

# BIOLOGY (BIOL)

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## **BIOL 401 - HUMAN CADAVER ANATOMY**

The dissection of the human body is a privilege given to few. This graduate course will provide a broad appreciation for the structural organization of the human body and to relate the organization to regional and systems-related functions through human dissection and lecture. Students will examine human cadavers in a regionally based format: including the back, spinal cord, thorax, abdomen, pelvis, upper and lower extremities, and head and neck.

Credits: 2-4

Course Notes: Student must be enrolled in the MA Biomedical Sciences,, MS Biology or Biotechnology and, Chemical Sciences program.

## **BIOL 404 - HISTOLOGY & ULTRASTRUCTURE**

Histology is the study of the microanatomy of cells, tissues, and organs as seen through a microscope. It examines the correlation between structure and function. This course will discuss preparation of tissues for microscopic examination, different types of microscopy, immunohistochemistry, and interpretation of tissue sections.

Credits: 2-3

## **BIOL 414 - QUANTITATIVE ECOLOGY & CONSERVATION**

Designing ecological experiments to answer critical questions about climate change, urbanization, ecosystem processes and conservation. This course will be skill-based with a focus around experimental designs, experimental manipulation, emphasizing statistical analyses, intensive field and laboratory exercises, and scientific report writing. Lectures and discussions will review current information on climate change and ecosystem processes in the context of current paradigms of global conservation.

Credits: 2,3

Attributes: Lab Course

Course Notes: MATH 122, BIOL 202 or equivalent required.

## **BIOL 418 - BIostatistics**

Design, analysis, and interpretation of biological data using statistics.

Credits: 3

## **BIOL 422 - BOTANY**

Study of the major plant groups, their classification and taxonomy, the anatomy used to identify species. Ethno-botanical importance (e.g. medicinal uses), anatomy, morphology and ecology of plant species will be emphasized. Ecological and economic importance of weedy and invasive species in an ecosystem context will be discussed. Principles of classifying seed plants by families will be introduced in the field and in the herbarium at The Field Museum.

Credits: 4

Course Notes: Consent of Instructor., Includes offsite field trips.

## **BIOL 423 - TROPICAL BIOLOGY**

Exploration of tropical habitats, both marine and terrestrial, in terms of basic biology and ecology and current threats due to development. Emphasis is on coral reefs, including snorkeling of the second largest barrier reef in the world off Ambergris Caye in Belize, with opportunities to observe diverse wildlife in the field. Terrestrial field trips include beaches, mangrove swamps, and tropical deciduous forests. Visits to Mayan ruins and the Belize Zoo on the mainland emphasize local cultural ties to the environment.

Credits: 2

Course Notes: Prerequisites: BIOL 324 or concurrent., One prior college science course required, or consent of instructor.

## **BIOL 424 - MARINE BIOLOGY**

Physical forces, biodiversity, organismal function, and ecological interactions that form marine environments. The principles of cell biology, organismic physiology, biomechanics, and ecology applied to marine biological problems.

Credits: 3

Course Notes: BIOL 201 with a min grade of C- or BIOL 202 with a, min grade of C- or BIOL 112 with a, min grade of B. BIOL 423, Tropical Biology,, can be taken as a lab for this, course. One prior college science course, with a min grade of C required.

## **BIOL 430 - PHYSIOLOGY: MECHANISMS AND DISORDERS**

Learning to approach human physiology from a medical perspective. This course covers the basic systems of the human body through a focus on case studies and medical applications, focusing on the functions and disorders of the digestive, reproductive, circulatory and nervous systems.

Credits: 3

Course Notes: BIOL 201 or equivalent.

## **BIOL 432 - ECOLOGY OF TALLGRASS PRAIRIES**

Prairies have been described as the most endangered ecosystems in North America. This is a field-oriented introduction to prairies, including exploration of unique ecological processes found at the population, community, and ecosystem levels. Special attention will be given to prairie plants, insects, soils, endangered species, and prairie restoration.

Credits: 4

Course Notes: Consent of Instructor., Includes offsite field trips.

## **BIOL 437 - NUTRITION IN AMERICA**

This course will look at our understanding of nutrition and its effect on the body through the lens of the dual epidemics of obesity and food insecurity in America. Students will learn about epigenetic, microbiome and physiological effects of diet through primary and secondary literature and group projects. Students will also learn about the challenges involved in combating food insecurity and improving the American diet through a service-learning component.

Credits: 3

Attributes: Natural Science

Course Notes: Crosslisted with BIOL 337

## **BIOL 439 - EVOLUTIONARY PHYSIOLOGY**

Learning to approach animal physiology from an evolutionary perspective. This course covers mechanisms by which animals perform life-sustaining functions, the evolution and adaptive significance of physiological traits, the diversity of physiological mechanisms, and how physiology and the environment interact. Laboratory involves dissection and study of physiological traits in a variety of different animals as well as experiments on the adaptive significance of traits.

Credits: 2,3

Attributes: Lab Course

**BIOL 443 - CLINICAL BIOETHICS AND MEDICAL LITERATURE**

This course provides an important foundation for the study of bioethics, focusing on the principles of bioethics and some salient legal and clinical cases. Students in this class will gain the fundamental tools for understanding and applying the medical literature. Students will gather information and convincing evidence from high-quality repositories of the health literature. In addition, students will determine the best available evidence for indications of validity, importance and usefulness. This is a survey course covering various contemporary topics in bioethics, focusing on issues encountered in clinical practice. Areas to be studied include end-of-life decision making, the family in medical decision making, issues in clinical research, euthanasia, and pediatric issues. The format includes lectures followed by small group case-based discussions.

Credits: 3

Course Notes: Admission into MA Biomedical Sciences.

**BIOL 450 - CANCER BIOLOGY**

This course provides students with knowledge of the fundamental principles of the molecular and cellular biology of cancer cells. Biology of Cancer is designed to illustrate basic aspects of cancer development, and to discuss how molecular genetic approaches can be used to reveal fundamental processes of carcinogenesis. Lectures and demonstrations explain the role of growth factors, oncogenes, tumor suppressor genes, angiogenesis, and signal transduction mechanisms in tumor formation. Discussion of aspects of cancer epidemiology, prevention, and principles of drug action in cancer management is part of the course.

Credits: 3

Course Notes: Must have BIOL 301 or equivalent.

**BIOL 451 - GENERAL GENETICS**

Classical and molecular genetics. Transmission genetics, chromosome genetics, interaction of genes with sex and environment, mapping, DNA structure and replication, transcription, translation, chromosome structure and genome organization, extrachromosomal inheritance, mutagenesis, gene expression. Genetics of plants, insects, vertebrates, fungi, bacteria, and viruses.

Credits: 2,3

Attributes: Lab Course

Course Notes: Must register for BIOL 451 lecture lab in same semester. Should have or equivalent for BIOL 201 with a min grade of, C- and BIOL 301 with a min grade C-.

**BIOL 453 - MOLECULAR BIOLOGY**

Structure of nucleic acids and chromosomes, DNA replication and repair, general and site specific recombination, control of gene expression at the transcriptional and translational levels, oncogenes and retroviruses. Laboratory techniques include PCR, DNA fingerprinting and DNA sequencing.

Credits: 2,3

Attributes: Lab Course

**BIOL 456 - DEVELOPMENTAL BIOLOGY**

Basic principles and processes of embryology and development; selected invertebrates, vertebrates, and plants. )

Credits: 3

Course Notes: Should have or equivalent for BIOL 301 with a min grade of, C-.

**BIOL 458 - CELL BIOLOGY**

Molecular interactions that underlie the structure and functions of the cell. Topics include protein structure and function, membrane transport, post-translational modifications of proteins and protein secretion, cell cycle regulation, cell signaling and mechanisms of development and differentiation. Laboratory techniques include SDS-PAGE, cell fractionation, bacterial protein expression and purification, and immunohistochemistry.

Credits: 2,3

Attributes: Lab Course

**BIOL 460 - MICROBIOLOGY**

Structure and function of prokaryotic cells, including metabolic and genetic diversity; emphasis on differences and similarities with eukaryotes. Roles microbes play in human body, soil, and water ecosystems. Special emphasis on human diseases and microbial processes for the maintenance of biosphere. Applications to medicine, biotechnology, food processing, agriculture, pollution control. Laboratory includes proficient and safe handling of microorganisms, identification of unknown bacteria, and biochemical and microscopic methods. Included in the biotechnology certificate program.

Credits: 2,3

Attributes: Lab Course

Course Notes: Must have BIOL 301 or equivalent with a min grade C-.

**BIOL 461 - INFORMATION TECHNOLOGY FOR SCIENCES**

Methods of finding biological and biotechnological information. Online and hard copy methods will be discussed; emphasis on the use of various computer databases and the Internet. Genbank and protein sequence databases will be accessed. DNA and protein sequences will be analyzed using various computer-based homology programs.

Credits: 3

Course Notes: Should have BIOL 301 with a min grade of C- or instructor, consent.

**BIOL 463 - INTRODUCTION TO GENOME ANALYSIS**

This course will provide an in-depth exposure to advanced techniques in computational genomics. Lectures will discuss numerous available computational tools for extracting biological information from nucleotide and protein sequences. The computer-based laboratory will utilize a number of bioinformatics software to demonstrate how to manage, search and analyze genetic sequences. This course will specifically emphasize on current trends and developments in bioinformatics.

Credits: 3

Course Notes: BIOL 301 or equivalent with a min grade of C-.

**BIOL 466 - ECOL & EVOL OF MICRO ORG**

Interrelationships among microorganisms and their adaptation to the physical, chemical, and biological properties of their environments. Contexts include human health, the human microbiome, and host-pathogen interactions; the natural environment and microbial contributions to matter and energy flow; and applications of microorganisms to industrial processes. Examples of microorganisms from the 3 domains of life will be studied, with special emphasis on microbial diversity. Laboratory focuses on qualitative and quantitative methods for the study of microbial communities, characterization of metabolic and genetic diversity, and emerging research tools. Intended for advanced undergraduates and graduate students

Credits: 2,3

Attributes: Lab Course, Natural Science

**BIOL 467 - IMMUNOLOGY**

Humoral and cellular immune responses, generation of immune diversity, autoimmune and immunodeficiency diseases. Immunologic assays relevant to clinical settings. Laboratory techniques include antibody-antigen interaction, ELISA, and the purification of lymphocyte populations. Included in the biotechnology certificate program.

Credits: 2,3

Attributes: Lab Course

Course Notes: Must have BIOL 301 or equivalent with a min grade of C-.

**BIOL 468 - RESEARCH METHODS**

This course will cover the theory and practical application of various techniques used to analyze biological data including hands-on practice with equipment used in modern life science laboratories. Topics covered include pre-experiment planning, preparative methods, analytical methods, statistical evaluation of data and communication of results.

Credit may be used in fulfillment of the research requirement for the MS degree.

Credits: 3

Course Notes: Graduate status and completion of one semester of, graduate work at Roosevelt University.

**BIOL 469 - CONSERVATION BIOLOGY: AFRICA**

Conservation Biology—Tropical Africa is a 10 day, field-based course that will largely be carried out in the Amani Nature Reserve, Tanzania, where Dr. Norbert Cordeiro (Roosevelt University) and Dr. Henry Ndangalasi (University of Dar es Salaam, Tanzania) have been working since 1998. Field work will include (i) conducting applied ecological studies relevant to conservation in the area, (ii) discussing and problem-solving issues of poverty and conservation affecting human access to resources, (iii) meeting with Tanzanian stakeholders to gain an appreciation of the complexities of the solutions required to conserve one of the world's most important forests. Students will also spend 2 days in a savannah habitat at one of Tanzania's premier national parks. This course will involve designing ecological experiments, experimental manipulation, statistical analyses, intensive field and laboratory exercises, and scientific report writing.

Credits: 2,3

Attributes: Lab Course

**BIOL 471 - BIOLOGY OF AGING**

The biological relationships between the normal activities of life and aging. Changes in structure and function at various levels of biological organization (subcellular population) with age. Lectures, expert guest speakers, student seminars, term paper.

Credits: 3

Course Notes: Must have a min of 3 hours of a 100 level BIOL course with a, min grade C-.

**BIOL 480 - APPLICATIONS OF BIOTECHNOLOGY**

Research, medical, environmental and industrial uses of biotechnology. Lectures by the biotechnology faculty as well as industrial researchers. Current and future trends in the field.

Credits: 3

**BIOL 481 - BIOLOGY OF BIRDS: ORNITHOLOGY**

This is a hands-on course in the study of birds, from basic biology, to evolution, taxonomy, anatomy, ecology and behavior. There will be labs at the Field Museum using real specimens, and the exploratory field work component will include bird identification skills and bird ecology and behavior. Using a combination of lectures and invited speakers, students will build a firm and solid foundation on bird behavior, ecology and evolution, which will include a plethora of field techniques and laboratory skills.

Credits: 4

Course Notes: BIOL 202 (with a min grade of C-), field work included.

**BIOL 482 - BIOTECHNOLOGY INDUSTRY PRACTICE**

An exploration of the biotechnology industry, including biotechnology commercialization, academic partnerships, economics and global business models; ethical, legal, environmental and social considerations; good laboratory practice (GLP) and good manufacturing practice (GMP); the role of governmental regulatory policy in research, development and production.

Credits: 3

Course Notes: Graduate standing or consent of instructor., Required for Biotechnology Management concentration

**BIOL 483 - SPECIAL TOPICS IN BIOLOGY**

Discussion and critical review of contemporary issues in biology and biomedical sciences based on student and instructor interests. Discussions are intended to foster thought and exploration of solutions to problems in health care, biological research, and approaches to combat health disparities.

Credits: 3

**BIOL 485 - THESIS**

Independent laboratory research culminating in a written thesis under supervision of a faculty sponsor and thesis committee.

Credits: 1-6

Course Notes: Graduate Status.

**BIOL 485Y - THESIS COMPLETION**

Credits: 0

Prerequisites: BIOL 485

Course Notes: Completion of the MS thesis beyond BIOL 485.

**BIOL 491 - BIOLOGY INTERNSHIP**

Off-campus experience at area medical facility. Rotation through at least five medical specialties at a hospital or an approved medical or biomedical research or clinical facility. At least 12 contact hours.

Credits: 1-6

**BIOL 492 - RESEARCH IN BIOLOGY**

Independent field- or laboratory-based research experience under the supervision of a faculty sponsor. A minimum of 3 completed semester hours will fulfill the research requirement for the MS degree. Up to 3 semester hours may be applied toward thesis requirements. Students may register in consecutive semesters.

Credits: 1-4

Course Notes: Consent of instructor. \$100 per semester hour., Students must arrange for independent laboratory research, experience with a science faculty member, prior to registration.

**BIOL 495 - INDEPENDENT STUDY**

Independent library research or theory-based experience under the supervision of a faculty sponsor. 1 to 5 semester hours may be applied toward the MS degree. Credit may not be applied toward research or thesis requirements.

Credits: 1-5