

CSUB - Department of Biology Master of Science Degree Program

The formal program of study for the Master's Degree in Biology includes 45 units of committee-approved graduate work, at least 35 units of which must be at the 500/600-level. Biology 505, 577, and 605 may require an appropriate upper division pre-requisite. Other pre-requisites will vary according to course offering, be determined by the course instructor, and will be announced in the Course Schedule and on the Biology Department Web Page.

Course Requirements for the Master of Science in Biology

A minimum of 45 units of course work is required for the MS in Biology. The following courses are required of all students:

1. BIOL 505 Current Topics in Biology (9 units)
2. BIOL 510 Advanced Writing and Experimental Design
3. BIOL 605 Seminar in Biology

For students choosing the MS Thesis option, the following courses are required:

1. MATH 521 Statistics and Data Analysis
2. BIOL 690 Thesis

For students choosing the MS Non-Thesis option, the following courses are required:

1. BIOL 540 Graduate Practicum in the Teaching of Biology
2. BIOL 680 Non-Thesis Project

	<u>Thesis Option</u>	<u>Non-Thesis Option</u>
BIOL 505 - Current Topics in Biology	9	9
BIOL 510 - Advanced Experimental Design and Analysis	4	4
BIOL 540 - Graduate Practicum in the Teaching of Biology	-	3
BIOL 605 - Seminar in Biology	3	3
BIOL 680 - Non-Thesis Project, including written report	-	6
BIOL 690 - Thesis, including oral defense	9	-
Additional 400-, 500-, or 600-level courses (could include non-biology courses as appropriate)	15	20
Math 521 – Statistics and Data Analysis	5	-
TOTAL UNITS	45	45

List of Graduate Courses

BIOL 505 Current Topics in Biology (3)

Current topics of special interest to graduate students in Biology. Topics and content will vary as announced but will include contemporary or interdisciplinary areas of interest. Repeatable. Prerequisites: Graduate standing or consent of instructor.

BIOL 510 Advanced Experimental Design and Analysis (4)

Course covers how to effectively communicate biological science to the scientific community as well as effective methodology in experimental design. Prerequisites: Graduate standing or consent of instructor.

BIOL 540 Graduate Practicum in the Teaching of Biology (3)

Theory and practice in teaching biology at the undergraduate level. Regular meetings with the faculty sponsor and supervised experience in course design, lecturing, tutoring, laboratory preparation and delivery, administering and scoring examinations, and leading classroom discussions. Prerequisites: Graduate standing

BIOL 577 Advanced Topics in Biology (5)

Laboratory or field-based graduate level biological topics in a specialized area of contemporary biology, such as genetics, ecology, microbiology, physiology, behavioral biology, systematics, or molecular biology. Topics will be announced. May be repeated for credit as topics change. Prerequisites: Graduate standing or consent of instructor.

BIOL 605 Seminar in Biology (3)

Student presentation and discussion of reviews and reports focusing on current literature and scientific research in the areas of Biology. Prerequisites: Approved petition for advancement to candidacy.

BIOL 680 Non-Thesis Project (6)

Students complete a project that requires the appropriateness of topic, theory, and methods applicable to the nature of the degree, conducted under the supervision of the Departmental Graduate Committee. Prerequisites: Approved petition for advancement to candidacy.

BIOL 690 Thesis (3)

Laboratory, field investigation, or a combination of both investigating a research problem. Preparation, completion, and oral defense of a written thesis approved by the Thesis Committee and the Departmental Graduate Committee. May be repeated twice for credit. Students may apply a total of 9 units towards degree. Prerequisites: Approved petition for advancement to candidacy.

MATH 521 Statistics and Data Analysis (5)

Basics of significance testing, basic exploratory data analysis, data summaries, multivariate data, time series, and multiway tables. Techniques may include graphical displays, transformations, outlier identification, smoothing, regression, and robustness.

List of Elective Courses

- BIOL 404 Conservation Biology (5)** Study of problems related to biological conservation, including endangered species issues, environmental laws, and mitigation solutions required by regulations. Includes site visits to conservation areas, collection of biological data, preparation of assessment reports, and study of elements of environmental impact reports. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 306 and 310, or equivalent, or consent of instructor.
- BIOL 406 Advanced Ecology (5)** Advanced study of ecology. Emphasis includes evolutionary perspectives of physical and biological environments, population dynamics, and ecosystem stability. Laboratory emphasis will be placed on analytical methods used in the field. Laboratory includes weekend field trips. Two hours lecture and nine hours laboratory. Field trip fee required. Prerequisites: BIOL 306 and 310, or equivalent, or consent of instructor.
- BIOL 414 Medical Microbiology (5)** Isolation and identification procedures, and the clinical significance of medically important microorganisms (mainly bacteria). Key points of these organisms' epidemiology, and pathogenic mechanisms will be discussed. Skills concerning the isolation and identification of medically important bacteria is emphasized in laboratory. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 311 or 312.
- BIOL 424 Evolutionary Genetics (5)** Contributions of molecular genetics to the understanding of evolution. Emphasis is placed on the processes of mutation, selection, and random genetic events as they affect the genetic architecture of natural populations and the process of speciation. Topics include quantitative inheritance, population genetics, phylogenetics, conservation genetics, and bioinformatics. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 304 and 310, or equivalent, or consent of instructor.
- BIOL 430 Molecular Biology (5)** Evolution and molecular organization of the cell, macromolecules of organisms, and gene expression. Emphasis placed on recombinant DNA techniques, genetic engineering and biotechnology. Two hours lecture and nine hours laboratory. Prerequisite: BIOL 304 and 310, or equivalent, or consent of instructor.
- BIOL 433 Developmental Biology (5)** Development and growth of plants and animals at the cellular and organismic level. Embryogenesis of organisms from fertilization to the establishment of organ systems. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 304 and 310, or equivalent, or consent of instructor.
- BIOL 451 Functional Analysis of Vertebrate Structure (5)** Anatomy of vertebrates interpreted in terms of function including support, running, jumping, digging, climbing, swimming, flying and feeding. These functions are studied in their environmental context and as evolutionary adaptations. Independent student project will focus on one of these

adaptations. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 351, or equivalent, or consent of instructor.

BIOL 455 Physiological Measurements (5) Physiological measurement techniques focusing on data collection and analysis of selected vertebrate organ systems. Discussion topics include electrical properties of nerve, cardiac and skeletal muscle tissues, pulmonary and metabolic function, and sensory physiology. Emphasis will be placed on understanding the mechanisms of how each system works and the benefits and limitations of the measurement techniques currently available. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 255 or 357, BIOL 305 and BIOL 310, or equivalent, or consent of instructor.

BIOL 462 Plant Physiology (5) Structure, function, and physiological mechanisms of vascular plants. Topics include water and nutrient relations, photosynthesis and respiration. Two hours lecture and nine hours laboratory. Prerequisites: BIOL 305 and 310, or equivalent, or consent of instructor.

BIOL 470 Evolution (4) Study of the processes of organic evolution. Three hours lecture and three hours laboratory. Prerequisites: Open only to graduate students and senior Biology majors who have completed 40 units of Biology courses.

BIOL 580 Research (1-5) Independent research: the student formulates a problem and research design in consultation with the faculty, conducts the investigation, compiles and analyzes the data, and presents the findings in written form. Although repeatable, a maximum of five units may be applied towards the Master's degree. Available by consent of the advisor.

Note: Other 400 and 500 level courses outside of the Biology Department may be taken and applied towards the degree if deemed acceptable by the advisor and the Departmental Graduate Committee.