

# BIOLOGY (BIOL)

---

## BIOL 5101 Independent Study

**Credit:** 1 (0-0-1)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.

**Repeat Status:** Course may be repeated 11 time(s).

## BIOL 5105 Graduate Seminar

**Credit:** 1 (1-0-0)

This course provides graduate students with an opportunity to explore current primary research across a variety of biological disciplines. This seminar will use a variety of modalities including journal club style review of literature, invited talks by leading biologists and proposal presentations by the students to evaluate current topics in biology.

**Restrictions:** Enrollment is limited to Graduate level students.

**Repeat Status:** Course may be repeated 5 time(s).

## BIOL 5201 Independent Study

**Credits:** 2 (0-0-2)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.

**Repeat Status:** Course may be repeated 5 time(s).

## BIOL 5301 Independent Study

**Credits:** 3 (0-0-3)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.

**Repeat Status:** Course may be repeated 3 time(s).

## BIOL 5303 Ecosystems Ecology

**Credits:** 3 (3-0-0)

This course will help students understand the physical, chemical and biological processes regulating the dynamics of terrestrial and aquatic ecosystems. We will review theory, discussion of key scientific papers and analysis of case studies. Students will develop a more in depth understanding of ecosystem organization and function over time. We will trace the interconnectedness between anthropogenic or natural disturbance on ecosystem processes such as nutrient transfer and its role on ecosystem composition. Students will also understand how theoretical concepts and models are applied in management and restoration of ecosystems from belowground-aboveground linkages to global change.

**Restrictions:** Undergraduate level students may not enroll.

## BIOL 5306 Thesis

**Credits:** 3 (0-0-3)

Research contributing to the graduate degree program.

**Restrictions:** Enrollment is limited to Graduate level students.

**Repeat Status:** Course may be repeated 3 time(s).

## BIOL 5309 Biology of Disease

**Credits:** 3 (3-0-0)

This course will examine the molecular and cellular basis that underlie common infectious and noninfectious diseases of humans as well as mechanisms of transmission and epidemiology. The etiology and progression of the diseases will be discussed in addition to an understanding of experimental models and current therapeutic approaches. The infectious diseases covered will include those attributed to viral pathogens, prokaryotic pathogens, eukaryotic pathogens, and prions. The noninfectious diseases investigated include diabetes, cardiovascular disease, obesity, stroke, neurological diseases, and cancer.

**Restrictions:** Enrollment is limited to Graduate level students.

## BIOL 5310 Graduate Scientific Scholarship

**Credits:** 3 (3-0-0)

This course provides graduate students with an introduction to biological research methods including scientific ethics, writing, and citation, and grant writing.

**Restrictions:** Enrollment is limited to Graduate level students.

## BIOL 5311 Molecular Ecology

**Credits:** 3 (3-0-0)

Molecular ecology is an exciting field that is taking advantage of the rapid development of new techniques in molecular genetics, as well as advances in the theoretical and statistical approaches, to study fundamental processes in evolution and ecology. This course will use the application of genetic and genomic techniques to explore the interface of ecological physiology, population biology, community ecology, phylogeography, behavioral ecology and conservation genetics.

**Restrictions:** Enrollment is limited to Graduate level students.

## BIOL 5315 Biostatistics I

**Credits:** 3 (3-0-0)

This course is designed to introduce students to the fundamentals of experimental design, parameter estimation via sampling, and statistical inference. Emphasis will be placed on the selection and appropriate use of widely used statistical methods in the life sciences (e.g., t-tests, correlation, general linear modeling). Students will also learn the principles of model criticism and how to assess whether data meet the assumptions of a variety of inferential statistical approaches. Students will gain hands-on experience with statistical computing, with the goal of developing students' abilities to implement the methodologies covered in the course using a modern statistical computing environment (e.g., R; [www.r-project.org](http://www.r-project.org)).

**Restrictions:** Undergraduate level students may not enroll.

**BIOL 5320 Biostatistics II****Credits:** 3 (3-0-0)

This course is designed to introduce students who have successfully completed Graduate Biostatistics I to advanced topics in statistical modeling that are commonly used in ecology and evolutionary biology. Initially, emphasis is placed on extending the general linear model in ways that incorporate random effects (i.e., mixed effect models) and/or allow for non-normal error terms (i.e., generalized linear models). Students will also be introduced to parametric and nonparametric models commonly applied to survival data and information theoretic approaches to model selection and model-based inference. Students will then receive an overview of some of the most commonly used multivariate methods in the life sciences before receiving an introduction to basic flow control and resampling with and without replacement.

**Restrictions:** Undergraduate level students may not enroll.**BIOL 5370 Special Graduate Topics in Bio****Credits:** 3 (3-0-0)

This course is designed to allow the program to add a specialized course that fits the needs and requirements of the cohort of graduate students but will not be a permanent elective course topic. Special topics courses allow the students and faculty to explore current new topics in the scientific field, to focus specialized training on a particular biological subfield, and/or provide specialized training in a unique subfield/topic that is currently not an elective.

**Restrictions:** Undergraduate level students may not enroll.**BIOL 5401 Independent Study****Credits:** 4 (0-0-4)

Independent study projects provide research experience and academic credit for laboratory, field work, or theoretical research. Independent study projects may be done with any faculty in the biological sciences.

**Restrictions:** Enrollment is limited to Graduate level students.**Repeat Status:** Course may be repeated 2 time(s).**BIOL 5404 Biotechnology****Credits:** 4 (3-1-0)

This course will explore the current use of biotechnology in biological research.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5405 Cellular Mechanisms****Credits:** 4 (3-1-0)

This course is the study of how different biochemical, metabolic, and molecular pathways of the cell work together to produce the many functions of cells such as movement, response to hormones, growth, protein synthesis, etc. The topics included in this course are transcription, translation, signal transduction pathways, protein targeting, secretion, endocytosis, cell death, cellular organization, and motility. Prokaryotic and eukaryotic mechanisms will be discussed when applicable. Cell-cell interactions and tissue formation will be discussed, including the loss of cell division control leading to cancer.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5406 Population & Community Ecology****Credits:** 4 (3-1-0)

This course provides an advanced view of the concepts that underlie the spatial and temporal dynamics of populations and the communities within which they are embedded using mathematical and graphical analysis and empirical investigations. Lectures will emphasize concepts and models. Readings from the primary literature will facilitate the student's abilities to critically evaluate the primary literature and will provide a historical perspective of the discipline. Topics to be covered will include population growth and regulation, species interactions, eco-evo dynamics, food webs, and patterns of diversity.

**Restrictions:** Enrollment is limited to Graduate level students.**BIOL 5470 Special Graduate Topics in Bio****Credits:** 4 (3-1-0)

This course is designed to allow the program to add a specialized course that fits the needs and requirements of the cohort of graduate students but will not be a permanent elective course topic. Special topics courses allow the students and faculty to explore current new topics in the scientific field, to focus specialized training on a particular biological subfield, and/or provide specialized training in a unique subfield/topic that is currently not an elective.

**Restrictions:** Undergraduate level students may not enroll.