BIOL - BIOLOGY (BIOL)

BIOL 100 Horizons in Biology
Credit 1. 1 Lecture Hour.
Introduction to the study of biology at Texas A&M University; gain knowledge of departmental and campus resources to assist and enhance the pursuit of a degree in biology, microbiology, molecular and cellular biology or zoology.
Prerequisites: First-semester and first-time-in-college freshman majoring in BIOL, MICR, BMCB and ZOOL.

BIOL 101 Botany
Credits 4. 3 Lecture Hours. 3 Lab Hours.
(BIOL 1311 and 1111, BIOL 1411) Botany. Structure, physiology and development of plants with an emphasis on seed plants. (Not open to students who have taken BIOL 111 and BIOL 112 or BIOL 113); includes laboratory that reinforces and provides supplemental information related to the lecture topics.

BIOL 107 Zoology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
(BIOL 1313 and 1113, 1413) Zoology. Survey of animal life with respect to cell organization, genetics, evolution, diversity of invertebrates/vertebrates, anatomy/physiology, and interaction of animals with their environment; includes laboratory that reinforces and provides supplemental information related to lecture topics. (Not open to students who have taken BIOL 111 and BIOL 112 or BIOL 113).

BIOL 111 Introductory Biology I
Credits 4. 3 Lecture Hours. 3 Lab Hours.
(BIOL 1306 and 1106, 1406) Introductory Biology I. First half of an introductory two-semester survey of contemporary biology that covers the chemical basis of life, structure and biology of the cell, molecular biology and genetics; includes laboratory that reinforces and provides supplemental information related to the lecture topics.

BIOL 112 Introductory Biology II
Credits 4. 3 Lecture Hours. 3 Lab Hours.
(BIOL 1307 and 1107, 1407) Introductory Biology II. The second half of an introductory two-semester survey of contemporary biology that covers evolution, history of life, diversity and form and function of organisms; includes laboratory that reinforces and provides supplemental information related to the lecture topics.
Prerequisite: BIOL 111.

BIOL 113 Essentials in Biology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
(BIOL 1308 and BIOL 1108) Essentials in Biology. One-semester in introductory biology for non-majors; chemical basis of life, cellular and molecular biology, genetics, evolution, biodiversity and interaction of organisms with their environment; includes laboratory to supplement and reinforce lecture topics.

BIOL 206 Introductory Microbiology
Credits 4. 3 Lecture Hours. 4 Lab Hours.
(BIOL 2321 and 2121, 2421) Introductory Microbiology. Basic microbiology of prokaryotes and eukaryotes; main topics include morphology, physiology, genetics, taxonomy, ecology, medically important species and immunology; mandatory laboratory designed to give hands-on experience and to reinforce basic principles.
Prerequisites: BIOL 101, BIOL 107, BIOL 111, or BIOL 113; CHEM 101 and CHEM 111 or CHEM 103 and CHEM 113. May not be used for credit by biology, molecular and cell biology, microbiology, zoology, predentistry or premedicine majors.

BIOL 213 Molecular Cell Biology
Credits 3. 3 Lecture Hours.
Explores the molecular basis of cell structure, function and evolution; gene regulation, cell division cycle, cancer, immunity, differentiation, multicellularity and photosynthesis; may not take concurrently with, or after the completion of, BIOL 413.
Prerequisites: BIOL 112; CHEM 102 and CHEM 112.

BIOL 214 Genes, Ecology and Evolution
Credits 3. 3 Lecture Hours.
A genetically-based introduction to the study of ecology and evolution; emphasis on the interactions of organisms with each other and with their environment.
Prerequisite: BIOL 112.

BIOL 285 Directed Studies
Credits 1 to 4. 1 to 4 Other Hours.
Problems in various phases of plant, animal and microbial science.
Prerequisites: Freshman or sophomore classification; approval of ranking professor in field chosen and Undergraduate Advising Office.

BIOL Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours.
Selected topics in an identified area of biology. May be repeated for credit.
Prerequisite: Approval of instructor.

BIOL 291 Research
Credits 0 to 4. 0 to 4 Other Hours.
Active research of basic nature under the supervision of a Department of Biology faculty member. May be repeated for credit.
Prerequisites: Freshman or sophomore classification and approval of faculty member.

BIOL 295 Research Fundamentals in the Life Sciences
Credit 1. 1 Lecture Hour.
First course of four in capstone research program in biology; groundwork for subsequent research-intensive courses; practical understanding of how biological research is accomplished; develop models; synthesize work; glean predictive hypothesis; design critical tests; collect and analyze data; refine or reject hypotheses.
Prerequisite: BIOL 213 or concurrent enrollment, or approval instructor.

BIOL 300 Research Seminar: Tropical Ecology in Costa Rica
Credit 1. 1 Lecture Hour.
Advanced instruction in research activities for Costa Rica; critical planning and writing skills essential in conducting research and communicating results using scientific methods and formatting.
Prerequisites: Junior or senior classification; approval of instructor.

BIOL 302 Careers in Biology
Credit 1. 1 Lecture Hour.
Development of job search skills; utilization of career resources; self-assessment of career interests and career objectives; strategies for professional correspondence and networking; business etiquette and interviewing techniques; insight into life science career opportunities.
Prerequisites: Junior or senior classification; department of biology majors only; or approval of instructor.

BIOL 318 Chordate Anatomy
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Classification, phylogeny, comparative anatomy, and biology of chordates; diversity, protochordates, vertebrate skeletons, shark and cat anatomy studied in laboratory.
Prerequisite: BIOL 112.
BIOL 319 Integrated Human Anatomy and Physiology I
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Integrated approach to cellular, neural, skeletal, muscular anatomy and physiology; includes some histology, histopathology, radiology and clinical correlations.
Prerequisite: BIOL 111 and BIOL 112, or BIOL 107.

BIOL 320 Integrated Human Anatomy and Physiology II
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Continuation of BIOL 319. Integrated approach to endocrine, cardiovascular, respiratory, digestive, urinary, reproductive and developmental anatomy and physiology; includes some histology, histopathology, radiology and clinical correlations.
Prerequisite: BIOL 111 and BIOL 112, or BIOL 107; BIOL 319 or approval of instructor.

BIOL 328 Plants and People
Credits 3. 2 Lecture Hours. 3 Lab Hours.
Development and uses of principal economically important plants of the world; plants and plant parts used in production of important commodities; vascular plants.
Prerequisite: BIOL 101 or BIOL 111 or BIOL 112 or approval of instructor.

BIOL 335 Invertebrate Zoology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Morphology, taxonomy, natural history and phylogeny of invertebrate animals, with emphasis on biodiversity; class includes both lecture and lab. Labs include study of preserved material and demonstration of living animals in aquaria and terraria.
Prerequisite: BIOL 112 or approval of instructor.

BIOL 344 Embryology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Introduction to general and comparative embryology; molecular and cellular mechanisms of development; genetics and early development of selected invertebrates (C. elegans, Drosophila and sea urchin) and emphasis on vertebrates (frog, fish, chick and mouse).
Prerequisite: BIOL 213 or GENE 302.

BIOL 350 Computational Genomics
Credits 3. 2 Lecture Hours. 2 Lab Hours.
Hands-on approach to obtaining, organizing and analyzing genome-related data; emphasis on asking and answering biologically relevant questions by designing and performing experiments using computers; understanding biology from a computational perspective.
Prerequisite: Junior or senior classification in life sciences, engineering, mathematics, chemistry.

BIOL 351 Fundamentals of Microbiology
Credits 4. 3 Lecture Hours. 4 Lab Hours.
Introduction to modern microbiology with emphasis on prokaryotes; includes microbial cell structure, function, and physiology; genetics, evolution, and taxonomy; bacteriophage and viruses; pathogenesis and immunity; and ecology and biotechnology; includes laboratory experience with microbial growth and identification.
Prerequisites: BIOL 112; CHEM 227, and CHEM 237 or CHEM 231; or approval of instructor.

BIOL 352 Diagnostic Bacteriology
Credits 4. 2 Lecture Hours. 6 Lab Hours.
Practical experience in handling, isolation and identification of pathogenic microorganisms using biochemical tests and rapid identification techniques.
Prerequisite: BIOL 206 or BIOL 351.

BIOL 357 Ecology
Credits 3. 3 Lecture Hours.
Analysis of ecosystems at organismal, population, interspecific and community levels. BIOL 358 is the laboratory for this lecture course.
Prerequisite: BIOL 112 or approval of instructor.

BIOL 358 Ecology Laboratory
Credit 1. 3 Lab Hours.
Quantitative analyses of freshwater and terrestrial ecosystems; includes data sampling and presentation of results in written and oral formats; required fieldtrips; analysis of competition and predator-prey interactions using ecological models.
Prerequisite: BIOL 357 or concurrent enrollment; junior or senior classification.

BIOL 388 Principles of Animal Physiology
Credits 4. 3 Lecture Hours. 3 Lab Hours.
Introduction to how animals function, including basics of neurophysiology, endocrinology, muscular, cardiovascular, respiratory, osmoregulatory, and metabolic physiology; broadly comparative in scope and encompassing adaptation of physiological systems to diverse environments; the laboratory stresses techniques used for monitoring and investigating physiological mechanisms and responses to environmental changes.
Prerequisites: BIOL 112; CHEM 228.

BIOL 395 Directed Investigation in Bioinformatics
Credits 2. 1 Lecture Hour. 2 Lab Hours.
Second course of four in capstone research program in biology; conduct individual research projects utilizing bioinformatic tools.
Prerequisite: BIOL 213 or approval of instructor.

BIOL 400 Tropical Ecology Costa Rica
Credits 6. 2 Lecture Hours. 12 Lab Hours.
Advanced field course taught at multiple field stations in Costa Rica; emphasis on biological, ecological, natural history and philosophical attributes of tropical ecosystems; includes planning and conducting a field-oriented research project, and presentation of results.
Prerequisites: BIOL 300 and approval of instructor; junior or senior classification.

BIOL 401 Critical Writing in Biology
Credit 1. 1 Lecture Hour.
Reading scientific papers and writing short synopses of papers with a focus on learning how to think and write like a scientist; fills the current Writing Intensive "W" course requirement for biology.
Prerequisites: BIOL 213 and BIOL 214; junior or senior classification.

BIOL 405 Comparative Endocrinology
Credits 3. 3 Lecture Hours.
Basic principles of endocrinology including structure and functions of hormones in vertebrates; hormonal control of growth, metabolism, osmoregulation, and reproduction; endocrine techniques and mechanism of hormone action.
Prerequisites: BIOL 213 and CHEM 227; BIOL 320 or BIOL 388 strongly recommended.

BIOL 406/GENE 406 Bacterial Genetics
Credits 3. 3 Lecture Hours.
A problem oriented course surveying the manipulation and mechanisms of genetic systems in bacteria; recombination, structure and regulation of bacterial genes, plasmids and phages.
Prerequisites: BIOL 351; GENE 302.
Cross Listing: GENE 406/BIOL 406.
BIOL 413 Cell Biology  
Credits 3. 3 Lecture Hours.  
Structure, function, and biogenesis of cells and their components; interpretation of dynamic processes of cells, including protein trafficking, motility, signaling and proliferation.  
Prerequisites: BIOL 213 and BICH 410.

BIOL 414 Developmental Biology  
Credits 3. 3 Lecture Hours.  
Concepts of development in systems ranging from bacteriophage to the mammalian embryo; use of recombinant DNA technology and embryo engineering to unravel the relationships between growth and differentiation, morphogenesis and commitment, aging and cancer.  
Prerequisite: BIOL 413 or concurrent enrollment or approval of instructor.

BIOL 423 Cell Biology Laboratory  
Credits 2. 1 Lecture Hour. 3 Lab Hours.  
Modern methods of study of cell structure and cell function.  
Prerequisites: BIOL 413 and BICH 412 or concurrent enrollment; approval of instructor.

BIOL 430 Biological Imaging  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Still and video photography and photomicrography, computer-based digital image analysis and processing of biological images; theory and principles of light and electron microscopy including transmission and scanning electron microscopy; optical contrast methods for light microscopy including phase contrast, DIC, polarizing light and confocal laser scanning microscopy.  
Prerequisite: Junior classification or approval of instructor.

BIOL 434/NRSC 434 Regulatory and Behavioral Neuroscience  
Credits 3. 3 Lecture Hours.  
Cell biology and biophysics of neurons; functional organization of the vertebrate nervous system; physiological basis of behavior.  
Prerequisites: BIOL 213, BIOL 319, BIOL 388, NRSC 335/PSYC 335 or PSYC 335/NRSC 335.  
Cross Listing: NRSC 434/BIOL 434.

BIOL 435 Laboratory for Regulatory and Behavioral Neuroscience  
Credit 1. 3 Lab Hours.  
Study of modern methods and tools used to investigate nervous system structure and function.  
Prerequisite: Approval of instructor.

BIOL 437 Molecular and Human Medical Mycology  
Credits 3. 3 Lecture Hours.  
Principles of fungal pathogenesis, diagnosis and antifungal therapies, and relevant genetic and molecular tools for studying human pathogens and drug delivery.  
Prerequisites: BIOL 351; junior or senior classification; or approval of instructor.

BIOL 438 Bacterial Physiology  
Credits 4. 4 Lecture Hours.  
Structure and function of prokaryotic cells, with emphasis on evolutionary adaptations to different environmental, developmental, and pathogenic selection pressures; formation of teams and preparation of presentations on specific topics in microbiology.  
Prerequisites: BIOL 351; BIOL 406/GENE 406 or concurrent enrollment; BICH 410, BICH 431/GENE 431 and GENE 302 strongly recommended.

BIOL 440 Marine Biology  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
Introduction to biology of common organisms inhabiting bays, beaches and near-shore oceanic waters with special reference to Gulf of Mexico biota; emphasis on classification, distribution, history, ecology, physiology, mutualism, predation, major community types and economic aspects of marine organisms.  
Prerequisite: BIOL 112 or approval of instructor.

BIOL 445 Biology of Viruses  
Credits 3. 3 Lecture Hours.  
Structure, composition and life cycles of viruses; methods used to study viruses; their interaction with host cells; mechanisms of pathogenicity and cellular transformation; responses of the host to viral infection, and vaccine applications; in-depth study of the life cycles of the major classes of viruses and discussion of emerging viruses.  
Prerequisite: BIOL 213 or BIOL 351 or approval of instructor.

BIOL 450/BICH 450 Genomics  
Credits 4. 3 Lecture Hours. 3 Lab Hours.  
The study of genomic data includes consideration of the logic behind the most important genomic approaches, as well as their capabilities and limitations in investigating biological processes; the science of accessing and manipulating genomic data; and practical applications, including development of an hypotheses-driven dataminig experiment.  
Prerequisites: BIOL 213, GENE 301 or GENE 302, BICH 431/GENE 431 or GENE 431/BICH 431, or BIOL 351; junior or senior classification or approval of instructor.  
Cross Listing: BICH 450/BIOL 450.

BIOL 451 Bioinformatics  
Credits 3. 3 Lecture Hours.  
Introduction to the entire field of bioinformatics; theoretical background of computational algorithms, with an emphasis on application of computational tools related to modern molecular biological research.  
Prerequisite: Junior or senior classification, or approval of instructor.

BIOL 452 Fungal Functional Genomics  
Credits 4. 3 Lecture Hours. 4 Lab Hours.  
Extensive research experience in eukaryotic molecular genetics using the fungus Neurospora crassa as the primary model system; analysis of Neurospora gene-deletion strain collection to examine the effects of genes on the organism’s traits; introduction of molecular techniques for genome manipulation and analysis.  
Prerequisite: Junior or senior classification in any life science major or approval of instructor.

BIOL 454 Immunology  
Credits 3. 3 Lecture Hours.  
Introduction to basic immunological concepts and principles of serology.  
Prerequisite: BIOL 351 or equivalent or approval of instructor.

BIOL 455 Laboratory in Immunology  
Credits 2. 6 Lab Hours.  
Practical application of serological principles which include precipitation, agglutination and blood banking principles; techniques in tissue culture and hybridoma technology also included.  
Prerequisite: BIOL 454 or registration therein.

BIOL 456 Medical Microbiology  
Credits 3. 3 Lecture Hours.  
Microbiology, epidemiology and pathology of human pathogens with an emphasis on bacterial agents.  
Prerequisite: BIOL 351 or approval of instructor.
BIOL 461 Antimicrobial Agents
Credit 1. 1 Lecture Hour.
Understanding of antimicrobial agents, limitations of use, biosynthesis and regulation, and challenges in development as new therapeutics.
Prerequisites: BICH 410 or BICH 440 and BIOL 351 or VTPB 405.

BIOL 462/WFSC 462 Amazon River Tropical Biology
Credits 3. 3 Lecture Hours.
History, ecology, evolutionary-biology, geography and culture of the Amazon River and Rio Negro; exploration of the world’s most bio-diverse river during a 10-day expedition from Manaus, Brazil; survey biota, record observations about the ecosystem, select research topics, development of presentations.
Prerequisites: BIOL 107, BIOL 112, BIOL 113, BIOL 357 or RENR 205; or approval of instructor.
Cross Listing: WFSC 462/BIOL 462.

BIOL 463 Epigenetic Mechanisms and Inheritance
Credits 3. 3 Lecture Hours.
Knowledge of chromatin structure, the mechanisms of chromatin inheritance and the consequences of heritable chromatin structures on gene expression; phenomenology, molecular underpinnings and evolutionary implications.
Prerequisite: Junior or senior classification or approval of instructor.

BIOL 466 Principles of Evolution
Credits 3. 3 Lecture Hours.
Evolutionary patterns, mechanisms and processes at the organismal, chromosomal and molecular levels; modes of adaptation and the behavior of genes in populations.
Prerequisite: GENE 302 or approval of instructor.

BIOL 467 Integrative Animal Behavior
Credits 3. 3 Lecture Hours.
Examines how behavior contributes to survival and reproduction, and how evolutionary history and ecological circumstance interact to shape the expression of behavior; focus on integrative nature of behavior; how the interaction of evolutionary processes, mechanistic constraints, and ecological demands determine behavioral strategies.
Prerequisite: BIOL 214, BIOL 357, BIOL 388, BIOL 405, BIOL 434/ NRSC 434, or BIOL 466, or approval of instructor.

BIOL 480 Departmental Colloquium
Credit 1. 1 Lecture Hour.
Attend presentations given by renowned scientists from various fields of biology; learn about new developments in science; stay abreast of current and trending research topics.
Prerequisites: Senior classification; majors in BIOL, MICRO, BMCB and ZOOL.

BIOL 481 Seminar in Biology
Credit 1. 1 Lecture Hour.
Recent advances. Restricted to senior undergraduate majors in biology, microbiology, botany or zoology.

BIOL 484 Internship
Credits 0 to 4. 0-1 Other Hours.
Directed internship in a private firm or public agency to provide research experience appropriate to the student’s degree program and career objectives. May be taken two times.
Prerequisite: Approval of internship agency and advising office.

BIOL 485 Directed Studies
Credits 1 to 12. 1 to 12 Other Hours.
Problems in various phases of plant, animal and bacteriological science.
Prerequisites: Junior classification; approval of ranking professor in field chosen and Undergraduate Advising Office.

BIOL 487/VTPB 487 Biomedical Parasitology
Credits 4. 3 Lecture Hours. 2 Lab Hours.
Helminth and protozoan parasites of medical and veterinary importance; life cycles, morphology, taxonomic classification, economic and public health aspects and current topics in parasitic diseases.
Prerequisites: BIOL 107 or BIOL 112; junior or senior classification or approval of instructor.
Cross Listing: VTPB 487/BIOL 487.

BIOL 489 Special Topics in...
Credits 1 to 4. 1 to 4 Lecture Hours. 0 to 10 Lab Hours.
Selected topics in an identified area of biology. May be repeated once for credit.

BIOL 491 Research
Credits 0 to 4. 0 to 4 Other Hours.
Active research of basic nature under the supervision of a Department of Biology faculty member. May be taken two times. Registration in multiple sections of this course is possible within a given semester provided that the per semester credit hour limit is not exceeded.
Prerequisite: Approval of departmental faculty member.

BIOL 493 Independent Bioinformatics Research
Credits 2. 1 Lecture Hour. 2 Lab Hours.
Third course of four in capstone research program in biology; continuation of research projects utilizing bioinformatic tools.
Prerequisite: BIOL 395 or approval of instructor.

BIOL 495 Biology Capstone: Research Communication in the Life Sciences
Credits 2. 2 Lecture Hours.
Culmination of capstone research experience; formalization of research results in written and oral forms; introduction to primary genres or scientific writing; apply principles of rhetoric and composition to diverse methods of professional communication.
Prerequisite: BIOL 452, BICH 464, BIOL 400, BIOL 493 or BIOL 491 or approval of instructor.