will be treated as population dynamical and evolutionary phenomena. Primary consideration will be given to four topics: (1) the within-host population dynamics of micro parasites (viruses, bacteria, and protozoa) and the immune defenses, (2) the population biology of infectious disease transmission and its control by vaccination and chemotherapy, (3) theories of the evolution of parasite virulence, and (4) the somatic cell population biology and evolution of neoplasms and their metastasis. *Prerequisites: Biology 141 and 142, college level mathematics and calculus, and an intense interest in this subject.* (This course originates in the Biology Department.)

465. Molecular Genetics. This course will look at the genetic mechanisms in eukaryotes, regulation of gene expression, and recombinant DNA research. *Prerequisites: Biology 141 and 142. Cell Biology (Biology 250) and Biochemistry (Biology 301 and 302) are strongly recommended.*

470. Special Topics in Biology. A lecture series or special course for advanced students on topics of special biological concern. May be repeated for a total credit of 8 hours when topic varies. Variable credit, 1-4 hours per semester. *Prerequisites: Biology 141 and 142.* See current course atlas.

470. Senior Seminars. A seminar series or special course for advanced students on topics of special biological concern. May be repeated for a total credit of 8 hours when topic varies. Variable credit, 1-4 hours per semester. *Prerequisites: Biology 141 and 142.* See current course atlas.

475. Biology of the Eye. (Same as IBS 548.) This course is for juniors, seniors, and graduate students who may be interested in a basic understanding of the eye. This course will review basic principles and state-of-the-art information on ocular anatomy, embryology, biochemistry, physiology, genetics, immunology, microbiology, pharmacology, and pathology. *Prerequisites: Biology 141 and 142.* (This course originates in the Biology Department and is taught by Dr. Henry Edelhauser and Dr. John Nickerson of the Emory University Department of Ophthalmology.)

480. Modeling Biological Systems. This course will cover the construction and analysis of mathematical models of cellular and population processes in biology. *Prerequisites: Biology 141 and 142; recommended corequisite: Biology 480L (laboratory component).* (This course, taken together with Biology 480L, meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.)

480L. Modeling Biological Systems Laboratory. 2 credit hours. This laboratory course must be taken concurrently with the lecture course Biology 480. *Prerequisites:* Biology 141 and 142; co-requisite: Biology 480. (This course, taken together with Biology 480, meets the upper-level laboratory requirement for students under the Fall 2006 and later biology degree programs.)

495A/495B. Honors Research. Fall, spring, summer. 1-4 credit hours. Independent research for students invited to participate in the Biology Department Honors Program. Senior Biology Honors students should take Biology 495A in the Fall semester and 495B in the Spring semester. Those graduating in the Fall semester should take 495B in the Fall. 495B satisfies the college writing requirement upon submission and acceptance of a completed honors thesis based on the student's research. For more information, go to the webpage for the Honors Program in Biology. *Prerequisites: Biology 141 and 142. Permission of Instructor is required for both Biology 495A and 495BWR.* Contact Barbara Shannon via e-mail at barbara.shannon@emory.edu or call 404-727-6294 to obtain a permission number. 4 credit hours of Biology 495 may be counted as elective credit and an upper-level lab only after completion of the second semester of 495.

497R. Supervised Reading. Fall, Spring. Variable credit with a limit of 4 hours per semester. Readings are done in conjunction with a faculty member. Interested students should communicate with appropriate faculty and obtain their permission in advance of registration. *Prerequisites: Biology 141 and 142 and permission of instructor.* Contact Barbara Shannon via e-mail at barbara.shannon@emory.edu or call 404-727-6294 to obtain a permission number. This course does NOT count for the biology major and does NOT fulfill the writing requirement.

499R. Undergraduate Research. Fall, Spring, Summer. Research participation open to second semester Freshmen, sophomores, juniors, and seniors. Variable credit, maximum 4 hours per semester. For more information, refer to the undergraduate research page on the Biology Department website. *Prerequisites: Biology 141 and 142 and permission of instructor.* 4 credit hours of Biology 499R may be counted as elective credit and an upper-level lab only after completion of the second semester of 499R.

Notes:

Biology 470 courses will be assigned a new number for later semesters. The name of the course will remain the same.