Biology

Chair
• Tina L. Tootle

Undergraduate major: biology (BA, BS)
Undergraduate minor: biology
Graduate degrees: MS in integrated biology; PhD in integrated biology
Faculty: https://biology.uiowa.edu/people/faculty
Website: https://biology.uiowa.edu/

Courses

Biology Courses

Many courses include laboratory, discussion, and/or field components.

The following courses are not open to graduate students and do not provide credit toward a biology major: BIOL:1060 Big Ideas: Origins of the Universe, Earth, and Life; BIOL:1140 Human Biology: Nonmajors; BIOL:1141 Human Biology: Health Professions; BIOL:1251 How the Brain Works (and Why It Doesn’t); BIOL:1260 Plants and Human Affairs; BIOL:1261 Introduction to Botany; BIOL:1370 Understanding Evolution; and BIOL:2211 Genes, Genomes, and the Human Condition.

BIOL:1000 First-Year Seminar 1 s.h.
Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities, field trips). Requirements: first- or second-semester standing.

BIOL:1060 Big Ideas: Origins of the Universe, Earth, and Life 3 s.h.
Origin of the universe, the biochemistry of life, and the origin of life on Earth; for non-science majors. Recommendations: first-year or sophomore standing. GE: Natural Sciences without Lab. Same as ASTR:1060, EES:1060.

BIOL:1140 Human Biology: Nonmajors 4 s.h.
Overview of molecular and cellular basis of human life; structure, function of human tissues, organs, organ systems; evolution, reproduction, genetics, impact of molecular biology and genetic engineering; integration of humans and the biosphere; lecture, laboratory. GE: Natural Sciences with Lab.

BIOL:1141 Human Biology: Health Professions 4 s.h.
Molecular and cellular basis of human life; structure, function of human tissues, organs, organ systems; evolution, reproduction, genetics, impact of molecular biology and genetic engineering; integration of humans and the biosphere; lecture, laboratory. Requirements: one year of high school chemistry. Recommendations: CHEM:1070. GE: Natural Sciences with Lab.

BIOL:1251 How the Brain Works (and Why It Doesn’t) 3-4 s.h.
Introductory survey of neuroscience; structure and function of the brain; nature of consciousness; brain function in mental illness and degenerative disorders; genes and the mind; perception, sensation, memory, and emotions. Requirements: non-biology major. GE: Natural Sciences without Lab.

BIOL:1260 Plants and Human Affairs 2-3 s.h.
How plants are useful to people: food, clothing, shelter, medicines, psychoactive agents; plants’ social, economic, ecological significance. GE: Natural Sciences without Lab.

BIOL:1261 Introduction to Botany 4 s.h.
Biology of plant life; emphasis on structure, function, reproduction, inheritance, diversity, evolution. Requirements: one year of high school chemistry. GE: Natural Sciences with Lab.

BIOL:1295 Career Preparation and Life Design for Biology Majors 1 s.h.
Exploration of career paths, employers, graduate programs; preparation for life after college; development of practical skills in job searching, writing, interviewing, and networking; for students who are unsure what they can do after graduation with a bachelor’s degree in biology. Requirements: junior or senior standing.

BIOL:1370 Understanding Evolution 3 s.h.
Evolution and diversity of living things, their patterns on Earth, their organization in ecological systems; dynamics of evolutionary processes. GE: Natural Sciences without Lab.

BIOL:1411 Foundations of Biology 4 s.h.
Unifying concepts of living systems; emphasis on common properties and processes; chemical and cellular basis of life, genetics, and evolution. Prerequisites: CHEM:1110 with a minimum grade of C- or CHEM:1070 with a minimum grade of A-. GE: Natural Sciences with Lab.

BIOL:1412 Diversity of Form and Function 4 s.h.
Underlying unifying concepts of life; emphasis on diversity of living systems; the tree of life, cellular evolution, prokaryotic and eukaryotic diversity, plant and animal form and function; interactions among diverse forms of life and their environment. Prerequisites: BIOL:1411 with a minimum grade of C-. GE: Natural Sciences with Lab.

BIOL:1808 Ways of Knowing Science 1 s.h.
Science as a powerful way of knowing based on experimentation and observation of natural world; introduction to subdisciplines of scientific research; scope and methods of scientific research; questions that scientific research seek answers for; methods that scientists use to obtain answers to their questions; how science affects us personally and how it affects the rest of society; research seminars, discussion, and exploration.

BIOL:2120 Good Genes Gone Bad: Genetic Disorders of Notable Celebrities 3 s.h.
Introduction to a wide range of genetic disorders affecting notable celebrities; relevant genetic pathways in easy-to-understand language; exploration of mechanisms of disease and treatments. GE: Natural Sciences without Lab.

BIOL:2211 Genes, Genomes, and the Human Condition 3 s.h.
Organization, expression, and evolution of genes in context of genomes; focus on human genome; distribution and transmission of variation in human population. Prerequisites: BIOL:1411. Recommendations: BIOL:1412.
BIOL:2246 Entomology Lab 4 s.h.  
Insects are the most species-rich and diverse of all animals; introduction to insect biology; emphasis on evolution, diversity, ecology, and morphology with some additional focus on physiology and behavior; students work in lab and field settings; memorization of entomological terms required; hands-on learning including how to employ various tools, techniques, and approaches used by professional entomologists, insect collecting and preservation, DNA extraction and sequencing, and analysis of evolutionary and ecological data. Prerequisites: BIOL:1412.

BIOL:2254 Endocrinology 3 s.h.  
Production and effect of hormonal chemical messengers of secretory glands; emphasis on cell signaling in vertebrate systems; actions of hormones in regulating growth, physiology, and reproduction; organ to molecular levels. Prerequisites: BIOL:1411 and (BIOL:1412 or HHP:3500 or PSY:2701). Recommendations: CHEM:2210.

BIOL:2374 Biogeography 3 s.h.  
Introduction to processes that lead to the patterns of plant and animal distributions we see across the globe; processes of focus include plate tectonics, climate, and human-ecological interactions; species management and conservation in relationship to climate and change in human patterns of environment. Prerequisites: BIOL:1141 or BIOL:1370 or BIOL:1261 or GEOG:1020 or BIOL:1412. Same as GEOG:2374.

BIOL:2512 Fundamental Genetics 4 s.h.  

BIOL:2663 Plant Response to the Environment 3 s.h.  
Mechanisms of plant responses to environmental factors (biotic and abiotic) at organismal and molecular levels. Prerequisites: BIOL:1411 and BIOL:1412.

BIOL:2673 Ecology 3 s.h.  
Adaptations of organisms to their physical and biological environments; organism-environment interactions; population biology; interactions between species; ecology of communities, ecosystems; human impact on ecosystems. Recommendations: a basic statistics or calculus course. Same as ENVS:2673.

BIOL:2723 Cell Biology 3 s.h.  
Structures of cells and organelles in relation to their functions at molecular, cellular levels; emphasis on higher eukaryotic cells. Prerequisites: BIOL:1411 and (BIOL:1412 or HHP:3500 or PSY:2701) and CHEM:1120.

BIOL:2753 Introduction to Neurobiology 3 s.h.  
Techniques of molecular biology, genomics, neuropharmacology, and functional brain imaging applied to understanding how the brain works. Prerequisites: (BIOL:1412 or HHP:3500) and BIOL:1411.

BIOL:3172 Evolution 4 s.h.  
Nature, evidence, analysis, implications, molecular/genetic basis; historical record, phylogeny, speciation, adaptation, investigative methods. Prerequisites: BIOL:1412 with a minimum grade of C- and BIOL:2512 with a minimum grade of C- and (STAT:2010 or STAT:3510 or MATH:1550 or MATH:1850 or MATH:1460).

BIOL:3212 Bioinformatics for Beginners 3 s.h.  
Overview of bioinformatics topics including access to sequence data, pairwise and multiple sequence alignment algorithms, molecular phylogeny, microarray data analysis, protein analysis, proteomics, and protein structure analysis; emphasis on each topic includes biological motivation, computational approach (practical and theoretical), and interpretation of output. Prerequisites: BIOL:2512 or BIOL:2211 or BMB:3120 or MIRC:3170. Same as IGPI:3212.

BIOL:3233 Introduction to Developmental Biology 3 s.h.  
Fundamental mechanisms in differentiation, organogenesis, morphogenesis; and pattern formation; mechanistic approach at molecular, cellular, tissue levels of organisms. Prerequisites: BIOL:1411 and CHEM:1120 and (BIOL:1412 with a minimum grade of C- or HHP:3500 with a minimum grade of C-). Recommendations: BIOL:2512.

BIOL:3244 Animal Behavior 3 s.h.  
Genetics, sensory physiology, migration, development of behavior, circadian rhythms, foraging strategies, aggression, sexual and parental behavior, group selection, social behavior. Prerequisites: BIOL:1411 and (BIOL:1412 or PSY:2701).

BIOL:3245 Animal Behavior Laboratory 4 s.h.  
Behavioral aspects of vertebrate and invertebrate animals under pressure of different genetic background, aggression and competition for a mate, food or security, social behavior. Prerequisites: BIOL:1411 and (BIOL:1412 or PSY:2701).

BIOL:3253 Neurobiology I 4 s.h.  
Neurobiology from molecular/cellular to systems levels including cell biology of the neuron; membrane electrophysiology; synaptic transmission and plasticity; functional neuroanatomy; sensory, motor, and autonomic systems; emotion, memory, sleep, language, attention and cognition, neuronal development; focus on systems and developmental neurobiology; first in a two-semester sequence. Prerequisites: BIOL:1411 and (PSY:2701 or BIOL:2753).

BIOL:3254 Neurobiology II 4 s.h.  
Neurobiology from molecular/cellular to systems levels including cell biology of the neuron; membrane electrophysiology; synaptic transmission and plasticity; functional neuroanatomy; sensory, motor, and autonomic systems; emotion, memory, sleep, language, attention and cognition, neuronal development; focus on molecular/cellular neurobiology and neurophysiology; second in a two-semester sequence. Prerequisites: BIOL:3253 and (PHYS:1512 or PHYS:1612).

BIOL:3314 Genomics 3 s.h.  
Major areas of genomics including genome sequencing, assembly, and annotation; evolutionary genomics, metagenomics, functional genomics, and computational genomics; synthetic biology and genome engineering. Prerequisites: BIOL:1412 and (BIOL:2211 or BIOL:2512 or BIOL:2723). Same as IGPI:3314.

BIOL:3343 Animal Physiology 3 s.h.  
Principles of cellular and systems physiology; emphasis on quantitative and experimental aspects. Prerequisites: BIOL:1411 and CHEM:1110 and CHEM:1120 and (MATH:1380 or MATH:1460 or MATH:1550 or MATH:1850). Recommendations: (PHYS:1511 and PHYS:1512) or (PHYS:1611 and PHYS:1612).
BIOL:3363 Plant Developmental Biology 3 s.h.
Developmental processes throughout life cycle of vascular plants; current knowledge of mechanisms, control; emphasis on molecular and genetic approaches to studying development. Prerequisites: BIOL:1412 and BIOL:2512.

BIOL:3373 Human Population Genetics and Variation 3 s.h.
Principles of evolutionary change of genes and genomes applied to human populations and to comparisons between humans and their closest primate relatives; emphasis on consequences of mutation, natural selection, and demographic changes. Prerequisites: BIOL:2512 with a minimum grade of C- or BIOL:2211 with a minimum grade of C-.

BIOL:3603 Mechanisms of Aging 3 s.h.
Evolutionary theories of aging, cellular and genetic basis of aging and repair, disruption of homeostasis in aging; focus on studies of biological and environmental causes of age-related diseases. Prerequisites: BIOL:1411 and (BIOL:1412 or HHP:3500 or PSY:2701). Recommendations: BIOL:2723.

BIOL:3626 Cell Biology Laboratory 4 s.h.
Conceptual understanding and technical skills in fluorescence microscopy and digital imaging, mammalian cell culture, tissue fractionation, centrifugation, electrophoresis, and expression of recombinant proteins. Prerequisites: BIOL:2723.

BIOL:3655 Neurogenetics Laboratory 4 s.h.
Emphasis on project-oriented training to develop fundamental hands-on experimental manipulations and techniques, problem-solving skills, and data analysis methodology; students utilize modern genetic, behavioral, and electrophysiological methods to explore how gene and environment influence nervous system function and behavioral expression using genetic model organisms. Prerequisites: BIOL:2512 or BIOL:2211. Recommendations: BIOL:2753 or PSY:2701.

BIOL:3656 Neurobiology Laboratory 4 s.h.
Principles and practice of neurobiology research, including microscopy and imaging, cellular and molecular neurobiology, and electrophysiology. Prerequisites: (BIOL:1411 and PSY:2701) or BIOL:2753.

BIOL:3663 Plant Response to the Environment 3 s.h.
Mechanisms of plant responses to environmental factors (biotic and abiotic) at organismal and molecular levels. Prerequisites: BIOL:1412 and (BIOL:2512 or BIOL:2723 or BIOL:3716 or MICR:3170 or BMB:3120).

BIOL:3676 Evolution Lab 4 s.h.
Methods of sampling and describing variation in natural populations; application of molecular genetic, bioinformatic, and computational techniques to describe genetic variation through sequence analysis; use of controlled laboratory experiments and computer simulations to illustrate evolutionary principles. Prerequisites: BIOL:2512 or BIOL:2211. Corequisites: BIOL:3172 or BIOL:3373, if not taken as a prerequisite. Recommendations: grade of C or higher in BIOL:3172.

BIOL:3713 Molecular Genetics 4 s.h.
Mechanism, regulation of RNA, DNA, protein biosynthesis, with emphasis on methods of genetic analysis; application of modern recombinant DNA techniques to basic problems. Prerequisites: BIOL:2512 or BMB:3120 or BMB:3110.
BIOL:4386 Introduction to Scientific Computing for Biologists 3 s.h.
In modern biological research, computational tools are no longer a luxury but a necessity; introduction to a set of computational tools and best-practices in data analysis to prepare for data-intensive research in the field of biomedical sciences; topics include reproducibility in computational projects, version control, command-line interface, remote computing, and general and statistical programming. Prerequisites: BIOL:2512 or BMB:3110 or BMB:3120 or MICR:3170. Recommendations: CS:2110.

BIOL:4806 Service Learning in Biology arr. Credit for community outreach and/or service; service learning projects involve more than just volunteering; preparation of a detailed plan summarizing project goals, activities, and audience; routine meetings with team members and faculty mentor; research and development of educational materials and/or activities focused on a biology topic; plan, promote, support, and assess an event that engages the targeted community.

BIOL:4897 Teaching Internship in Biology 1-3 s.h.
Training and practical experiences in the teaching of biology; includes a weekly training session with a PhD instructor or course supervisor, active assistance of the primary instructor in one or more class meetings each week, and/or providing constructive written feedback on laboratory or classroom exercises; additional experiences may include leading a training session, co-teaching or lead-teaching one or more lab or classroom exercises, and assisting with the development of classroom activities or resources; specific experiences will vary depending on the course and supervisor needs. Prerequisites: BIOL:1411 with a minimum grade of B and BIOL:1412 with a minimum grade of B. Requirements: third- or fourth-year standing and interview with instructor.

BIOL:4898 Communicating Research 2 s.h.
Independent, investigative research experience; research process and communication—establishing goals and expectations with a mentor, developing and framing a research hypothesis or question, communicating results in written and oral form to scientist and nonscientist audiences; supportive learning environment to share research experiences and develop identities as scientists, learn skills to become effective independent researchers and science communicators. Requirements: concurrent enrollment in BIOL:4999 or BIOL:3994 or HONR:3994 or URES:3994; or working in a research laboratory as a volunteer or paid research assistant for the semester enrolled.

BIOL:4995 Honors Research in Neuroscience arr. Independent scientific research related to the field of neuroscience. Requirements: honors standing in neuroscience, UI GPA of at least 3.33, and neuroscience GPA of at least 3.33. Same as PSY:4995.

BIOL:4998 Honors Seminar in Biology 2 s.h.
Prerequisites: BIOL:1411. Requirements: honors standing.

BIOL:4999 Honors Research in Biology arr. Independent scientific research related to the field of biology. Requirements: honors standing in biology, UI GPA of at least 3.33, and biology GPA of at least 3.33.

BIOL:5110 Practicum: College Teaching for Biology 2 s.h.
Practical pedagogical concerns including how to structure a course, devise learning outcomes, development of syllabus and calendar of assignments, evaluation of student work, and creation of a student-centered classroom with collaborative learning experiences; for biology TAs teaching in introductory courses BIOL:1411 and BIOL:1412.

BIOL:5172 Graduate Studies in Evolution 4 s.h.
Nature, evidence, analysis, implications, molecular/genetic basis; historical record, phylogeny, speciation, adaptation, investigative methods. Prerequisites: BIOL:1412 with a minimum grade of C- and BIOL:2512 with a minimum grade of C- and (STAT:2010 or STAT:3510 or MATH:1550 or MATH:1850 or MATH:1460). Corequisites: BIOL:5412 or BIOL:5512 or GENE:6150.

BIOL:5199 Critical Readings in Biology arr.

BIOL:5211 Genomes, Genomes, and the Human Condition Graduate Lecture 3 s.h.
Organization, expression, and evolution of genes in context of genomes; focus on human genome; distribution and transmission of variation in human population. Recommendations: BIOL:1411 highly recommended. Same as IGPI:5211.

BIOL:5218 Microscopy for Biomedical Research arr.
Basic microscopy methods for research including optics, preparation, and analysis of biomedical specimens; light, fluorescence, confocal, transmitting electron, scanning electron, atomic force microscopes, elemental analysis; immunochemistry and stereochemistry techniques; individualized laboratory instruction. Prerequisites: BIOL:2723. Same as ACB:5218, MIRC:5218.

BIOL:5412 Fundamental Genetics - Graduate Lecture 3 s.h.

BIOL:5512 Readings in Genetics 2 s.h.
Critical evaluation of classic genetics papers. Requirements: biology graduate standing.

BIOL:5653 Fundamental Neurobiology I 3 s.h.
Neurobiology from molecular/cellular to systems levels, including cell biology of the neuron; membrane electrophysiology; synaptic transmission and plasticity, functional neuroanatomy, sensory, motor and autonomic systems; emotion, memory, sleep, language, attention and cognition, neuronal development; focus on systems and developmental neurobiology; first in a two-semester sequence. Same as NSCI:5653, PSY:5203.

BIOL:5654 Fundamental Neurobiology II 3 s.h.
Neurobiology from molecular/cellular to systems levels, including cell biology of the neuron; membrane electrophysiology; synaptic transmission and plasticity; functional neuroanatomy, sensory, motor and autonomic systems; emotion, memory, sleep, language, attention and cognition, neuronal development; focus on molecular/cellular neurobiology and neurophysiology; second in a two-semester sequence. Prerequisites: BIOL:5653 or NSCI:5653 or PSY:5203. Same as NSCI:5654, PSY:5205.

BIOL:5658 Fundamental Neurobiology I Discussion 2 s.h.
Discussion of selected papers, including classics from neurobiology literature; coordinated with BIOL:5653 lecture material. Same as NSCI:5658, PSY:5204.
BIOL:5659 Fundamental Neurobiology II
Discussion 2 s.h.
Discussion of selected papers, including classics from neurobiology literature; coordinated with BIOL:5654 lecture material. Same as NSCI:5659, PSY:5206.

BIOL:6188 Seminar: Writing in Natural Sciences 2 s.h.
Writing and critiquing skills in the natural sciences.

BIOL:6199 Research: Biology arr.

BIOL:6265 Neuroscience Seminar 0-1 s.h.
Research presentations. Same as ACB:6265, MPB:6265, NSCI:6265, PSY:6265.

Analysis and presentation of primary research on central biological questions utilizing a full array of model and non-model organisms and analytical approaches; development of effective skills in public speaking, presentation, and scientific writing.

BIOL:6899 Independent Study in Biology arr.

BIOL:7270 Principles of Scholarly Integrity 1 s.h.
Training in responsible conduct of research; student/mentor responsibilities; authorship and reviewing; plagiarism/falsification/fabrication of data; intellectual property; conflict of interest; fiscal, institutional, societal; treatment of human and animal subjects; data handling. Requirements: enrollment in graduate psychology or biology program. Same as PSY:7270.

BIOL:7604 Principles of Scholarly Integrity 0 s.h.
Training in responsible conduct of research and scholarly activities; student/mentor responsibilities; authorship; plagiarism/falsification/fabrication of data; intellectual property; conflict of interest; fiscal, institutional, societal; treatment of human and animal subjects; data handling. Requirements: postdoctoral standing in psychology or biology. Same as PSY:7604.