

# BIOLOGY (BIO)

**BIO 500. Special Topics in Molecular and Cell Biology.** 3 Credits.  
**Prerequisites:** None

**BIO 501. Special Topics: Advanced Protein Methods.** 4 Credits.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 505. Writing and Science.** 3 Credits.  
 This course reviews how scientific results and ideas are communicated and reviewed. Course content includes the storage and retrieval of scientific information, data presentation (table, figures, graphics), the writing of reports and papers as well as the preparation of publications for peer review. Copyright, patent law and the ethical issues involved in scientific communication also are considered. Assignments include oral and written presentations and attendance at assigned seminars and meetings.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 515. Advanced Biochemistry.** 4 Credits.  
 This course offers advanced insights into major areas of biochemistry, including the structure and function of biological molecules, cell and membrane structure and function, bioenergetics and enzyme function, and cellular metabolism. This is a suitable prerequisite for many graduate courses.  
**Prerequisites:** None  
**Offered:** Every year, Spring

**BIO 517. Advanced Developmental Biology.** 3 Credits.  
 This graduate-level course is an in-depth investigation into the processes that enable a single cell to become an entire multicellular organism with specialized organs and tissues. Various model organisms are explored, compared, and integrated to illustrate key molecular and cellular mechanisms that lead to the formation of whole organisms, and how those mechanisms have been modified through evolution to generate organismal diversity. Emphasis is on a critical analysis of the primary literature related to these topics.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 521. Stem Cell Biology.** 3 Credits.  
 This course provides a comprehensive overview of stem cell biology. Participants explore the topics of embryonic and adult stem cells, stem cell characteristics, reprogramming, stem cell therapies and tissue regeneration. Primary research literature associated with each topic is discussed and students gain an understanding of the role of stem cells in health and disease.  
**Prerequisites:** None  
**Offered:** As needed, Spring

**BIO 523. Classical Genetics.** 1 Credit.  
 This 1-credit course is aimed at graduate students who are preparing to teach in the biological sciences and are preparing for the PRAXIS exam-specifically the Biology Content Test. In this interactive course, students review foundational information pertaining to classical genetics and further develop a knowledge base by participating in in-depth examination of primary research papers.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 524. Evolution.** 1 Credit.  
 This 1-credit course is aimed at graduate students who are preparing to teach in the biological sciences and are preparing for the PRAXIS exam-specifically the Biology Content Test. In this interactive course, students review foundational information pertaining to evolution and further develop a knowledge base by participating in in-depth examination of primary research papers.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 525. Diversity of Life and Organismal Biology.** 2 Credits.  
 This 2-credit course is aimed at graduate students who are preparing to teach in the biological sciences and are preparing for the PRAXIS exam-specifically the Biology Content Test. In this interactive course, students review foundational information pertaining to organismal biology and further develop a knowledge base by participating in in-depth examination of primary research papers.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 526. Ecology.** 2 Credits.  
 This 2-credit course targets graduate students who are preparing to teach in the biological sciences and are preparing for the PRAXIS exam-specifically the Biology Content Test. In this interactive course, students review foundational information pertaining to ecology and further develop a knowledge base by participating in in-depth examination of primary research papers.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 540. Cell Signaling.** 3 Credits.  
 This course focuses on the molecular mechanisms by which cells communicate with each other. Using examples from both prokaryotes and eukaryotes, students examine how cells release signaling molecules and how target cells recognize and respond to the signals. Discussions center on how signal processing is altered in diseases such as cancer, autoimmune disorders and some bacterial infections. Emphasis is on a critical analysis of the primary literature related to these topics.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 550. Graduate Journal Club - Molecular Cell Biology.** 1 Credit.  
 This course is a graduate-level scientific journal club in which students present recent ground-breaking published research papers in the fields of Molecular Biology, Cell Biology and Biochemistry. This course will develop students' ability to critically assess scientific literature including the interpretation of appropriate experimental design, data analysis and the broader implications of new scientific advances. Credit: 1 credit; may be taken a maximum of 3 times.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 562. Bioinformatics.** 3 Credits.  
 This hands-on course is intended to introduce students to a variety of applied bioinformatics tools and techniques. Students will learn basic sequence analysis and alignment methods using nucleic acid and protein databases and will gain exposure to methods for analyzing large data sets such as RNA sequencing output. Students will also gain familiarity with coding languages and will utilize these languages for basic data analysis. Introductions to various other techniques and tools facilitating protein prediction and phylogenetic tree building will also occur.  
**Prerequisites:** None  
**Offered:** As needed

**BIO 568. Molecular and Cell Biology.****4 Credits.**

This course provides an advanced understanding of the cell from a molecular perspective. Through lectures, team based learning, and discussion of primary journal articles, students will gain a greater understanding of the processes used by cells to grow, divide and respond to different intracellular and extracellular signals.

**Prerequisites:** None**Offered:** Every year, Fall**BIO 571. Molecular Genetics.****4 Credits.**

This study of the prokaryotic and eukaryotic genetic material including transcription, translation, DNA replication and repair, gene cloning techniques, the regulation of the synthesis of gene products and genomics. Emphasis is placed on new genetic techniques that are used in industry and medicine.

**Prerequisites:** None**Offered:** Every year, Fall**BIO 589. Molecular and Cell Neurobiology.****3 Credits.**

This course provides students with a detailed foundation of the basic principles of cellular and molecular neurobiology. Through lectures and interactive simulations, students become fluent in modern experimental approaches to explore and understand the properties of electrical signaling and cell-cell communication. Students apply their knowledge in independent projects investigating the physical basis of a disease of neurophysiological origin.

**Prerequisites:** None**Offered:** As needed**BIO 605. DNA Methods Laboratory.****4 Credits.**

This project lab course enables students to develop hands-on experience with the basic techniques in cell and molecular biology including DNA purification, cloning, and gene expression analysis.

**Prerequisites:** Take BIO 571.**Offered:** Every year, Spring**BIO 606. Protein Methods Laboratory.****4 Credits.**

This project-based lab course enables students to develop hands-on experience with basic techniques in cell biology and protein biochemistry including protein purification, chromatographic and electrophoretic techniques, and immunoanalysis.

**Prerequisites:** Take BIO 515.**Offered:** Every year, Fall**BIO 610. Introduction to Mammalian Cell Culture Nanocourse.****1 Credit.**

This 1-credit cell culture nanocourse introduces students to key laboratory and safety techniques used in mammalian cell culture. Students will learn how to transfect cells, as well as how to thaw, plate, passage and freeze them, with an emphasis on aseptic technique. Key microscopy techniques, including phase contrast and fluorescence microscopy, will be used to visualize, count and assess cell viability of adherent and transfected cells.

**Prerequisites:** Take BIO 605 or have permission of the instructor.**Offered:** As needed**BIO 649. Independent Research.****2 Credits.**

Students work independently to define and conduct original research.

This course is required for students anticipating thesis work in Molecular and Cell Biology, and is conducted under the guidance and with the approval of a thesis adviser and thesis committee.

**Prerequisites:** None**Offered:** As needed**BIO 650. Thesis I in Molecular and Cell Biology.****4 Credits.**

This course is a requirement for the thesis option within the MS in Molecular and Cell Biology. Students must demonstrate both breadth and depth of knowledge in their field of specialization. They also must demonstrate scientific research skills and present their findings to a thesis committee and the greater molecular and cell biology community.

**Prerequisites:** Take BIO 649.**Offered:** Every year, All**BIO 651. Thesis II in Molecular and Cell Biology.****4 Credits.**

Thesis II is a requirement for the thesis option MS in Molecular and Cell Biology. Students complete their independent research project, write an original thesis describing their research results, defend their thesis in front of a thesis committee, and give a presentation to the greater molecular and cell biology community.

**Prerequisites:** Take BIO 650**Offered:** Every year, All**BIO 675. Comp Exam in Molecular and Cell Biology.****2 Credits.**

The written comprehensive exam is a requirement of the non-thesis option for the MS in Molecular and Cell Biology. Students must demonstrate both breadth and depth of knowledge by illustrating a command of the subject matter obtained from individual courses into unified concepts which link the student's own specialization to other fields of study. Students are encouraged to meet with the program director before registering for the comprehensive exam. Minimum grade of a B- is required to pass the comprehensive examination.

**Prerequisites:** Take a minimum of four of the five following courses:

BIO 515 BIO 568 BIO 571 BIO 605 BIO 606.

**Offered:** Every year, Fall and Spring**BIO 688. Independent Study.****1-4 Credits.****Prerequisites:** None**Offered:** As needed**BIO 689. Independent Study.****1-4 Credits.****Prerequisites:** None**Offered:** As needed