

# BIOLOGY (BIO)

## BIO 587 TOPICS IN BIOLOGY

1-4, 1/0

In-depth examination of rapidly and significantly changing disciplinary issues, topics, or practices; offered occasionally.

## BIO 590 INDEPENDENT STUDY

1-6, 0/0

Independent investigation into a specific area of biology; topic selected by the student in consultation with a faculty member

## BIO 600 FOUNDATIONS OF GRADUATE STUDIES IN BIOLOGY

3, 3/0

Prerequisite: Graduate student status in Biology. Introduction to the culture and structure of graduate studies in Biology including the methodology and tools, writing, experimental design, and communication of biological research.

## BIO 601 FOUNDATIONS OF CELL AND MOLECULAR BIOLOGY

3, 3/0

Prerequisites: Undergraduate courses in cell biology and genetics or instructor permission. Fundamental paradigms in cell and molecular biology as illustrated by current research; mechanisms by which genes control morphogenesis of plants and animals; evolution of the eukaryotic genome; mechanisms by which the transcription of eukaryotic genes is regulated; regulation of the cell-division cycle in eukaryotic cells. Emphasizes current literature, as well as writing and oral expression about the literature readings.

## BIO 602 FOUNDATIONS OF ENVIRONMENTAL PHYSIOLOGY

3, 3/0

Prerequisites: Undergraduate courses in botany and zoology or instructor permission. Evolution of specialized features in plants and animals that allow them to maintain a stable internal environment while being exposed to a variety of external environmental conditions: adaptations of organisms for environments low in water or oxygen; problems associated with ionic and water regulation in freshwater and marine organisms; fundamental physiological principles that apply to both plants and animals.

## BIO 603 FOUNDATIONS OF ECOLOGY AND EVOLUTION

3, 3/0

Prerequisites: Undergraduate courses in ecology and evolution or instructor permission. Current theories and paradigms of modern ecology and evolution; population and community interactions of organisms; coevolution; ecological and evolutionary genetics; micro- and macroevolution.

## BIO 608 MOLECULAR GENETICS

3, 3/0

Prerequisite: One course in genetics. Molecular basis of the structure, replication, and genetic function of DNA; mutation, recombination, and the nature of genes; the genetic code, messenger and transfer RNA, and protein biosynthesis; molecular evolution of proteins.

## BIO 611 BIOTECHNOLOGY

3, 3/0

Prerequisite: BIO 303 or BIO 314 or an equivalent course. Exploration of current technologies in molecular biology, cell biology, and immunology to address agricultural, environmental, industrial, and human health issues. Topics include recombinant DNA technology, DNA sequencing, RNA interference, CRISPR-Cas9 genome editing, monoclonal antibodies, immunotherapies, stem cells, genetically modified organisms, infectious disease diagnosis, treatment and vaccination, and regulations of biotechnology. Offered occasionally.

## BIO 612 TOPICS IN ECOLOGY

3, 3/0

Prerequisites: One semester each of ecology and biometrics or equivalent. Lecture and discussion on a specific topic in ecology, such as population ecology, microbial ecology, plant ecology, ecology of the Great Lakes, or advanced limnology. Topics vary with each session. May be taken more than once.

## BIO 616 TOPICS IN ANIMAL PHYSIOLOGY

3, 3/0

Prerequisites: General physics, organic chemistry, and one year of physiology. Lecture and discussion on special topics in animal physiology, such as immunology, advanced animal physiology, and animal responses to stress. Topics vary with each session. May be taken more than once.

## BIO 617 RESEARCH SEMINAR

1, 1/0

Presentations and discussions of current research projects by graduate students in biology. Each participant presents a seminar. Required for all candidates for the M.A. degree in biology.

## BIO 619 PLANT ECOLOGY

3, 3/0

Prerequisites: Undergraduate course in ecology. The relationship between plants and their environment from the scale of individuals to ecosystems. Plant physiological ecology, plant community composition and structure, competition and facilitation, effects of human activities, disturbance, succession and plant-animal interactions. Offered every other year.

**BIO 621 TERRESTRIAL ECOSYSTEM ECOLOGY**

3, 3/0

Prerequisite: Undergraduate course in ecology. Exploration of the ecosystem concept in ecology. Interactions among organisms and their environment as an integrated system. Factors regulating pools and fluxes of materials and energy through terrestrial ecological systems. Structure and functional relationships, spatial and temporal patterns in ecosystem processes, and the legacy of response to past events. Offered occasionally.

**BIO 622 FOUNDATIONS OF ANIMAL DEVELOPMENT**

3, 3/0

Prerequisite: At least one upper division undergraduate course in cell or molecular biology, or instructor permission. Fundamental principles and processes of animal development with emphasis on molecular and cell mechanisms underlying differentiation, pattern formation, morphogenesis, and regeneration. Topics include fertilization, cleavage, gastrulation, and organogenesis. Experimental paradigms and techniques explored through primary literature. Offered alternate years.

**BIO 626 TOPICS IN BOTANY**

3, 3/0

Prerequisites: 9 credit hours of botany-oriented courses. Lecture and discussion on a specific topic in botany, such as biosystematics, dendrology, wetland plants, plant pathology, or plant response to stress. Topics vary with each session. May be taken more than once.

**BIO 627 TOPICS IN ZOOLOGY**

3, 3/0

Prerequisites: 9 credit hours of zoology-oriented courses. Lecture and discussion on a specific topic in zoology, such as invertebrate zoology, entomology, fisheries biology, or functional vertebrate morphology. Topics vary with each session. May be taken more than once.

**BIO 629 FISHERIES MANAGEMENT**

3, 3/3

Prerequisite: One semester of ecology or instructor permission. Advanced study of the ecology and management of fish populations emphasizing inland fisheries in North America. Topics include management philosophies, fisheries statistics and modeling, habitat protection and manipulation, introduced and endangered species, stocking, and Great Lakes fisheries.

**BIO 630 STREAM ECOLOGY**

3, 3/3

Prerequisite: One semester each of ecology and statistics or instructor permission. Biological, chemical, geomorphic, and hydrologic features affecting the ecology of flowing water systems. Emphasis on freshwater invertebrate life histories, adaptations, and community structure in shallow streams.

**BIO 635 GREAT LAKES ECOLOGY**

3, 3/0

Prerequisite: One semester of ecology or instructor permission. Study of the North American Great Lakes: physical and chemical features, biological structure, and ecological interactions. Focus on environmental issues, including water quality and the effect of introduced species.

**BIO 661 QUANTITATIVE PCR**

1, 1/0

Prerequisite: BIO 303 or equivalent. Theory and practice of quantitative Polymerase Chain Reaction (qPCR), a technique used to quantify nucleic acid molecules in biological and environmental samples. Experimental design, instrumentation, data analysis, and MIQE standards will be emphasized. Offered occasionally.

**BIO 670 BIOLOGICAL DATA ANALYSIS**

3, 3/0

Prerequisite: One course in statistics. Experimental design and statistical analysis of biological data; applications of computers to biological investigations. Designed for students in the initial stages of planning their research.

**BIO 672 FORENSIC MOLECULAR BIOLOGY**

4, 3/3

Prerequisites: BIO 303 or BIO 350; FOR 612 or CHE 312; CHE 670 or CHE 470 or BIO 305; or equivalents. Applications of biology, biochemistry, and genetics to forensic science with an in-depth look at the evidential information that can be obtained from blood, semen, saliva, and hair. Details of DNA profiling, including DNA extraction, DNA quantification, PCR amplification, STR analysis and interpretation, and mtDNA sequencing. Protein polymorphisms and immunological tests. Laboratory component providing hands-on experience with techniques commonly used in a forensic biology laboratory. Equivalent Course: CHE 672

**BIO 690 MASTER'S PROJECT**

1-3, 0/0

Prerequisite: Approval of proposal by the student's project committee; open to M.S. in education candidates. Investigation of a special-interest problem, planned and executed with consultation and advisement from the instructor and the student's project committee.

**BIO 695 RESEARCH THESIS IN BIOLOGY**

1-6, 0/0

Prerequisite: Approval of proposal by the student's thesis committee; open to M.A. or M.S. in education candidates. Individual investigation of an original problem submitted in acceptable form according to directions given by the Graduate School.

**BIO 699 CAPSTONE EXPERIENCE IN BIOLOGY**

1, 0/0

Prerequisites: BIO 600 and permission of the graduate advising committee. A culminating, "capstone" experience of the M.A. Biology program for students pursuing the non-thesis option which includes writing a literature synthesis and a public oral presentation of their work. Offered every semester.

**BIO 721 THESIS/PROJECT CONTINUATION**

0, 0/0

**BIO 722 THESIS/PROJECT EXTENDED**

0, 0/0