BIOLOGY (BIO)

BIO 101. Biology and the Human Condition. (4 h)
Basic principles in biology, emphasizing recent advances in biology in the context of their ethical, social, political, and economic considerations. Intended for students with little or no previous experience in biology. BIO 101 is recommended for those who are not pursuing a career in the health professions or planning to continue on in biology. Does not count toward the biology major or minor. Credit not given for both BIO 101 and BIO 111. Lab-3 hours. (D)

BIO 101L. Biology and the Human Condition-Lab. (0 h)
Lab only. No credit.

BIO 105. Plants and People. (4 h)
Explores the numerous associations between plants and people, the fundamental importance of plant diversity to humans and their role in the sustainability of the biosphere. This course is intended for students with little or no previous experience in biology and does NOT count toward the major or minor in Biology. Lab-3 hours. (D)

BIO 111. Biological Principles. (4 h)
Study of the general principles of living things with focus on the cellular, organismal, and population levels of biological organization, emphasizing the role of heredity and evolution in these systems. Does not count toward the major or minor in biology. Credit not given for both BIO 101 and BIO 111. Lab-3 hours. (D)

BIO 111L. Biological Principles Lab. (0 h)
Lab only. No credit.

BIO 113. Evolutionary and Ecological Biology. (4 h)
Introduction to the principles of genetics, ecology, and evolution as they apply to organisms, populations, and communities, with emphasis on evolutionary processes within an ecological context. Intended as a beginning course in biology for prospective majors. Lab-3 hours. (D, QR)

BIO 113L. Evolutionary and Ecological Biology Lab. (0 h)
Lab only. No credit.

BIO 114. Comparative Physiology. (4 h)
Introduces the form and function of organisms, with emphasis on physical principles, structural organization, and critical function of plants and animals. Intended as a beginning course in biology for prospective majors. Lab-3 hours. (D)

BIO 114L. Comparative Physiology Lab. (0 h)
Lab only. No credit.

BIO 150. Biology I. (3 h)
Introduction to biological principles and concepts I. C-BIO 150L. (D)

BIO 150L. Biology I Lab. (1 h)
Lab-3 hours. C-BIO 150.

BIO 160. Biology II. (3 h)
Introduction to biological principles and concepts II. P-BIO 150 and 150L. C-160L.

BIO 160L. Biology II Lab. (1 h)
Lab-3 hours. P-BIO 150 and 150L. C-BIO 160.

BIO 210. Doing the Right Thing: Ethical Decision-Making in Biology and Medicine. (3 h)
Examines contemporary issues in bioethics, including responsible conduct in research, implications of technological advances in biology, environmental issues, and controversies in health care and medical practice. P-BIO 114 or POI.

BIO 213. Genetics and Molecular Biology. (4 h)
Introduction to the principles and processes of heredity, information flow, and gene function. Topics covered include Mendelian genetics, molecular genetics, and the origin of genetic variation. Lab-3 hours.

BIO 213L. Genetics and Molecular Biology Lab. (0 h)
Lab only. No credit.

BIO 214. Cellular Biology. (4 h)
Introduction to the principles and processes of cellular biology and their impact on organizational function. Topics include molecular organization of cellular structures, regulations of cellular functions, bioenergetics, and metabolism. Introduces cancer, immunology, and developmental biology. Lab-3 hours. P-BIO 114 and CHM 111 or POI.

BIO 214L. Cellular Biology Lab. (0 h)
Lab only. No credit.

BIO 216. Biodiversity. (4 h)
Investigates the history of life on earth and looks at its diversification in an evolutionary and ecological context. Lectures cover the mechanisms of biological diversification and surveys life on earth. Labs introduce students to the broad diversity of life through exercises with living organisms. Lab-3 hours. (D)

BIO 255. Bird Taxonomy (Florida). (2 h)
Immersion in bird taxonomy and ecology, conducted in southern Florida during six days of Spring Break. Two on-campus meetings are followed by a trip to top birding sites in North America, viewing over 100 species and covering most the world’s orders of birds. Out-of-pocket costs for food, transportation, and lodging expected to be $200 or less. P-POI.

BIO 301. Topics in Biology. (1-4 h)
Seminar and/or lecture courses in selected topics, some involving laboratory instruction. May be repeated if the course title differs.

BIO 302. Topics in Biology. (1-4 h)
Seminar and/or lecture courses in selected topics, some involving laboratory instruction. May be repeated if the course title differs.

BIO 303. Topics in Biology. (1-4 h)
Seminar and/or lecture courses in selected topics, some involving laboratory instruction. May be repeated if the course title differs.

BIO 304. Topics in Biology. (1-4 h)
Seminar and/or lecture courses in selected topics, some involving laboratory instruction. May be repeated if the course title differs.

BIO 311. Ecology and Conservation Biology of Coral Reefs. (3 h)
In-depth study of the various biotic and abiotic components that come together to structure ecosystem function and biodiversity at all spatial scales in one of Earth's most productive and diverse environments, yet one most threatened by human use and climate change. P-BIO 113.
BIO 312. Ecology and Conservation Biology of Coral Reefs. (4 h)
In-depth study of the various biotic and abiotic components that come together to structure ecosystem function and biodiversity in all spatial scales in one of Earth's most productive and diverse environments, yet one most threatened by human use and climate change. Lab component is a one-week field trip over spring break. P-BIO 113.

BIO 313. Herpetology. (4 h)
The biology of reptiles and amphibians, emphasizing the unique morphological, physiological, behavioral and life-history adaptations of both groups, and their evolutionary relationships. The lab consists mostly of field trips, supplemented with lab and field projects. P-BIO 113, 114 and 213.

BIO 314. Evolution. (3 h)
How and why adaptive complexity and biodiversity evolve, illustrated with major events in the history of life on Earth. P-BIO 113 and 213.

BIO 315. Population Genetics. (4 h)
Study of the amount and distribution of genetic variation in populations of organisms and of how processes such as mutation, recombination, and selection affect genetic variation. Lectures introduce theoretical studies, and include discussion of molecular and phenotypic variation in natural populations. Labs make use of computer modeling and simulation, and experiments using populations of fruit flies and other model organisms as appropriate. P-BIO 113 and 213 (QR)

BIO 317. Plant Physiology and Development. (3 h)
Lecture course that examines the growth, development, and physiological processes of plants. Control of these processes is examined on genetic, biochemical, and whole plant levels. P-BIO 114, 213 and 214.

BIO 318. Plant Physiology and Development. (4 h)
Lecture and laboratory course that examines the growth, development, and physiological processes of plants. Control of these processes is examined on genetic, biochemical, and whole plant levels. Labs consist of structured experiments and an independently designed research project. Lab-3 hours. P-BIO 114, 213 and 214.

BIO 320. Comparative Anatomy. (4 h)
A study of the vertebrate body from an evolutionary, functional, and developmental perspective. Labs emphasize structure and function, primarily through the dissection of representative vertebrates. Lab-3 hours. P-BIO 113 and 114.

BIO 321. Parasitology. (4 h)
A survey of protozoan, helminth, and arthropod parasites from the standpoint of morphology, taxonomy, life histories, and host/parasite relationships. Lab-3 hours. P-BIO 113 and 114.

BIO 322. Biomechanics. (4 h)
Analyzes the relationship between organismal form and function using principles from physics and engineering. Solid and fluid mechanics are employed to study design in living systems. Lab-3 hours. P-BIO 114.

BIO 323. Animal Behavior. (4 h)
A survey of laboratory and field research on animal behavior. Lab-3 hours. P-BIO 113 and 114.

BIO 324. Hormones and Behavior. (3 h)
Explores the mechanisms of hormonal influences on behavior in a broad range of animals, including humans. P-BIO 114.

BIO 325. Chronobiology. (3 h)
An introduction to the field of biological rhythms, covering different types of rhythms, their evolution, and the mechanisms by which such rhythms are generated and regulated at the molecular, cellular, and system levels. P-BIO 213, 214, or POI.

BIO 326. Microbiology. (4 h)
Structure, function, and taxonomy of microorganisms with emphasis on bacteria. Topics include microbial ecology, industrial microbiology, and medical microbiology. Lab emphasizes microbial diversity through characterizations of isolates from nature. P-BIO 213 and 214, CHM 122 or POI.

BIO 327. Mycology: Biology of Fungi. (4 h)
Introduces fungi, their evolution and natural taxonomy; cell and molecular biology; genetics, mating, and development; primary and secondary biochemistry; and their interactions with other organisms and the environment. Lab introduces culturing, microscopic and molecular techniques. Lab-2 hours. P-BIO 113, 114, 213 and 214, or POI.

BIO 328. Biology of Aging. (3 h)
Explores mechanisms of aging, and effects of aging on cellular and physiological processes in a range of organisms. P-BIO 113, 114 and 214; or POI.

BIO 330. Land and Natural Resource Management. (3 h)
Provides a fundamental understanding of land and resource management. The major focus is on federal oversight and policies but state, local, non-profit, and international aspects are included. P-BIO 113.

BIO 331. Invertebrates. (4 h)
Systematic study of invertebrates, with emphasis on functional morphology, behavior, ecology, and phylogeny. Lab-3 hours. P-BIO 113 and 114.

BIO 333. Vertebrates. (4 h)
Systematic study of vertebrates, with emphasis on evolution, physiology, behavior, and ecology. Laboratory devoted to systematic, field, and experimental studies. Lab-3 hours. P-BIO 113 and 114.

BIO 335. Insect Biology. (4 h)
A study of the diversity, structure, development, physiology, behavior, and ecology of insects. Lab-3 hours. P-BIO 113 and 114.

BIO 336. Development. (3 h)
A study of the molecular, cellular, and anatomical aspects of embryonic development of invertebrate and vertebrate animals. P-BIO 114, 213 and 214, or POI.

BIO 337. Development. (4 h)
Lecture and laboratory study of the molecular, cellular, and anatomical aspects of embryonic development of invertebrate and vertebrate animals. Lab-3 hours. P-BIO 114, 213 and 214 or POI.

BIO 338. Plant Diversity. (4 h)
Explores the diversification of plants in the context of convergent evolution, functional processes and ecological importance. Lab-3 Hours. P-BIO 113 or POI.

BIO 340. Ecology. (4 h)
Interrelationships among living systems and their environments; structure and dynamics of major ecosystem types; contemporary problems in ecology. Lab-3 hours. P-BIO 113 and 114. (QR)

BIO 341. Marine Biology. (4 h)
An introduction to the physical, chemical, and biological parameters affecting the distribution of marine organisms. Lab-3 hours. P-BIO 113 and 114.
Introduction to the gross and cellular anatomical organization of the nervous system. Attention is given to relating structure to function, the anatomical basis of neuropathologies, and modern approaches in neuroanatomy and imaging. P-BIO 114 and POI.

BIO 345. Neurobiology. (3 h)
Introduction to the structure and function of the nervous system including the neural basis of behavior. Anatomical, physiological, and neurochemical approaches will be integrated in the study of the peripheral and central nervous systems. P-BIO 114 and 214.

BIO 346. Neurobiology. (4 h)
Provides a fundamental understanding of how plants have adapted to the stresses of their habitats, particularly in harsh or extreme environments such as deserts, the alpine, the arctic tundra, and tropical rain forests. Labs introduce students to a broad array of field instrumentation. P-BIO 113 and 114. (QR)

BIO 347. Physiological Plant Ecology. (3 h)
Intensive field course in tropical biodiversity. Students will travel to major tropical biomes, including deserts, glaciated peaks and rain forests. Lectures emphasize the basic ecological principles important in each ecosystem; laboratories consist of student-designed field projects. Course location varies yearly. Offered in the summer only. P-BIO 113 and 114 and POI.

BIO 348. Physiological Plant Ecology. (4 h)
Lecture and laboratory course that examines the functional systems that sustain life in vertebrate animals. Lab - 3 hours. P-BIO 114 and 214.

BIO 349. Tropical Biodiversity. (4 h)
Lecture and laboratory course introducing basic resources, their limitations and methods for sustainability. Genetic, aquatic, terrestrial, and ecosystem resources will be examined. P-BIO 113.

BIO 350. Conservation Biology. (3 h)
Focuses on the development of neural structures and the plasticity of the mature nervous system. Attention is given to experimental model systems, particularly Drosophila melanogaster. The laboratory will feature molecular, immunocytochemical, and cell culture techniques for the study of neurons. P-BIO 213 and 214.

BIO 351. Vertebrate Physiology. (4 h)
A lecture and laboratory course emphasizing ecological and evolutionary influences on the physiology, behavior, diversity, and population biology of birds, and case studies in conservation biology. P - BIO 113 and 114.

BIO 352. Developmental Neuroscience. (4 h)
Focuses on the development of neural structures and the plasticity of the mature nervous system. Attention is given to relating structure to function, the anatomical basis of neuropathologies, and modern approaches in neuroanatomy and imaging. P-BIO 114 and 214.

BIO 353. Functional Neuroanatomy. (3 h)
Intensive field-oriented course focusing on ecosystems, natural resource management and environmental conservation of southeastern Australia. Students travel to major biomes including sub-tropical rainforests, coral reefs and the Australian urban environment. Laboratories are field-based, with some consisting of student-designed projects. Lab-3 hours. Taught only in summers in Australia. P-BIO 113 or POI.

BIO 354. Methods in Neuroscience. (3 h)
Explores the ways in which biological mechanisms can inspire new technologies, products, and businesses. The course combines basic biological and entrepreneurial principles. Also listed as ESE 357.

BIO 355. Biology of Birds. (4 h)
Lecture and laboratory course emphasizing ecological and evolutionary influences on the physiology, behavior, diversity, and population biology of birds, and case studies in conservation biology. P - BIO 113 and 114.

A lecture and laboratory course introducing basic techniques in cell biology, leading to an independent project. Lab-3 hours. P-BIO 213 and 214.

BIO 357. Methods in Neuroscience. (3 h)
A study of the components and protective mechanisms of the immune system. Lab-3 hours. P-BIO 114 and 214.

BIO 358. Sensory Biology. (3 h)
A lecture and laboratory course with emphasis on sensory physiology and other aspects of sensory systems, e.g. molecular biology and anatomy. Credit not allowed for both BIO 363 and 364. Lab-3 hours. P-BIO 114 and 214.

BIO 361. Principles of Biological Microscopy. (4 h)
A lecture and laboratory course with emphasis on sensory physiology and other aspects of sensory systems, e.g. molecular biology and anatomy. Credit not allowed for both BIO 363 and 364. Lab-3 hours. P-BIO 114 and 214.

BIO 362. Immunology. (3 h)
Lecture and laboratory course introducing basic techniques in cell biology, leading to an independent project. Lab-3 hours. P-BIO 213 and 214.

BIO 364. Methods in Neuroscience. (3 h)
Introduces students to viruses, viral/host interactions, pathogenicity, methods of control and their use in molecular biology, including gene therapy. P-BIO 114, 213 and 214.

BIO 365. Biology of the Cell Lab. (1 h)
Explores the ways in which biological mechanisms can inspire new technologies, products, and businesses. The course combines basic biological and entrepreneurial principles. Also listed as ESE 357.

BIO 366. Sensory Biology. (4 h)
A study of the components and protective mechanisms of the immune system. Lab-3 hours. P-BIO 114 and 214.

BIO 367. Virology. (3 h)
A lecture and laboratory course with emphasis on sensory physiology and other aspects of sensory systems, e.g. molecular biology and anatomy. Credit not allowed for both BIO 363 and 364. Lab-3 hours. P-BIO 114 and 214.

BIO 368. The Cell Biological Basis of Disease. (3 h)
Explores the ways in which biological mechanisms can inspire new technologies, products, and businesses. The course combines basic biological and entrepreneurial principles. Also listed as ESE 357.
BIO 369. The Cell Biological Basis of Disease. (4 h)
Examines some of the defects in basic cellular mechanisms that are responsible for many diseases. The labs use advanced microscopic and histological techniques to investigate basic properties of cells. Lab-3 hours. P-BIO 114 and 214.

BIO 370. Biochemistry I: Macromolecules and Metabolism. (3 h)
Introduces principles of biochemistry including structure, function, and biosynthesis of biological molecules, analysis of enzyme function and activity, bioenergetics, and regulation of metabolic pathways. Also listed as BMB 370 and CHM 370. Also offered in Salamanca. P-CHM 223 or CHM 280 or BIO 214.

BIO 370L. Biochemistry Lab. (1 h)
Overview of biochemical approaches to study structure and function of macromolecules. Does not count towards the chemistry major with concentration in biochemistry. This course is recommended for pre-health students. Also listed as CHM 370L. Credit allowed for CHM 370L/ BIO 370L or CHM371L/BIO 371L, but not both. Lab-3 hours. P-CHM 223 or CHM 280 or BIO 214. P or C-CHM370/CHM 370.

BIO 371L. Advanced Biochemistry Lab. (1.5 h)
Emphasizes approaches for isolation and analysis of enzymes. Required for majors in biochemistry and molecular biology and the chemistry major with concentration in biochemistry and recommended for research focused students. Also listed as BMB 371L and CHM 371L. Cannot receive credit for this course and CHM 370L/BIO 370L. Lab-4 hours. P-CHM 223 or CHM 280 or BIO 214. P or C-BMB370/BIO 370/CHM 370.

BIO 372. Molecular Biology. (3 h)
Examines the defects in basic cellular mechanisms that are responsible for many diseases. The labs use advanced microscopic and histological techniques to investigate basic properties of cells. Lab-3 hours. P-BIO 114 and 214, or POI.

BIO 372L. Molecular Biology Laboratory. (1.5 h)
Introduces modern methods of molecular biology to analyze and manipulate expression of genes and function of gene products. Also listed as BMB 372L and CHM 372L. Cannot receive credit for this course and BMB 373/CHM 373. P-BIO 213 and 214 and BIO 370/BMB 370/CHM 370 or POI.

BIO 373. Cancer Biology. (3 h)
Analysis of cellular and molecular mechanisms that transform normal cells, trigger abnormal proliferation, and lead to tumor formation. Emphasis is on the biological basis of cancer, with some exploration of clinical and social consequences. P-BIO 213 and 214, or POI.

BIO 374. Neuropharmacology. (3 h)
Examines some of the defects in basic cellular mechanisms that are responsible for many diseases. The labs use advanced microscopic and histological techniques to investigate basic properties of cells. Lab-3 hours. P-BIO 114 and 214.

BIO 375. Great Threatening and/or Neglected Diseases of Mankind. (3 h)
Examines various diseases and, particularly, those found in developing countries. Students will research these diseases, prepare a presentation on them, and write a comprehensive paper of each disease that will include clinical aspects of the diseases, treatments (if any), social and political aspects of the diseases, and evaluate why these diseases remain threats to mankind. P-BIO 213 and 214 or POI.

BIO 376. Methods in Molecular Genetics. (4 h)
A hybrid lecture/laboratory course that gives students a hands-on introduction to a diverse array of techniques commonly used in molecular genetics laboratories. P - BIO 213 and 214, or POI.

BIO 377. Community Ecology. (4 h)
An advanced ecology course covering mechanisms that determine the dynamics and distribution of plant and animal assemblages: life-history, competition, predation, geology, climate, soils, and history. Lectures focus on ecological principles and theory. Lab includes local field trips and discussion of the primary literature. Several weekend field trips. Lab-3 hours. P-BIO 113, 114 and 214. (QR)

BIO 378. Biogeography. (3 h)
Study of geographic variation and distribution of organismal diversity using theoretical, historical and ecological information with specific applications to conservation and sustainability. P-BIO 113 or POI.

BIO 378L. Biogeography Lab. (1 h)
Introduces methods of analysis related to the study of biogeography. Lab-3 hours. P or C-BIO 378.

BIO 379. Introduction to Geographic Information Systems (GIS). (4 h)
Lecture and laboratory course that introduces the concepts and use of GIS as a mapping and analytical tool. Lectures cover the history of GIS, GIS data structures and sources of data, map projections, GIS tools applications, and resources. Exercises include examples of GIS applications in environmental modeling, sociodemographic change, and site suitability analyses. P-BIO 113 or POI.

BIO 380. Biostatistics. (3 h)
An introduction to statistical methods used by biologists, including descriptive statistics, hypothesis-testing, analysis of variance, and regression and correlation. (QR)

BIO 381. Epigenetics. (3 h)
Studies the molecular mechanisms for inheritance of genome modifications. Uses primary literature to explore the environmental and developmental signals that influence epigenetic controls of gene expression and disease. Also listed as BMB 381. P-BIO 213 and 214; or POI.

BIO 381L. Epigenetics Laboratory. (1 h)
Lab provides hands-on experiences with genome editing and molecular genetics to address the function and expression of genes. Also listed as BMB 381L. P or C-BIO 381 or POI.

BIO 382. Molecular Signaling. (3 h)
Examines the molecular and biochemical mechanisms by which hormones, neurotransmitters, and other signaling molecules act to change growth, development, and physiological and behavioral responses of organisms with a focus on discussion of primary literature. Also listed as BMB 382. P-BIO 213, 214, and BIO 370/BMB 370/CHM 370.

BIO 383. Genomics. (3 h)
Examines the architecture, expression, and evolution of genomes. Uses current primary literature to examine the functional and evolutionary dynamics of genomes and the modern analytic techniques used to investigate genome-wide phenomena. Also listed as BMB 383. P-BIO 213; or POI.

BIO 383L. Genomics Lab. (1 h)
Introduces analytic methods and interpretation of genome wide data through practical tutorials. Also listed as BMB 383L. P-BIO 213. P or C- BIO 383; or POI.
BIO 385. Bioinformatics. (3 h)
Introduction to computational approaches essential to modern biological inquiry. Approaches may include large biological dataset analyses, sequence similarity and motif searches, and analysis of high-throughput genomic technologies. Emphasizes interdisciplinary interaction and communication. Also listed as CSC 385 and PHY 385. P-CSC 221 or BIO 213 or POI.

BIO 387. Computational Systems Biology. (3 h)
Introduction of concepts and development of skills for comprehension of systems biology problems, including both biological and computational aspects. Topics may include genome-wide transcriptomic analysis, protein interaction networks, large-scale proteomics experiments, and computational approaches for modeling, storing, and analyzing the resulting data sets. Emphasizes interdisciplinary interaction and communication. Also listed as CSC 387. P-CSC 221 or BIO 213 and 214; or POI.

BIO 390. Mentored Research. (2 h)
Introduces the technology and techniques of research. Working under the supervision of a faculty member or research staff, students will obtain experience in experimental design and analysis. The course may be taken as a precursor to BIO 391. Satisfies the research requirement for the BS degree. Pass/Fail option. P-POI.

BIO 391. Independent Research. (2 h)
Working under the guidance of a faculty member or research staff member, students will conduct an independent research project that involves the collection and analysis of data, and that culminates in a written paper or poster to be submitted to the sponsoring faculty or staff member. The same numbered course cannot be repeated. Subsequent courses should be taken in consecutive order. Satisfies the research requirement for the BS degree. Pass/Fail option. P-POI.

BIO 392. Independent Research. (2 h)
Working under the guidance of a faculty member or research staff member, students will conduct an independent research project that involves the collection and analysis of data, and that culminates in a written paper or poster to be submitted to the sponsoring faculty or staff member. The same numbered course cannot be repeated. Subsequent courses should be taken in consecutive order. Satisfies the research requirement for the BS degree. Pass/Fail option. P-POI.

BIO 393. Research in Biology. (2 h)
For students who wish to continue research projects beyond BIO 391 and 392. Not to be counted toward major. The same numbered course cannot be repeated. Subsequent courses should be taken in consecutive order. Pass/Fail option. P-POI.

BIO 394. Research in Biology. (2 h)
For students who wish to continue research projects beyond BIO 391 and 392. Not to be counted toward major. The same numbered course cannot be repeated. Subsequent courses should be taken in consecutive order. Pass/Fail option. P-POI.