BIOLOGY

Overview

The Biology Department offers Masters programs in Biology and Medical Sciences. Our faculty members are well-respected leaders in their fields and publish extensively. They also attract a significant amount of external grant support which allows them to pursue research projects that are at the forefront of modern biology. Students receive individual attention as they pursue their own research and work toward their master's degree.

Graduate Programs

- Biology (MS) (https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/biology/biology-ms/)
- Medical Sciences (MA) (https://catalog.luc.edu/graduate-professional/graduate-school/arts-sciences/biology/medical-sciences-ma/)

Biology (BIOL)

BIOL 401 Medical Literature and Ethics (3 Credit Hours)
The course will include lectures on the foundational concepts of modern ethics, in class discussions of ethics primarily centered on discussion of cases from different ethical perspectives, quizzes to assess reading mastery and familiarity with material to qualify students on how to discuss cases and formal case presentations by student working groups.
Outcomes:
Understand and articulate the philosophical basis for different ethical frameworks; Have a firm command of the "four principles" of Benevolence, Non-maleficence, Justice and Autonomy and their clinical applications; Be able to resolve clinical ethical issues and back up your reasoning

BIOL 402 Microbiology (3 Credit Hours)
Lecture and laboratory. Fundamental concepts of microbial life, physiology, and metabolism.
Outcomes:
Students will learn the differences between the 3 domains of life and will comprehend the biochemistry, morphology, growth characteristics, structure and ecology of microbes

BIOL 405 Advanced Development (3 Credit Hours)
Developmental Biology draws from Genetics, Molecular Biology, Genomics, and Embryology and is a foundational science for understanding problems in Humans ranging from birth defects to cancer. Because of its multidisciplinary foundation, Developmental Biology is best thought of as a SYSTEM OF IDEAS, EXPERIMENTS AND OBSERVATIONS, as such you will greatly expand your scientific vocabulary and problem solving abilities during the course of this semester. Often you will need to draw on your stored knowledge from many disciplines to understand the topics we will cover. The course will comprise lectures on general development, evolution and developmental genetics, followed by discussions of papers on particular topics, and student presentations.

BIOL 408 Writing for the Medical Professions (3 Credit Hours)
This course will be required for the Master of Arts in Medical Sciences (MAMS) program. It will include readings related to developing the student's physician persona, and writings that are required for the medical school application process. Pre-requisites: Admission to the MA in Medical Sciences program.
Outcomes:
Students will be prepared to write effective primary and secondary essays for their medical school applications; communicate clearly their motivation to pursue a career in medicine and the relevance of their experiences to their pre-medical preparation

BIOL 409 Advanced Genetics (3 Credit Hours)
Pre-requisites: Restricted to students in the MAMS Program (Note: MAMS = MSCI-MA)
The course will comprise formal discussions on the molecular basis of information storage and retrieval in the cell, the role of genetics in human development and homeostasis, the mapping of human genes in familial or population contexts, and modern understanding of the connection between genotype, phenotype and human traits.

BIOL 410 Advanced Cell Biology (3 Credit Hours)
This course explores, in depth, the life cycle and activities of a typical eukaryotic cell. Some of the topics covered are cell polarity, cytoskeleton, plasma membrane, protein modifications and trafficking, extracellular matrix and cell death. Competencies to be gained in this course: To develop the skill of reading and analyzing the primary literature on topics pertaining to cell biology. Judging whether a conclusion is supported by sufficient data. Identifying the controls in published experiments. Exam-taking skill improvement using short reading passages from the scientific literature as topics.

BIOL 413 Advanced Immunology (3 Credit Hours)
Introduces innate and adaptive immunity, lymphocyte development, T-cell and B-cell mediated immunity, leukocyte trafficking, immunological memory hyperimmune reactions, autoimmunity, tumor and transplant immunity. Must be enrolled in the Master of Arts in Medical Sciences (MAMS) program.
Outcomes:
Students will acquire an overview of the human immune system that prepares them for success in a medical school immunology class

BIOL 415 Advanced Parasitology (4 Credit Hours)
Lecture and laboratory. A study of animal parasites, their distribution, structure, adaptations, life cycles, and host relationships.
Outcomes:
Students will learn to recognize the major groups of animal parasites, be able to explain their life cycles and describe the mechanisms that hosts use to ward off parasite infestation

BIOL 416 Limnology Lec/Lab (4 Credit Hours)
Lecture and laboratory. An introduction to the structure and function of lake and stream ecosystems. The course includes the integration of physical, chemical, and biological parameters. Laboratories include weekend field trips to aquatic habitats. Students will learn to evaluate the trophic status and health of a lake by the end of the course.
Outcomes:
Students will learn methods of sampling and analyzing physical, chemical and biological factors in lake and stream ecosystems, and how to integrate these complex data sets to answer ecosystem process-level questions

BIOL 417 Wetland Ecology Lec/Lab (4 Credit Hours)
Lecture and laboratory. An introduction to the study of wetlands habitats. This course includes discussion of physical and chemical factors, biota, production and community dynamics. Laboratories include several field trips to regional wetland habitats.
Outcomes:
Students will understand the functioning of wetlands, become aware of the variety of wetlands and become familiar with wetland biota, especially wetland plants

BIOL 418 Aquatic Insects Lecture & Laboratory (4 Credit Hours)
Lecture and laboratory. This course focuses on the classification and ecology of insects that have become fully or partially adapted to the aquatic environment. Emphasis will be on the ecology and biology (behavior, physiology and phylogeny) of aquatic insects. The course includes laboratory field trips to local and upper Midwest aquatic habitats.
Outcomes:
Students will acquire an understanding of the ecological relationships between aquatic insects and their physical and biological environment, including their interactions with humans

BIOL 422 Research (1-6 Credit Hours)
Laboratory or field research under faculty guidance emphasizing hypothesis testing, literature searches, experimental design, and use of appropriate techniques.
Outcomes:
Students will learn the full set of research skills required in doing an independent project and reporting the results

BIOL 426 Entomology Lec/Lab (4 Credit Hours)
Lecture and laboratory. An introductory course that covers the morphology, metamorphosis, classification and biology of the major insect groups. The laboratory includes dissection and the use of analytical keys and figures to identify insect taxa. Field trips and student collections add to the laboratory experience. They will also learn to distinguish immature insects from adult insects and to recognize the numerous beneficial insects as well as the small number that are detrimental.
Outcomes:
Students will learn to identify major insect groups in the field and in the laboratory

BIOL 430 Virology (3 Credit Hours)
This course covers the molecular details of viral infection and the diverse strategies used by these pathogens to invade cells and avoid immune clearance. The focus will be on mammalian viruses of biomedical relevance.
Outcomes:
Students will be able to demonstrate detailed understanding of basic viral structure, basic viral replication/infection cycles, and specific examples of viruses and their infection strategies

BIOL 450 Advanced Bioinformatics (2 Credit Hours)
Pre-requisites: BIOL 388 or BIOL 488
Students will study fundamental bioinformatics algorithms and emerging software tools in the field. The course will include the study of primary literature and design and implementation of bioinformatics algorithms.
Course equivalencies: X- BIOI 500 /BIOL 450
Outcomes:
Students can describe, design, implement, and evaluate bioinformatics algorithms

BIOL 451 Bioinformatics Seminar (1 Credit Hour)
Pre-requisites: BIOL 388 or BIOL 488
The seminar will introduce students to current topics in bioinformatics through presentations given by leaders in bioinformatics research. This course will also include more formal training in scientific presentation skills. Students can summarize, critique, and present bioinformatics research.
Course equivalencies: X-BIOI501/BIOL451

BIOL 452 Human Anatomy and Physiology I (3 Credit Hours)
The course objectives are to learn the gross anatomical structures of the human body. To organize the relationships between these structures and systems using patterns of innervation and development. To be able to apply anatomical knowledge in ways pertinent to clinical issues.

BIOL 453 Human Anatomy and Physiology II (3 Credit Hours)
Pre-requisites: Restricted to students in the MAMS Program
This is the second semester of a 2 semester course. We will cover the physiology of the cardiovascular, respiratory, digestive, renal, reproductive, and endocrine systems, in addition to acid-base and fluid balance, temperature regulation, and exercise physiology. Functioning will be discussed from a systems level to a molecular level.

BIOL 455 Advanced Neuroscience (3 Credit Hours)
This course will focus on the cellular, anatomical, and functional organization of the human nervous system that range in topics from ion channel physiology to cognition. Students will survey the elements of the nervous system necessary for a foundation for medical school. An understanding of pathologies presented in disease, dysfunction, and injury will be included.
Outcomes:
Learn foundational neurological concepts presented to first year medical students; Learn the pathology of neurological disease, dysfunction, and injury through clinical cases; Understand the neurological basis of higher-order functions

BIOL 458 Developmental Neurobiology (3 Credit Hours)
This course focuses on cellular and molecular underpinnings of the development of neuronal features of the nervous system. Topics include neural induction and subsequent differentiation events, regulation of neuronal survival, axon guidance, target selection, and synaptogenesis. Students will also learn how to critically read primary research papers and present these papers to the class.
Outcomes:
Students will become familiar with principles of neural development and the studies that led to those principles

BIOL 461 Advanced Neurobiology (3 Credit Hours)
The purpose of this course is to introduce major principles and concepts of modern neurobiology. An emphasis is placed upon an understanding of the electrophysiology of the neuron and the manner in which groups of neurons are organized into functional nervous systems subserving sensory, motor or integrative functions.
Outcomes:
Student will gain a sold foundation in nervous system structure and function

BIOL 466 Advanced Biochemistry (3 Credit Hours)
Life is based on four principle cellular components: proteins, lipids, carbohydrates, and nucleic acids. Biochemistry is concerned with the structure, function, and interactions of these compounds with one another and their environment. As such biochemistry plays a vital part in all aspects of the medical sciences since it not only helps us to understand how the (human) cell works on a molecular level but also how to decipher and possibly counter pathogenic conditions. Consider that almost all drugs used in medical treatment target proteins or groups of proteins to modulate their biochemical properties.

BIOL 470 Biostats & Exp Design Lec/Lab (4 Credit Hours)
This course is designed for students who are in, or plan to attend, graduate or professional school, and thus, will be working with their own data or critically analyzing existing data. This course will emphasize the theory and application of commonly used statistics in biology.

BIOL 479 Biology AP Workshop (3 Credit Hours)
No course description is available

BIOL 482 Advanced Molec Genetics (3 Credit Hours)
This course covers the molecular details of genetic processes such as DNA replication, RNA and protein synthesis, gene regulation and genome organization.
Outcomes:
Students will be able to demonstrate a detailed understanding of (1) basic molecular techniques, (2) the macromolecules involved in genetic processes, and (3) published experiments that underlie our knowledge of these processes

BIOL 483 Pop Genetics (3 Credit Hours)
Fundamental principles of population, ecological, and evolutionary genetics, including molecular evolution and analysis of the genetic structure of populations. They learn how to apply basic tools of population genetic analysis.
Outcomes:
Students develop knowledge and awareness of population genetic theory and information

BIOL 485 Prin Electron Microscopy Lec/Lab (4 Credit Hours)
Lecture and laboratory. This course focuses on the various areas of Electron Microscopy, both Scanning and Transmission. Topics include sample preparation, microscope operation, image acquisition using photographic and digital techniques, history and development, and new and special techniques. Students will also learn how to correctly interpret their results, and properly present their data.
Outcomes:
Student will become adept with the various techniques needed to produce research quality electron micrographs

BIOL 488 Bioinformatics (3 Credit Hours)
Students will engage in the applications of computer-based tools and database searching to better understand the fields of genetics, genomics, evolutionary biology, and personalized medicine. Students will be introduced to scripting programming languages for analyzing biological data sets.
Outcomes:
Students will be able to appropriately use computer software and databases to accurately analyze biological data and interpret the results, applying their understanding of genetic processes

BIOL 493 Directed Reading (1-4 Credit Hours)
Student investigates a current topic in biology.

BIOL 495 Special Topics (1-4 Credit Hours)
Special areas of study outside the usual curriculum, that vary each time the course is offered.
Outcomes:
Students will master a unique topic in biology

BIOL 495L Special Topics Lab (0 Credit Hours)
Laboratory. Special areas of study outside the usual curriculum, that vary each time the course is offered. Outcome: Students will master a unique topic in biology.

BIOL 500 Scientific Logic (3 Credit Hours)
The Scientific Logic course is designed to teach scientific literacy in terms of writing grant proposals, reading scientific literature, scientific presentations and debate. The course is framed within an evolutionary foundation.
Outcomes:
Students will gain knowledge in advanced evolutionary topics, while preparing a grant proposal and developing skills with respect to critical thinking and scientific inquiry

BIOL 501 Seminar (1 Credit Hour)
Students present specific, current research topics including their own research to the class and faculty.

BIOL 502 Department Seminar (1 Credit Hour)
Students meet and discuss the research presented by seminar speakers.

BIOL 510 Instructions in Teaching Biology (1 Credit Hour)
Introduction to the fundamentals of teaching biology.

BIOL 511 Biology Teaching Practicum (2 Credit Hours)
Students gain firsthand teaching experience by assisting in undergraduate courses.

BIOL 595 Thesis Supervision (0 Credit Hours)
Students conduct thesis research under the direction of their Thesis Director.

BIOL 605 Master's Study (0 Credit Hours)
Students conduct thesis research under the direction of their Thesis Director.