

BIOLOGY

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The biology program provides a curriculum encompassing the study of the diversity and complexity of life with an emphasis on an interactive learning and research environment in which students and faculty explore new knowledge and current concepts. All students are involved in laboratory and field experiences that develop skills in formulating hypotheses, designing experiments or observational procedures, collecting data, analyzing results, and presenting conclusions in both oral and written form. Additionally, numerous opportunities exist for students to participate in original scientific research projects. Courses should be selected in consultation with an appropriate faculty advisor in the Biology Department. Students are encouraged to include within their course of study a variety of learning experiences including structured courses, research, internships, and summer and January term experiences.

Degrees Offered in Biology

Major in Biology

Major in Biology with a Concentration in Cell and Molecular

Minor in Biology

A **major in biology** consists of:

Required Core Courses: Students must earn a C- or better in both courses to continue as majors.

_____ BIOL 115

_____ BIOL 116 (PREQ: BIOL 115 and CHEM 111)

Breadth Distribution: Take at least one course from each of the following three breadth categories.

Ecological and Evolutionary Biology

_____ BIOL 220 Vertebrate Biology

_____ BIOL 222 Mammalogy

_____ BIOL 223 Entomology

- _____ BIOL 259 Conservation and Restoration Ecology
- _____ BIOL 326 Animal Behavior
- _____ BIOL 332 Evolutionary Biology
- _____ BIOL 337 Plant-Animal Interactions
- _____ BIOL 346 Ecosystem Ecology
- _____ BIOL 353 Physiological Ecology
- _____ Approved topics courses (see mentor and department advisor for approval)

Molecular and Cellular Biology

- _____ BIOL 228 Genetics
- _____ BIOL 230 Microbiology
- _____ BIOL 248 Cellular Physiology
- _____ BIOL 340 Immunology
- _____ BIOL 343 Molecular Biology of the Chromosome
- _____ BIOL 344 Molecular Biology of Gene Expression
- _____ BIOL 345 Genomics
- _____ BIOL 347 Cancer Biology
- _____ Approved topics courses (see mentor and department advisor for approval)

Physiological and Organismal Biology

- _____ BIOL 234 Anatomy and Physiology
- _____ BIOL 322 Comparative Vertebrate Anatomy
- _____ BIOL 324 Developmental Biology
- _____ BIOL 351 Extreme Physiology
- _____ BIOL 352 Systemic Physiology

_____ BIOL 358 Ornithology

_____ Approved topics courses (see mentor and department advisor for approval)

Electives

_____ Major elective

_____ Major elective

_____ Major elective

_____ Major elective

_____ Four (4) courses listed above must be at the 300 level or above.

Supporting Requirements for the Major

_____ CHEM 112

_____ Statistics course (one of the following: MATH 120, PSCI 271, PSY 120, PUBH 120, or SSCI 120)

Other Considerations When Planning for the Major:

- Chemistry 351 or Environmental Studies 135 may count as one of the nine biology courses. NOTE: Chemistry 351 does not count as one of the 300 level course requirements for the biology major, but will count in the overall credits needed for the major.
- Only two combined course credits of Biology 260, 460, 464, 472, 491, or 492 may count toward nine biology courses.
- Biology 240 credits will not count toward the major.
- All biology courses applied to major must be taken for a letter grade, except for courses offered S/D/U only or directed and independent studies taken S/D/U at the instructor's discretion.
- Chemistry 112 and a statistics course (Mathematics 120, Political Science 271, Psychology 120, Public Health 120, or Social Science 120) are required supporting courses for the major.

Total Credits Requirement = 9 course credits

A major in **biology with a concentration in cell and molecular** biology consists of:

Required Core Courses: Students must earn a C- or better in both courses to continue as majors.

_____ BIOL 115

_____ BIOL 116 (PREQ: BIOL 115 and CHEM 111)

Molecular and Cellular Breadth Concentration: Take five courses from among the following courses with no more than two courses at the 200 level.

- _____ BIOL 228 Genetics
- _____ BIOL 230 Microbiology
- _____ BIOL 248 Cellular Physiology
- _____ BIOL 340 Immunology
- _____ BIOL 343 Molecular Biology of the Chromosome
- _____ BIOL 344 Molecular Biology of Gene Expression
- _____ BIOL 345 Genomics
- _____ BIOL 347 Cancer Biology
- _____ Approved topics courses

Breadth Distribution: Take one course from each of the following breadth categories.

Ecological and Evolutionary Biology

- _____ BIOL 220 Vertebrate Biology
- _____ BIOL 222 Mammalogy
- _____ BIOL 223 Entomology
- _____ BIOL 259 Conservation and Restoration Ecology
- _____ BIOL 326 Animal Behavior
- _____ BIOL 332 Evolutionary Biology
- _____ BIOL 337 Plant-Animal Interactions
- _____ BIOL 346 Ecosystem Ecology
- _____ BIOL 353 Physiological Ecology
- _____ Approved topics courses (see mentor and department advisor for approval)

Physiological and Organismal Biology

_____ BIOL 234 Anatomy and Physiology

_____ BIOL 322 Comparative Vertebrate Anatomy

_____ BIOL 324 Developmental Biology

_____ BIOL 351 Extreme Physiology

_____ BIOL 352 Systemic Physiology

_____ BIOL 358 Ornithology

_____ Approved topics courses (see mentor and department advisor for approval)

_____ Four (4) courses listed above must be taken at the 300 level or above.

Supporting Requirements for the Major

_____ CHEM 351

_____ Statistics course (one of the following: Mathematics 120, Political Science 271, Psychology 120, Public Health 120, or Social Science 120)

Other Considerations When Planning for the Major:

- One combined course credit of Biology 260, 460, 464, 472, 491, or 492 may substitute for one of the Molecular/Cellular courses provided the research contains a cellular/molecular focus. Biology 240 credits will not count toward the major.
- All biology courses applied to major must be taken for a letter grade, except for courses offered S/D/U only or directed and independent studies taken S/D/U at the instructor's discretion.
- Chemistry 351 and a statistics course (Mathematics 120, Political Science 271, Psychology 120, Public Health 120, or Social Science 120) are required supporting courses for the major.

Total Credits Requirement = 9 course credits

A **minor in biology** consists of:

Required Core Courses: Students must earn a C- in both courses to continue as minors.

_____ BIOL 115

_____ BIOL 116 (PREQ: BIOL 115 and CHEM 111)

Breadth Distribution: Take one course from each of the following three breadth categories.

Ecological and Evolutionary Biology

- _____ BIOL 220 Vertebrate Biology
- _____ BIOL 222 Mammalogy
- _____ BIOL 223 Entomology
- _____ BIOL 259 Conservation and Restoration Ecology
- _____ BIOL 326 Animal Behavior
- _____ BIOL 332 Evolutionary Biology
- _____ BIOL 337 Plant-Animal Interactions
- _____ BIOL 346 Ecosystem Ecology
- _____ BIOL 353 Physiological Ecology
- _____ Approved topics courses (see mentor and department advisor for approval)

Molecular and Cellular Biology

- _____ BIOL 228 Genetics
- _____ BIOL 230 Microbiology
- _____ BIOL 248 Cellular Physiology
- _____ BIOL 340 Immunology
- _____ BIOL 343 Molecular Biology of the Chromosome
- _____ BIOL 344 Molecular Biology of Gene Expression
- _____ BIOL 345 Genomics
- _____ BIOL 347 Cancer Biology
- _____ Approved topics courses (see mentor and department advisor for approval)

Physiological and Organismal Biology

- _____ BIOL 234 Anatomy and Physiology
- _____ BIOL 322 Comparative Vertebrate Anatomy

_____ BIOL 324 Developmental Biology

_____ BIOL 351 Extreme Physiology

_____ BIOL 352 Systemic Physiology

_____ BIOL 358 Ornithology

_____ Approved topics courses (see mentor and department advisor for approval)

_____ One (1) course must be at the 300 level or higher.

Other Considerations When Planning for the Minor:

- All biology courses applied to the minor must be taken for a letter grade.

Total Credits Requirements = 5 course credits

COURSES

BIOL 101 Contemporary Topics in Biology

Introductory courses intended for the general audience that do not count as prerequisites for other courses in biology or satisfy requirements for the major in biology. These courses introduce students to the process and product of scientific inquiry, and to ways that knowledge of biology affects our lives. Title and emphasis announced in term schedule of courses. Past topics have included human genetics, emerging and re-emerging diseases, and biology for citizens. These courses include a laboratory component. May be repeated when topic varies. Requirements met: Sciences Breadth. (Usually each year)

BIOL 102 Advanced Placement Biology

Students earning a score of 4 or 5 on the Advanced Placement Biology exam or a 5, 6, or 7 on the Higher-Level International Baccalaureate Exam will receive credit for this course. This course is counted as a transfer credit toward satisfaction of the non-lab science breadth. Requirements met: Non-Lab Science Breadth.

BIOL 115 Evolution, Behavior, and Ecology

An introduction to evolution, behavior, and ecology. Topics include the mechanisms and results of evolution; speciation processes; population, community, and ecosystem ecology; fundamentals of animal behavior; and behavioral ecology. (Each fall)

BIOL 116 Introductory Cell Biology

This course focuses on a detailed analysis of structure and function of macromolecules characteristic of various cell types, cellular organelles, energetics and information transfer in living systems at the molecular level. Includes one three-hour lab per week. PREQ: Biology 115 and Chemistry 111 or instructor permission. Requirements met: Sciences Breadth and Half Writing Competency. (Each spring)

BIOL 220 Vertebrate Biology

Examines selected aspects of the biology of the vertebrate animals. Topics include morphology, ecology, behavior, systematics, fossil history, and phylogenetic relationships. The laboratory emphasizes qualitative and quantitative field studies of local vertebrates. Includes one three-hour lab per week. This course is intended for Sophomores and Juniors. PREQ: Biology 115 and Biology 116 or instructor permission. Requirements met: Science Breadth. (Each spring)

BIOL 222 Mammalogy

Examines the biology and ecology of mammals, with emphasis on conservation concerns and management strategies. Lecture topics include morphology, taxonomy, behavior, evolution, physiology, and ecology of mammals in Texas and around the world. The lab teaches practical skills necessary to study Mammalogy including live trapping and identification of mammals, preparation of museum specimens, and keeping a field journal. Includes one three-hour lab per week. This course is intended for Sophomores and Juniors. PREQ: Biology 115 and Biology 116 or instructor permission. Requirements met: Science Breadth.

BIOL 223 Entomology

Examines selected aspects of the biology of insects. Topics include evolution, morphology, physiology, ecology, and behavior. The laboratory emphasizes insect collecting and identification as well as quantitative field studies of insect ecology. Includes one three-hour lab per week. Intended for Sophomores and Juniors. PREQ: Biology 115 and 116 or instructor permission. Requirements met: Science Breadth. (Each fall)

BIOL 228 Genetics

An introduction to the principles of transmission and molecular genetics. Topics include Mendelian and non-Mendelian inheritance patterns, the biochemistry and maintenance of the genetic material, and the mechanisms of gene expression and regulation. Laboratory activities will focus on understanding both classical and modern approaches used in the study of genes and their interaction in the context of students participating in an authentic research experience. Includes one three-hour lab per week. This course is intended for Sophomore and Junior standing students. PREQ: Biology 116 and Chemistry 112, or instructor permission. Requirements met: Science Breadth. (Each fall)

BIOL 230 Microbiology

An exploration of structures and functions of microbes. Topics include microbial metabolism, growth of bacteria, microbial genetics, and an introduction to pathogenic microorganisms and host defense mechanisms. Includes one three-hour lab per week. This course is intended for Sophomores and Juniors. PREQ: Biology 116 and Chemistry 112, or instructor permission. Requirements met: Science Breadth. (Each spring and occasionally in the fall)

BIOL 234 Anatomy and Physiology

An introduction to the study of vertebrate anatomy and physiology. This course explores various systems of the human body with an appropriate balance and integration between the two disciplines. Includes one three-hour lab per week. This course is intended for Sophomores and Juniors. PREQ: Biology 116 or instructor permission. Requirements met: Sciences Breadth. (Each fall and spring)

BIOL 240 Research experience

Participation in biological research. Students are invited to work with faculty on some component of their research program. Students' responsibilities are established through a learning contract. Students will learn organizational skills, laboratory techniques, data acquisition and analysis skills, and will develop confidence in the laboratory or field. Grading is S/D/U only; may be repeated when topic varies. This course does not count toward the major or minor but serves as an introduction to research and is usually a prerequisite to more advanced research experiences. Variable course credit unit. PREQ: Instructor permission. COREQ: Biology 480.

BIOL 248 Cellular Physiology

An introduction to the structure and function of eukaryotic cells, with emphasis on cellular responses to the environment, and regulation of cellular physiology through gene expression or protein modification. The course will continue the exploration of topics introduced in Biology 116. Laboratory activities will focus on understanding the complexities of cellular physiology in the context of introducing an authentic research experience. Includes one three-hour lab per week. This course is intended for Sophomores and Juniors. PREQ: Biology 116 and Chemistry 112, or instructor permission. Requirements met: Science Breadth. (Each spring and occasionally in the fall)

BIOL 250 Intermediate Topics in Biology

A study of selected topics for beginning students based on faculty and student interests. Offered on an occasional basis. Course may be repeated when topic varies. 1 course credit. PREQ: Biology 115 and Biology 116 or instructor permission.

BIOL 259 Conservation and Restoration Ecology

An exploration of the ecological fundamentals of species conservation and ecosystem restoration. This course focuses upon the population biology of endangered and invasive species and rehabilitation of critical functioning of degraded ecosystems, including reintroduction and establishment of viable species populations, control of invasive species, and reestablishment of normal food webs. Investigative laboratories focus upon quantitative data collected by students in the field. Laboratory assignments place a premium on data analysis and interpretation. PREQ: Biology 115. Requirements met: Science Breadth. (Each fall)

BIOL 260 Intermediate Directed Study

Intended for novice students to develop and execute a project under close supervision of a faculty member. Project goals and approach must be approved by the department before the end of the sixth week of the term. Students typically present the results of their project in a public forum such as the Biology Department Seminar series. Course credit varies from 0.25-1.00. PREQ: Instructor permission.

BIOL 322 Comparative Vertebrate Anatomy

A study of the structure and adaptations of vertebrates. Evolution of vertebrate systems is emphasized in lecture. The laboratory includes a detailed study of the shark and cat. Includes one three-hour lab per week. PREQ: Biology 234 or instructor permission. Requirements met: Science Breadth. (Each spring)

BIOL 324 Developmental Biology

A study of the embryonic development of animals with an emphasis on vertebrates. The course integrates descriptive observations with experimental studies in order to better understand the underlying mechanisms of development. Course is taught as integrated lecture and lab PREQ: Completion of a 200-level or higher biology course or instructor permission. (Each fall)

BIOL 326 Animal Behavior

A study of the ecology and evolution of behavior. Topics include behavior genetics, biological rhythms, migration, predator-prey interactions, communication, reproductive behavior, sexual selection, and sociality. Field investigations and current research in animal behavior are emphasized. Laboratory investigations require statistical analysis and interpretation of quantitative data. Includes one three-hour lab per week. PREQ: Completion of a 200-level or higher biology course or instructor permission. Requirements met: Sciences Breadth and Half Writing Competency. (Each fall)

BIOL 332 Evolutionary Biology

A study of concepts and mechanisms of evolution. Topics include natural selection, co-evolution, molecular evolution, systematics, and extinction. Includes one three-hour lab per week. PREQ: Completion of a 200 level or higher biology course or instructor permission. Requirements met: Sciences Breadth. (Usually each spring)

BIOL 337 Plant-Animal Interactions

This course will provide an introduction to plant-animal interactions, including the relationships between plants and insects, vertebrates and humans. Emphasis will be on co-evolutionary relationships, herbivory, plant defense, pollination, seed dispersal, mutualism, biotechnology, and integrated pest management. Includes one three-hour laboratory per week. PREQ: completion of one, 200-level or above biology course or instructor permission. Requirements met: Science Breadth and Full Writing Competency.

BIOL 340 Immunology

An in-depth examination of the fundamental mechanisms by which the immune system protects vertebrates from disease. Topics include immune physiology, immunogenetics, and host-microbial interactions. Emphasis is on molecular and cellular processes critical to the development and proper function of immunity as well as applications of immunological techniques in research and clinical settings. Includes one three-hour lab per week. PREQ: One of Biology 228, Biology 230, Biology 234, or Biology 248, or instructor permission. Requirements met: Sciences Breadth and Half Writing Competency. (Fall of even-numbered years)

BIOL 343 Molecular Biology of the Chromosome

An in-depth examination of the current understanding of the structure and maintenance of viral, prokaryotic, and eukaryotic genetic material. Topics include nucleic acid structure, chromosome architecture, DNA replication, DNA damage and repair, homologous and site-specific recombination, and mechanisms of transposition. Emphasis is on laboratory techniques, experimental design and interpretation of data, and extensive analysis of the primary literature.

Includes one three-hour lab per week. PREQ: One of Biology 228, 230, 248, or Chemistry 351, or instructor permission. Requirements met: Science Breadth and Full Writing Competency.

BIOL 344 Molecular Biology of Gene Expression

An in-depth examination of the current understanding of how prokaryotes and eukaryotes regulate gene expression. Topics include basal transcription mechanisms, regulation of gene expression, RNA splicing and stability, organellar gene expression, translation and its regulation, and epigenetics. Emphasis is on laboratory techniques, experimental design and interpretation of data, and extensive analysis of the primary literature. Includes one three-hour lab per week.

PREQ: One of Biology 228, Biology 230, Biology 248, or Chemistry 351 or instructor permission; Chemistry 222 recommended. Requirements met: Sciences Breadth and Full Writing Competency. (Spring of odd-numbered years)

BIOL 345 Genomics

Explores current technological advances in genome research and how these advances are impacting science and society. Emphasis is on methods for analyzing large genomic data sets and their application to biological problems, including sequence alignment and search methods, gene prediction, phylogenetic trees, and genome annotation. Includes one three-hour lab per week. PREQ: One of Biology 228, Biology 230, Biology 248, or Chemistry 351, or instructor permission. Requirements met: Science Breadth. (Each fall)

BIOL 346 Ecosystem Ecology

Examines the flow of energy and the cycling of nutrients and water in ecosystems. Lecture topics include earth's climate and the distribution of ecosystems, geology and soils, photosynthesis and decomposition, and global biogeochemical cycles. Semester-long field measurements and lab analyses of environmental samples (e.g. soil, water) are used to quantify ecological processes. Includes one three-hour lab per week. PREQ: Completion of a 200-level or higher biology course and Chemistry 111, or instructor permission. (Each spring)

BIOL 347 Cancer Biology

Explores the molecular mechanisms underlying the process of cellular transformation to create cancerous cells with emphasis on the genetic and cellular changes that result in altered physiology of the cell. Topics for exploration include the natural history of cancer and epidemiology, the basic machinery of DNA replication and repair, the cell cycle, signal transduction, and genetic predisposition to cancer as well as the roles of oncogenes, tumor suppressor genes, tumor inducing-viruses, and environmental carcinogens in the development of cancer as well as current therapeutic approaches. Includes one three-hour lab per week. PREQ: Biology 228, 230, 248 or Chemistry 351. Requirements met: Science Breadth. (Fall of odd-numbered years)

BIOL 350 Advanced Topics in Biology

A specialized course on a topic in a particular field of biology. Includes one three-hour lab per week. May be repeated when topic varies. PREQ: Completion of a 200-level or higher biology course or instructor permission. 1 course credit.

BIOL 351 Extreme Physiology

Explores the physiology of organisms under extreme conditions. Topics will include physiological adaptations of the top athletes of the animal world (including humans) and the adaptations of plants, animals, and extremophiles of other lineages to harsh environmental conditions, including temperature extremes, high altitude, and extreme aridity. Emphasizes laboratory techniques, experimental design for novel experiments, data analysis, and analysis and presentation of primary literature. Includes one three-hour lab per week. PREQ: Completion of 200-level or higher biology course; Biology 234 recommended. Requirements met: Science Breadth and Half Writing Competency. (Spring of odd-numbered years)

BIOL 352 Systemic Physiology

A study of homeostatic structure and function at the organ and system levels, using human and laboratory animal models. Includes one three-hour lab per week. PREQ: Biology 234 and Chemistry 112, or instructor permission; Physics 106 strongly recommended. Requirements met: Sciences Breadth and Half Writing Competency. (Spring of even-numbered years)

BIOL 353 Physiological Ecology

This course is designed to examine the physiological adaptations of organisms to their environment in the context of ecology and evolution by tracking the flow of materials through a system from the individual to the ecosystem levels. Includes one three-hour lab per week. PREQ: Completion of 200-level or higher biology course; Biology 234 recommended. Requirements met: Science Breadth and Half Writing Competency. (Spring of odd-numbered years)

BIOL 358 Ornithology

A study of the biology of birds. Topics include anatomy, physiology, behavior, ecology, migration, evolution, taxonomy, and identification. Coursework includes both laboratory and field investigations and emphasizes local species and habitats. Students will perform independent research projects outside of class. Includes one three-hour lab per week. PREQ: Completion of a 200-level or higher Biology course; Biology 234 recommended. Requirements met: Sciences Breadth and Half Writing Competency. (Spring of odd-numbered years)

BIOL 450 Advanced Topics in Biology

An advanced course that focuses on a particular field of biology. Includes one three-hour lab per week. Instructor permission required. May be repeated when topic varies. 1 course credit.

BIOL 460 Advanced Directed Study

Intended for advanced students to develop and execute a project under close supervision of a faculty member. Project goals and approach must be approved by the department before the end of the 6th week of the term. Students typically present the results of their project in a public forum such as the Biology Department Seminar series. Offered for variable course credit from 0.25-1.00. PREQ: Instructor permission. COREQ: Biology 480.

BIOL 464 Teaching/Learning Participation

An individualized study that includes sharing in the instructional process for a particular biology course under the supervision of the faculty member teaching the course. Open only to certain

highly qualified juniors and seniors by invitation. See On-Campus Learning Opportunities for more information.

BIOL 472 Research and Design of Experiments

Provides formal training in the approaches used to advance understanding of biological processes. Course activities are built around original research projects designed and completed by students. Lectures, discussions, and readings provide students with the skills necessary for designing original research, performing experiments, analyzing data, and reporting results. PREQ: Instructor permission. Requirements met: Sciences Breadth and Half Writing Competency. (Usually each year)

BIOL 480 Research Discussion

This course provides students engaged in collaborative research with faculty an opportunity to read, critically evaluate, and discuss the current scientific literature. Students enroll in this course each semester they are enrolled in research. The course meeting time is arranged by each individual faculty member. COREQ: Biology 240 or Biology 260 or Biology 460 or Biology 490 or Biology 491. Zero course credit units. (Every semester)

BIOL 490 Independent Study

Intended for advanced senior students to develop and execute a research project with the input and guidance of a faculty mentor. Project goals and approach must be approved by the department before the end of the 6th week of the term. Students will complete a full written assessment of their project and typically present the results of their project in a public forum such as the Biology Department Seminar series. PREQ: Instructor permission. COREQ: Biology 480. Offered in variable course credit from 0.25-1.00.

BIOL 491 Honors Thesis in Biology

Intended for advanced senior students to execute a research thesis under the guidance of a faculty mentor, following an invitation by the department. Project goals and approach must be approved by the department before the start of the term. Students will complete a full written assessment of their project and typically present the results of their project in a public forum such as the Biology Department Seminar series. PREQ: Instructor permission. COREQ: Biology 480.

BIOL 492 Independent Study Off-Campus/NSOC

Student-driven independent study in a topic related to the major completed at an off-campus site. See Off-Campus Learning Opportunities for more information. PREQ: Junior or Senior standing. Special permission required. Offered in variable course credit from 0.25-1.00.