

## ■ Biology

Program Advisors: Ronald Iwamoto, Dr. Michael Dohm, Dr. Teena Michale, Lisa Perry, and Patricia Lee-Robinson

Chaminade University's Biology Department recognizes its Catholic/Marianist tradition and attempts to include the five principles that make Chaminade unique in its curriculum. Those principles are providing a quality education, educating for formation in faith, in maintaining family spirit, working towards service, peace, and justice, and preparing students for adaptation and change. No major can cover all of these points equally; however, the Biology curriculum has successfully offered a quality education for years. The laboratory environment of the program encourages and fosters a family spirit amongst its majors. The very nature of science, indeed the very cornerstone of the scientific method encompasses adaptation and change, fundamental components of a Biological education. Faith is involved in all manner of educational pursuit and biology works unceasingly towards improving the human condition and the society in which we must all participate.

Chaminade University offers major programs in biology leading to the Bachelor of Arts and the Bachelor of Science in Biology. A minor in biology is also offered. The major program in biology is designed to fulfill the needs of students interested in diverse fields of biology, zoology, botany, microbiology, marine biology, science education, and biomedical-health sciences. To meet these diverse interests, the primary objectives of the Biology Department are to:

1. provide the student with information about living organisms and their environment and thereby increase the student's ability to perceive and make decisions concerning themselves and other living things;
2. offer programs to the individual student that combine theoretical and practical experiences; and
3. prepare the individual student for diverse career fields and graduate or professional training.

### **Research Programs**

Research is an important aspect of the undergraduate biology curriculum. Two courses culminate a student's biology major program at Chaminade. These are research-related courses: BI 490 Senior Seminar and BI 499 Directed Senior Research. BI 490 Senior Seminar prepares the individual student to complete a research project by examining research articles, the design of experiments, the writing of research reports, and presentation of a seminar. BI 499 Directed Research is a course in which the student chooses a topic, conducts the research, writes a research paper, and presents a seminar. The research is directed by a faculty member in the area of the student's interest.

Students interested in zoology, botany, and science education enroll in a typical four-year curriculum that includes courses in biology, chemistry, mathematics, and physics. Courses in these areas include such diverse topics as invertebrate zoology, nutrition, botany, ethnobotany, microbiology and cell biology.

Students interested in becoming teachers have a choice of programs that includes elementary or secondary education emphasis. Each student in secondary science education is required to major in a science area, e.g., biology.

Students interested in pursuing careers in biomedical research, medicine, dentistry, pharmacy, veterinary medicine, nursing, medical technology, physical therapy, specialties in public health, and other related biomedical fields may select a program to meet graduate or professional school admissions requirements.

Field Experience courses (BI 287 and BI 487) are open to biology students wishing actual work experience and exposure to their selected field of study. Arrangements with various research centers, dental and medical facilities, and other health-related institutions allow the student to experience first-hand the daily routines in their area of interest.

### **Pre-professional Committee**

All entering students interested in postgraduate work in the biological or biomedical sciences should consult with the Pre-professional Committee which is composed of faculty from the science departments.

Members of this committee work cooperatively with the math and science advisors in counseling students on recommended course schedules, requirements for advanced work, professional examinations, and current opportunities and alternatives in biomedicine and related fields. They also act as a recommending body for applicants applying for advanced and professional schools.

Since entrance requirements to professional and graduate schools vary, a student who has a particular school in mind should inquire about specific requirements so that they can be included in his or her program at Chaminade University.

### **Major Programs**

#### **Bachelor of Arts**

The major in biology leading to the Bachelor of Arts degree is suggested for those students planning to pursue a master's degree, a doctorate, or a professional degree. The program allows for more electives within the major and liberal arts areas.

A foundation of core courses is offered for the first two years of the Bachelor of Arts program in biology to provide a broader base on which successive courses may build logically. The aim of the program is to make students sufficiently aware of the broad scope of biology that they may appreciate the potential as well as the limits of the training they are receiving.

The major in biology leading to the Bachelor of Arts degree includes the following requirements:

Pre-major requirements: BI 203 and BI 203L, BI 204 and BI 204L, BI 210, CH 203 and 203L, CH 204 and CH 204L, CH 323 and CH 323L, CH 324 and CH 324L, MA 210, PHY 151 and PHY 151L, PHY 152 and PHY 152L.

Major requirements: 31 semester hours of upper division courses to include BI 351 and BI 351L, BI 370 and BI 370L, BI 431 and BI 431L, BI 471 and BI 471L, and BI 490 and fourteen elective credits chosen with the approval of the major advisor.

Minor requirements: 12 semester hours of upper division courses to include at least one of the following courses: BI 351 and BI 351L, BI 353 and BI 353L, and BI 454 and BI 454L.

Declaration of minor should be filed prior to the end of the sophomore year.

Other requirements: See degree requirements.

## **Bachelor of Science**

The major in biology leading to the Bachelor of Science degree is designed to fulfill the needs of students interested in graduate and professional programs. The additional units in Biology are intended to heighten the student's preparation for professional training.

The major in biology leading to the Bachelor of Science Degree includes the following requirements:

Pre-major requirements: BI 203 and BI 203L, BI 204 and BI 204L, BI 210, CH 203 and CH 203L, CH 204 and CH 204L, CH 323 and CH 323L, CH 324 and CH 324L, MA 210, MA 211, PHY 251 and PHY 251L, and PHY 252 and PHY 252L.

Major requirements: 35 semester hours of upper division courses to include BI 351 and BI 351L, BI 370 and BI 370L, BI 431 and BI 431L, BI 442 and BI 442L, BI 490, a 3 credit experimental design and statistical analysis course to be developed, and fifteen elective credits chosen with the approval of the major advisor.

Other requirements: See degree requirements section.

## **Biology (BI)**

### **BI 101-BI 102 General Biology (3-3)**

Overview of basic biological principles, human concerns of overpopulation, environmental pollution, genetic engineering. Recommended for non-majors. BI 101 is not a prerequisite for BI 102. BI 101 and BI 102 offered annually. Concurrent registration in BI 101L and BI 102L necessary for lab science credit.

### **BI 101L-BI 102L General Biology Laboratory (1-1)**

One three-hour laboratory period per week to accompany BI 101 and BI 102. Laboratory work and field trips related to lecture topics. BI 101L and BI 102L offered annually.

### **BI 103 Botany (3)**

Distribution, identification, structure, and physiology of plants with special attention to identification, distribution, and uses of tropical plants of Hawai'i. Recommended for non-majors. Concurrent registration in BI 103L necessary for lab science credit.

### **BI 103L Botany Laboratory (1)**

One three hour laboratory period per week to accompany BI 103. Laboratory work and field trips based on experiments,

examinations of microscopic plant structure, and identification of Hawaiian specimens.

### **BI 110 People and Nature (3)**

Addresses biological, ecological and public health questions which may have social, ethical, religious, or political implications. Recommended for non-majors. Offered annually. Concurrent registration in BI 110L required for lab science credit.

### **BI 110L People and Nature Laboratory (1)**

One three-hour laboratory period per week to accompany BI 110. Laboratory work such as testing for water quality, field trips to aquaculture farms, estuaries, and the like. Offered annually.

### **BI 115 Introduction to Marine Biology (3)**

Life in various marine habitats studied with regard to its relationship to the ocean and to man. Various zones in the ocean and its inhabitants, the impact of man on the marine environment, and food sources from the sea will be discussed. Recommended for non-majors. Offered annually. Concurrent registration in BI 115L necessary for lab science credit.

**BI 115L Introduction to Marine Biology Laboratory (1)**

One three-hour laboratory period per week to accompany BI 115. Classification, anatomy, and physiology of live and preserved marine animals. Field trips are included. Offered annually.

**BI 130 Ethnobotany (3)**

Common native and introduced flora of Hawai'i are investigated. Endangered and threatened species, identification, communities, and uses are stressed. Recommended for non-majors. Concurrent registration in BI 130L necessary for lab science credit.

**BI 130L Ethnobotany Lab (1)**

One three-hour laboratory per week to accompany BI 130. Field trips for identification purposes are made as well as ecology studies and nature walks.

**BI 131 Human Nutrition (3)**

An introduction to basic concepts and current research in nutrition. The nature and roles of nutrients, nutrient requirements throughout the human life cycle, diseases resulting from over and under nutrition, food safety, and food sources. Recommended for non-majors. Offered annually. Concurrent registration in BI 131L necessary for lab science credit.

**BI 131L Human Nutrition Laboratory (1)**

One three-hour laboratory period per week to accompany BI 131. Survey of methodology and instrumentation involved in the analysis and evaluation of foods, their nutritional value, and diets. Offered annually.

**BI 151-BI 152 Human Anatomy and Physiology (3-3)**

Structure and function of the human body, to include basic biochemistry, cells, tissues, and a detailed and comprehensive study of the integumentary, skeletal, muscular, circulatory, immune, and digestive systems, and metabolism. Organ systems will include the nervous, urinary, endocrine, respiratory, and reproductive systems. Recommended for allied health sciences students.

Prerequisites: BI 151 for BI 152.

Recommended preparation: High school chemistry or biology.

**BI 151L-BI 152L Human Anatomy and Physiology Laboratory (1-1)**

Laboratory to accompany BI 151-152. One three-hour laboratory per week will include examination of models and slides, dissection, and physiological exercises.

Prerequisites: BI 151L for BI 152L.

Concurrent registration in BI 151-152 required.

**BI 162 General Microbiology (3)**

An introduction to microbiology, with special emphasis on human health. Topics covered include basic metabolism and microbial growth, sterilization and disinfection, host-microorganism interactions, the immune response, and a survey of pathogenic microorganisms and their mode of action. Concurrent registration in BI 162L required.

**BI 162L General Microbiology Laboratory (1)**

Laboratory course to accompany BI 162. Examination, cultivation, and identification of microorganisms pertinent to human health. Techniques covered include asepsis, isolation, culturing, and identification of microorganisms.

**BI 190 Premedical and Prehealth Sciences Seminar I (1)**

Introduction to the course of study and preparations necessary for making application to schools of medicine or schools of other health professions. The course will include an overview of the entrance requirements for such schools. Coursework will include experiences preparing for standardized examinations, resume writing and co-curricular enrichment activities.

**BI 203 and BI 204 Cellular and Organismic Biology (3-3)**

Concepts of cellular and molecular biology stressed in first semester; second semester devoted to organisms stressing phylogenetic, ecological, and genetic relations in plants and animals. Recommended for science majors. Offered annually. Recommended: one year each of high school biology and chemistry. Concurrent registration in BI 203L - BI 204L required.

**BI 203L and BI 204L Cellular and Organismic Biology Laboratory (1-1)**

One three-hour laboratory period per week to accompany BI 203 and BI 204. Laboratory work such as thin layer chromatography and enzyme kinetics experiments. Offered annually.

**BI 210 Biological Technique (1)**

Introduction to biological techniques. Techniques used in the fields of microbiology, histology, ecology, biochemistry, botany, and physiology are covered. One three-hour period per week. Offered annually. Prerequisites: One semester of biology.

**BI 287 Introductory Field Experience (1-3)**

Supervised work at a cooperating agency by arrangement with 45 hours of work required per credit hour. Student journal, progress reports, final paper, agency supervisor's evaluation, and faculty supervisor's visits used in grading. Offered every semester. Prerequisites: freshman or sophomore standing and consent of instructor.

**English 102 and COM 101 are prerequisites for all upper division courses****BI 301 Comprehensive Science Review (1)**

A course integrating major theories and principles of mathematics and the natural sciences. Foundation in preparation for graduate or professional studies and standardized entrance examinations. Grading is on a credit/no credit basis. May be repeated. Prerequisites: One year of biology and one semester of chemistry, or consent of instructor.

**BI 331 Advanced Human Nutrition (3)**

Basic biochemistry and physiology of human nutrition with emphasis on nutrient requirements of healthy individuals through the life cycle, functions and food sources of nutrients, and current topics pertaining to food science and human nutrition such as food safety, energy imbalance, malnutrition, and nutrition and chronic diseases. Concurrent registration in BI 331L required. Prerequisites: BI 203/203L, BI 204/204L.

**BI 331L Advanced Human Nutrition Laboratory (1)**

Laboratory to accompany BI 331. Laboratory includes nutrient analyses and nutritional assessment. Concurrent registration in BI 331 required. Prerequisites: BI 203/203L, BI 204/204L.

**BI 341 Botany (3)**

This course is designed to provide students with an in-depth study of Botany including terrestrial and marine adaptations, diversity, and form and function. It will include how humans use and depend on plants. Offered alternate years. Prerequisites: BI 101-102 or BI 203-204 for science majors or ENV 115 or 201. Concurrent registration in BI 341L required.

**BI 341L Botany Laboratory (1)**

One three hour laboratory period per week to accompany BI 341. Students will apply techniques from molecular through ecological methods to address the lecture

topics with emphasis on observation, analysis, and experimentation. Offered alternate years. Concurrent registration in BI 341 required.

**BI 351 Comparative Vertebrate Anatomy (3)**

Comparative study of vertebrate structure, organization and adaptation. Concurrent registration in BI 351L required. Prerequisites: BI 203/203L, BI 204/204L.

**BI 351L Comparative Vertebrate Anatomy Laboratory (1)**

One three-hour laboratory period per week to accompany BI 351. Laboratory dissections of lamprey, dogfish, and cat.

**BI 352 Embryology (3)**

Experimental and anatomical analysis of vertebrate development. Concurrent registration in BI 352L required. Prerequisites: BI 203/203L, BI 204/204L.

**BI 352L Embryology Laboratory (1)**

One three-hour laboratory period per week to accompany BI 352. Laboratory work examining morphogenesis, differentiation, and growth. Student experimental project.

**BI 353 Invertebrate Zoology (3)**

Structure and function of invertebrates with emphasis on phylogenetic-ecological relationships. Taxonomy, life cycles, and distribution. Emphasis also on marine invertebrates, especially those involved in coral reef and estuarine ecology. Offered alternate years. Prerequisites: One year of introductory biology. Concurrent registration in BI 353L required.

**BI 353L Invertebrate Zoology Laboratory (1)**

One three-hour laboratory per week to accompany BI 353. Work includes identification, dissection, experiments, and ecology. Offered alternate years. Concurrent registration in BI 353 required.

**BI 360 Biochemistry (3)**

Chemistry of carbohydrates, proteins, lipids, enzymes, and DNA; metabolism of carbohydrates, lipids, and amino acids; cycles thermodynamics, biosynthesis, and degradation; nucleic acids; physiological applications. Concurrent registration in BI 360L. Cross-listed as CH 360. Offered alternate years. Prerequisites: BI 203/203L, BI 204/204L and CH 324/324L.

**BI 360L Biochemistry Laboratory (1)**

Laboratory techniques, methods, and instrumentation used in analysis of carbohydrates, proteins, lipids, and nucleic acids. Cross-listed as CH 360L. Offered alternate years. Concurrent registration in BI 360 required.

**BI 362 Microbiology (3)**

Taxonomy, morphology, general physiology, genetics, immunology, and applied aspects of representative microorganisms. Offered alternate years. Prerequisites: BI 203/203L and BI204/204L. Recommended: CH 103/103L or CH 203/203L and CH 204/204L. Concurrent registration in BI 362L also required.

**BI 362L Microbiology Laboratory (1)**

One three hour laboratory period per week to accompany BI 362. Examination, cultivation and identification of microorganisms. Including methods such as straining, aseptic techniques, isolation, growth, biochemical and serological tests. Offered alternate years. Concurrent registration in BI 362 required.

**BI 363 General Entomology (3)**

Structure and function of the insects and closely related arthropods with emphasis on taxonomy, life cycles, distribution, and ecological relationships. Special emphasis will be given to groups of special significance to human health and well being. Prerequisites: BI 203 & 204 L/L, BI 353/353L. Concurrent registration in BI 363L required.

**BI 363L General Entomology Laboratory (1)**

One three-hour laboratory period per week to accompany BI 363. The laboratory will provide experience in collecting, mounting, and identification of insects to the family level, in addition to their structure. Concurrent registration in BI 363 required.

**BI 370 Cell and Molecular Biology (3)**

A study of the highly organized molecular and biochemical systems of the fundamental units of all living organisms, with an emphasis on structure and function. Requirement for Biology majors and those applying to medical school. Concurrent registration in BI 370L required. Prerequisites: BI 203/203L, BI 204/204L, CH 323/323L and CH 324/324L.

**BI 370L Cell and Molecular Biology Lab (1)**

One three hour laboratory period per week to accompany BI 370. Laboratory emphasizes experiments and exercises using molecular techniques currently in practice in cell biology. Concurrent registration in BI 370 required.

**BI 395 Introduction to Biomedical Science (1)**

A special seminar designed for students in biomedical research training, including principles of how to prepare, complete, and present biomedical research. Field trips to biomedical laboratories, local guest speakers, and national guest speakers are included. One three-hour period per week. Offered annually. Prerequisites: BI 203/BI 203L and BI 204/BI 204L.

**BI 431 Genetic Biology (3)**

Nature of the gene; molecular, physiological mechanisms of inheritance, molecular biology, and modern and classical principles. Offered annually. Concurrent registration in BI 431L required. Prerequisites: BI 203/203L, BI 204/204L. Recommended: CH 203/203L and CH 204/204L.

**BI 431L Genetic Biology Laboratory (1)**

One three hour laboratory period per week to accompany BI 431. Laboratory work such as fruit fly crosses, isozyme and nucleic acid, electrophoresis, and genetic experiments with microorganisms. Offered annually. Concurrent registration in BI 431 required.

**BI 442 General and Comparative Physiology (3)**

General and comparative study of fundamental activities of cells, tissues, and organ systems. Offered alternate years. Prerequisites: BI 203/203L and BI 204/204L, CH 323/323L and CH 324/324L, or consent of instructor. Concurrent registration in BI 442L required.

**BI 442L General and Comparative Physiology Laboratory (1)**

One three-hour laboratory period per week to accompany BI 442. The laboratory utilizes a variety of apparatus to measure physiological phenomena, including metabolic rate, muscle contraction, and membrane transport. In-depth laboratory reports are emphasized. Offered alternate years. Concurrent registration in BI 442 required.

**BI 444 Forensic Biology (3)**

A scientific examination of biological evidence. Includes examining the scientific basis of many types of biological evidence, applying scientific methods to, and interpretation of biological evidence. Cross-listed as FS 444. Prerequisites: BI 203/203L and BI 204/204L, CJ/FS 330. CH 203/203L and CH 204/204L Concurrent registration in BI/FS 444L is required.

**BI 444L Forensic Biology Laboratory (1)**

One three-hour laboratory period per week to accompany BI 444. Laboratory work includes such topics as blood analysis and identification, use of chromatographic and electrophoretic techniques, and PCR as applicable to forensic identification. Concurrent registration in BI 444 required.

**BI 454 Histology (3)** The study and identification of animal cells and tissue with particular emphasis on mammalian tissue. Prerequisites: BI 203/203L and BI 204/204L. Concurrent registration in BI 454L required.

**BI 454L Histology Laboratory (1)** One three-hour laboratory period per week to accompany BI 454. Techniques used in collecting and cultivating organisms, cells, and tissues; and sectioning methods of cytological, histological, and histochemical studies. Several experiments will be run on an open basis. Concurrent registration in BI 454 required.

**BI 471 Ecology (3)** Environmental-biological interrelations. Concepts of populations, communities, ecosystems, and conservation of resources by man. Offered alternate years. Prerequisites: BI 203/203L and BI 204/204L. Concurrent registration in BI 471L required.

**BI 471L Ecology Laboratory (1)** One three-hour laboratory period per week to accompany BI 471. Methods such as transects and coliform tests are covered. For several experiments the laboratory is run on an open basis and emphasizes field work. Offered alternate years. Concurrent registration in BI 471 required.

**BI 480 Special Topics (1-3)** Selected topics in biology. May be repeated. Previously offered courses: coral reef ecology and advanced invertebrate zoology. Prerequisites: one year of biology.

**BI 487 Field Experience (1-3)** Supervised research work at a cooperating agency by arrangement; 45 hours of work required per credit. Student journal, progress reports, final paper, and agency supervisor's reports used in grading. No more than six semester hours of internship experience may be applied to graduation in biology. Offered every semester. Prerequisites: junior or senior standing, one year of biology, and consent of instructor.

**BI 490 Senior Seminar (1)** Readings and discussion of special topics or procedures for planning a directed research project and presenting an oral and written report or results. Offered annually. Prerequisites: senior standing in biology or consent of program advisor.

**BI 495 Honors Research (1-3)** Research in an area of biology of special interest to the student. No more than four semester hours of honors work may be applied to graduation in biology. Prerequisites: senior or second semester junior majoring in biology or recommendation of program advisor.

**BI 496 Topics Seminar (1)** Individualized in-depth research, readings and discussions on current topics. Includes intensive library and computer-based searches and several oral reports. Offered annually. Prerequisites: Biology senior standing or approval of program advisor.

**BI 499 Directed Senior Research (3)** Individualized research on topic arranged through the program advisor. Offered annually. Prerequisites: senior standing in biology and consent of program advisor.