

# Biological Sciences

Biology is the scientific study of life, from molecules to cells, and organisms to ecosystems, including their evolution and interactions with the environment. The Biology A.S. degree is designed to give students a flexible academic foundation to meet transfer requirements for upper division coursework in the biological sciences, participate in the workplace, or meet personal goals. The Biology major is also designed for students planning to pursue careers in medicine, dentistry, pharmacy, or veterinary medicine. For all students pursuing transfer to any four-year program or professional school, it is critical that students meet with a counselor because major and general education requirements vary for each college/university. For students who plan to complete a baccalaureate degree in biology or similar major at a California State University (CSU), The Associate in Science in Biology for Transfer (AS-T) degree is the recommended transfer pathway.

Our courses also support the Allied Health fields providing the needed prerequisite academic and technical knowledge necessary for success in a wide variety of medical and dental fields. We also offer a number of courses that fulfill the science requirements of students in other majors. These include contemporary general biology, natural history, environmental biology, entomology, marine biology, dinosaurs, ornithology, and ethnobotany.

## Biological Sciences Career Options

Biology is the scientific study of life, from molecules to cells, and organisms to ecosystems, including their evolution and interactions with the environment. Biologists work as laboratory technologists, x-ray and respiratory technologists, physical therapists, physicians, nurses, and researchers in the medical field; as foresters, wildlife and fisheries biologists, field ecologists, ethnobiologists, botanists, entomologists, and others in field biology and ecology; as veterinary technicians, researchers, and doctors in veterinary medicine; as agronomists, plant pathologists, enologists, and pest management specialists in agriculture; as educators in K-12 schools, community colleges and universities, and in many other careers.

## Field Ecology Career Options

The Field Ecology Certificate program provides the training and education necessary to succeed in government agencies, private businesses, and non-profits that provide field ecology services. Entry-level jobs can be found in government resource agencies at the federal, state, and local levels and in private environmental consulting businesses and private non-profit environmental organizations.

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# Associate Degrees for Transfer

## A.S.-T. in Biology

The Associate in Science in Biology for Transfer is designed to prepare students for transfer to a baccalaureate degree program at the California State University in biology or the biological sciences, including molecular biology, cell biology, marine biology, botany, zoology, ecology, environmental science, evolution, genetics, microbiology, and agricultural science. Upon completion of the Associate in Science in Biology for Transfer, students will seamlessly transfer with junior standing to the California State University system.

The Associate Degree for Transfer (ADT) student completion requirements (as stated in SB1440 law):

- (1) Completion of 60 semester units or 90 quarter units that are eligible for transfer to the California State University, including both of the following:
  - (A) The Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education-Breadth Requirements (CSU GE-Breadth).
  - (B) A minimum of 18 semester units or 27 quarter units in a major or area of emphasis, as determined by the community college district.
- (2) Obtainment of a minimum grade point average of 2.0.

ADTs also require that students must earn a "C" or better in all courses required for the major or area of emphasis.

The Associate in Science in Biology for Transfer is intended specifically for students planning to transfer to a California State University. It is critical for all students to meet with an SCC counselor and to consult with the transfer institution to determine if any university program is impacted or has additional pre-transfer requirements. Completion of the Associate in Science in Biology for Transfer may not prepare students to transfer to the University of California or other colleges or universities offering a degree in biology or in the biological sciences, as these baccalaureate degree programs may have different requirements. If a student intends to transfer to the University of California, additional courses in chemistry, physics, and math may be required.

**Catalog Date:** June 1, 2020

## Degree Requirements

| COURSE CODE | COURSE TITLE               | UNITS |
|-------------|----------------------------|-------|
| BIOL 402    | Cell and Molecular Biology | 5     |
| BIOL 412    | Plant Biology              | 5     |
| BIOL 422    | Animal Biology             | 5     |

| COURSE CODE  | COURSE TITLE                                | UNITS |
|--------------|---|-------|
| CHEM 400     | General Chemistry I                         | 5     |
| CHEM 401     | General Chemistry II                        | 5     |
| MATH 350     | Calculus for the Life and Social Sciences I | 3     |
| PHYS 350     | General Physics                             | 4     |
| PHYS 360     | General Physics                             | 4     |
| PSYC 300     | General Principles (3)                      | 3     |
| or PSYC 480  | Honors General Principles (3)               |       |
| Total Units: |   | 39    |

The Associate in Science in Biology for Transfer (AS-T) degree may be obtained by completion of 60 transferable, semester units with a minimum 2.0 GPA, including (a) the major or area of emphasis described in the Required Program, and (b) either the Intersegmental General Education Transfer Curriculum (IGETC) or the California State University General Education-Breadth Requirements.

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- apply the scientific method to pose questions and test hypotheses about the natural world.
- evaluate the design, analysis, and interpretation of scientific experiments.
- successfully perform biological laboratory techniques, including microscopy, and understand laboratory safety protocols.
- define and correctly use a core set of scientific terminology relevant to biological organisms and principles.
- write clear, well organized essays or research papers that demonstrate the ability to integrate the chemical, cellular, organismal, population, and ecosystem levels of biological organization into explanations of biological processes.
- demonstrate an understanding of biological evolution by explaining the diversity and unity of life in terms of evolutionary mechanisms including natural selection.
- apply biological principles to successfully complete upper division coursework in general biology, cell biology, molecular biology, genetics, botany, zoology, marine biology, anatomy, physiology, ecology, and evolution.
- apply the process of science and scientific skills in order to successfully participate in supervised research in a biological science.

## Career Information

Biologists work as laboratory technologists, x-ray and respiratory technologists, physical therapists, physicians, nurses, and researchers in the medical field; as foresters, wildlife and fisheries biologists, field ecologists, ethnobiologists, botanists, entomologists, and others in field biology and ecology; as veterinary technicians, researchers, and doctors in veterinary medicine; as agronomists, plant pathologists, enologists, and pest management specialists in agriculture; as educators in K-12 schools, community colleges, and universities; and in many other careers.

## Associate Degrees

### A.S. in Biology

Biology is the scientific study of life, from molecules to cells, and organisms to ecosystems, including their evolution and interactions with the environment. The Biology A.S. degree is designed to give students a flexible academic foundation to meet transfer requirements for upper division coursework in the biological sciences, participate in the workplace, or meet personal goals. The Biology major is also designed for students planning to pursue careers in medicine, dentistry, pharmacy, or veterinary medicine. For all students pursuing transfer to any four-year program or professional school, it is critical that students meet with a counselor because major and general education requirements vary for each college/university. For students who plan to complete a baccalaureate degree in biology or similar major at a California State University (CSU), The Associate in Science in Biology for Transfer (AS-T) degree is the recommended transfer pathway.

**Catalog Date:** June 1, 2020

### Degree Requirements

| COURSE CODE                               | COURSE TITLE   | UNITS |
|---|--|-------|
| CHEM 400                                  | General Chemistry I (5)                                      | 5     |
| or CHEM 305                               | Introduction to Chemistry (5)                                |       |
| or CHEM 309                               | Integrated General, Organic, and Biological Chemistry (5)    |       |
| A minimum of 10 units from the following: |  | 10    |
| BIOL 402                                  | Cell and Molecular Biology (5)                               |       |
| BIOL 412                                  | Plant Biology (5)  |       |
| BIOL 422                                  | Animal Biology (5)   |       |
| BIOL 430                                  | Anatomy and Physiology (5)                                   |       |
| BIOL 431                                  | Anatomy and Physiology (5)                                   |       |
| BIOL 440                                  | General Microbiology (4)                                     |       |
| A minimum of 8 units from the following:  |  | 8     |
| BIOL 100                                  | Introduction to Concepts of Human Anatomy and Physiology (3) |       |

| COURSE CODE  | COURSE TITLE  | UNITS |
|--------------|---|-------|
| BIOL 305     | Natural History (4)   |       |
| BIOL 308     | Contemporary Biology (3)  |       |
| BIOL 309     | Contemporary Biology Laboratory (1)   |       |
| BIOL 314     | Dinosaurs and the Science of Life (3)   |       |
| BIOL 315     | Dinosaurs and the Science of Life Laboratory (1)                                  |       |
| BIOL 320     | Field Botany (3)  |       |
| BIOL 326     | Ethnobotany (3)   |       |
| BIOL 327     | Ethnobotany Laboratory (1)  |       |
| BIOL 330     | Introduction to Entomology (3)  |       |
| BIOL 332     | Introduction to Ornithology (4)   |       |
| BIOL 342     | The New Plagues: New and Ancient Infectious Diseases Threatening World Health (3) |       |
| BIOL 350     | Environmental Biology (3)   |       |
| BIOL 360     | Environmental Regulations (3)   |       |
| BIOL 362     | Field Methods in Ecology (4)  |       |
| BIOL 364     | Restoration Ecology (2)   |       |
| BIOL 370     | Marine Biology (4)  |       |
| BIOL 402     | Cell and Molecular Biology (5)  |       |
| BIOL 412     | Plant Biology (5)   |       |
| BIOL 422     | Animal Biology (5)  |       |
| BIOL 430     | Anatomy and Physiology (5)  |       |
| BIOL 431     | Anatomy and Physiology (5)  |       |
| BIOL 434     | Pathology: The Study of Disease (3)   |       |
| BIOL 440     | General Microbiology (4)  |       |
| Total Units: |   | 23    |

The Biology Associate in Science (A.S.) degree may be obtained by completion of the required program, plus general education requirements, plus sufficient electives to meet a 60-unit total. See SCC graduation requirements.

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- use the scientific method to pose questions and test hypotheses about the natural world.
- evaluate the design, analysis, and interpretation of scientific experiments.
- demonstrate an understanding of the process of biological evolution by the mechanism of natural selection.
- use and understand biological laboratory techniques and safety protocols.
- recognize and define a core set of biological terms and principles.
- compile and analyze data generated through experimentation.

## Career Information

Biologists work as laboratory technologists, x-ray and respiratory technologists, physical therapists, physicians, nurses, and researchers in the medical field; as foresters, wildlife and fisheries biologists, field ecologists, ethnobiologists, botanists, entomologists, and others in field biology and ecology; as veterinary technicians, researchers, and doctors in veterinary medicine; as agronomists, plant pathologists, enologists, and pest management specialists in agriculture; as educators in K-12 schools, community colleges, and universities; and in many other careers.

# Certificate of Achievement

## Field Ecology Certificate

The Field Ecology Certificate program provides the training and education necessary to succeed in government agencies, private businesses, and non-profits that provide field ecology services. The certificate provides the opportunity to learn ecological field methods including identification of flora and fauna, quantitative assessment methods, wetland delineations, regulatory processes, restoration ecology, and geographic information systems. In addition to field methods, students will receive education in general ecological principles.

Two pathways to obtain the certificate exist for this program (students will choose only one of these pathways). Both pathways require the same core courses and only vary in their elective components. Pathway 1 is oriented toward students pursuing their Associate in Science degree in Biology and allows use of either BIOL 412 (Plant Biology) or BIOL 422 (Animal Biology) to partially meet unit requirements for elective courses in the program. Pathway 2 is oriented toward students not pursuing their Biology degree; and unit requirements for elective courses are entirely obtained from the list of elective courses in the program.

# Certificate Requirements

| COURSE CODE     | COURSE TITLE              | UNITS |
|-----------------|---------------------------|-------|
| BIOL 305        | Natural History           | 4     |
| BIOL 320        | Field Botany              | 3     |
| BIOL 360        | Environmental Regulations | 3     |
| BIOL 362        | Field Methods in Ecology  | 4     |
| Subtotal Units: |                           | 14    |

## Pathway 1 (For students also pursuing an Associate in Science Degree in Biology)

| COURSE CODE   | COURSE TITLE   | UNITS |
|---|--|-------|
| BIOL 412  | Plant Biology (5)  | 5     |
| or BIOL 422   | Animal Biology (5)   |       |
| A minimum of 5 units from the following:  |  | 5     |
| BIOL 321  | Advanced Field Botany (3)  |       |
| BIOL 326  | Ethnobotany (3)  |       |
| BIOL 327  | Ethnobotany Laboratory (1)   |       |
| BIOL 330  | Introduction to Entomology (3)                                       |       |
| BIOL 332  | Introduction to Ornithology (4)                                      |       |
| BIOL 350  | Environmental Biology (3)  |       |
| BIOL 352  | Conservation Biology (3)   |       |
| BIOL 364  | Restoration Ecology (2)  |       |
| BIOL 370  | Marine Biology (4)   |       |
| BIOLFS 310  | Natural History Field Study: Mojave Desert (2)                       |       |
| BIOLFS 311  | Natural History Field Study: Advanced Study of the Mojave Desert (2) |       |
| BIOLFS 350  | Natural History Field Study: Sierra Nevada Plants (2)                |       |
| CHEM 320  | Environmental Chemistry (4)  |       |
| GEOG 331  | Exploring Maps and Geographic Technologies (3)                       |       |
| GEOG 334  | Introduction to GIS Software Applications (3)                        |       |
| GEOL 345  | Geology of California (3)  |       |
| Pathway 1 (For students also pursuing an Associate in Science Degree in Biology) Units: |  | 10    |
| Total Units:  |  | 24    |

## Pathway 2 (For students pursuing only the Field Ecology Certificate)

| COURSE CODE                               | COURSE TITLE   | UNITS |
|---|--|-------|
| A minimum of 10 units from the following: |  | 10    |
| BIOL 321                                  | Advanced Field Botany (3)  |       |
| BIOL 326                                  | Ethnobotany (3)  |       |
| BIOL 327                                  | Ethnobotany Laboratory (1)   |       |
| BIOL 330                                  | Introduction to Entomology (3)                                       |       |
| BIOL 332                                  | Introduction to Ornithology (4)                                      |       |
| BIOL 350                                  | Environmental Biology (3)  |       |
| BIOL 352                                  | Conservation Biology (3)   |       |
| BIOL 364                                  | Restoration Ecology (2)  |       |
| BIOL 370                                  | Marine Biology (4)   |       |
| BIOLFS 310                                | Natural History Field Study: Mojave Desert (2)                       |       |
| BIOLFS 311                                | Natural History Field Study: Advanced Study of the Mojave Desert (2) |       |

| COURSE CODE  | COURSE TITLE  | UNITS |
|--|---|-------|
| BIOLFS350  | Natural History Field Study: Sierra Nevada Plants (2) |       |
| CHEM 320   | Environmental Chemistry (4)                           |       |
| GEOG 331   | Exploring Maps and Geographic Technologies (3)        |       |
| GEOG 334   | Introduction to GIS Software Applications (3)         |       |
| GEOL 345   | Geology of California (3)                             |       |
| Pathway 2 (For students pursuing only the Field Ecology Certificate)<br>Units: |   | 10    |
| Total Units:   |   | 24    |

## Student Learning Outcomes

Upon completion of this program, the student will be able to:

- describe the basic principles of ecology, particularly in the context of field oriented biology.
- identify flora and fauna of the region.
- assess ecosystem evaluation methods and demonstrate competence in ecosystem analysis methodologies.
- examine the regulatory processes and agencies involved with environmental regulations at the local, state, and federal levels.
- apply the evolutionary process to its role in ecosystems.
- collect biological and ecological data during field work opportunities.
- record data in a field notebook and on data sheets.
- operate equipment used for the field work component of the program (e.g. nets and other collecting equipment for fishery surveys, nets and sorting trays associated with benthic macro invertebrate surveys for rapid bioassessment, and soil extraction tools for assessment of wetland hydric soils.)
- analyze data collected during field experiments and investigations (e.g. fishery data collected from captured species, percentages of cover of native and non-native plant species from an experimental vegetation plot, determination of water quality characteristics based on sensitivities of benthic macro invertebrate taxonomic units).
- formulate strategies and methodologies for data collection in various field situations.

## Career Information

The Field Ecology Certificate can fulfill the needs of agencies and private businesses, and non-profits for entry-level ecological and environmental technicians and field biologists. Entry-level jobs can be found in government resource agencies at the federal, state, and local levels and in private environmental consulting businesses and private non-profit environmental organizations. This certificate program will provide advancement opportunities to those currently employed in the environmental and resource professions. In addition to updating job skills, this certificate will provide new training and education opportunities for returning and continuing students.

# Biology (BIOL)

## BIOL 100 Introduction to Concepts of Human Anatomy and Physiology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC  |
| <b>Prerequisite:</b>      | None.   |
| <b>Advisory:</b>          | AH 110 (Medical Language for Health-Care Providers), ENGRD 110 (Efficient Reading) or ESLR 320 (Advanced-Low Reading), and ENGWR 51 (Developmental Writing) or ESLW 310 (Intermediate-High Writing), and BIOL 290 (Science Skills and Applications) with grades of "C" or better. |
| <b>General Education:</b> | AA/AS Area IV   |
| <b>Catalog Date:</b>      | June 1, 2020  |

This introductory lecture course provides an overview of the basic anatomy and physiology of all 11 body systems and is required for students entering the licensed vocational nursing and occupational therapy assistant programs. The course emphasizes the direct connection between human activities (i.e. diet and lifestyle choices) and health of the body. It is designed for students having little or no background in the biological sciences. The course is also open to those intending to pursue studies in the biological sciences who need to strengthen or develop a vocabulary in human anatomy and physiology.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate professionalism through attendance, lack of tardiness, assignment completion, classroom behavior, and respect for fellow students.
- list and describe the organs and functions of all 11 body systems.
- discuss the concept of homeostasis and its maintenance through feedback loops.
- sketch and explain the components of a feedback loop.
- classify the four types of adult tissues based on structure and function.
- construct accurate concept maps that summarize challenging topics.
- diagnose, using scientific methodology, disease states based on medical case studies and explain the basic underlying disease process for each case.

- describe the main homeostatic feedback loops for each of the 11 body systems.

## BIOL 290 Science Skills and Applications

|                      |   |
|----------------------|---|
| <b>Units:</b>        | 0.5                                       |
| <b>Hours:</b>        | 27 hours LAB                              |
| <b>Prerequisite:</b> | None.                                     |
| <b>Corequisite:</b>  | Concurrent enrollment in a science course |
| <b>Catalog Date:</b> | June 1, 2020                              |

This course offers individualized instructional modules designed to provide or improve skills in the various science courses. A partial list of skills may include the following: textbook comprehension, principles of learning and retention, note taking, annotating, discipline-based vocabulary, paraphrasing, reading graphics, test taking, spatial ability, proportionality, and problem solving. Registration is open through the ninth week of the semester. To begin the course any later than that week would not permit completion of course material.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply the text chapter outlining strategy to their own science text.
- construct paraphrases for concepts presented in science textbooks or in their class notes.
- prepare notes for their science class via the Reading Across the Disciplines (RAD) note-taking method.
- interpret various types of graphs and diagrams from their science textbook.
- create concept maps in order to see relationships between ideas presented in their science textbook.
- assess various test taking strategies appropriate for their science class.
- demonstrate ability to read "actively" in their science textbook.
- apply proportional reasoning and spatial awareness techniques to improve content comprehension.
- develop a calendar that indicates study time, modifying it throughout the semester as needed.

## BIOL 299 Experimental Offering in Biology

|                      |              |
|----------------------|--------------|
| <b>Units:</b>        | 0.5 - 4      |
| <b>Prerequisite:</b> | None.        |
| <b>Catalog Date:</b> | June 1, 2020 |

## BIOL 305 Natural History

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 4  |
| <b>Hours:</b>             | 54 hours LEC; 54 hours LAB                                     |
| <b>Prerequisite:</b>      | None.  |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better. |
| <b>Transferable:</b>      | CSU; UC  |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B         |
| <b>Catalog Date:</b>      | June 1, 2020   |

The course is a survey of ecosystems in California with a special emphasis on the relationships between the species, adaptations of those species to their environment, and general ecological concepts. Students will explore the environment and diversity of organisms occurring in our geographical area but will be able to apply this knowledge to other areas as well. Attending a minimum of one field trip is required. The course is designed for the non-science major and is one of the core courses in the Field Ecology Certificate.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain the important biotic and abiotic factors of the various ecosystems of California.
- examine the many different relationships between species.
- apply general ecological concepts.
- incorporate the principles of natural selection in understanding relationships between a species' adaptations and its environment.
- recognize several common species of California plants and animals in the field.
- assess the importance of climate and geology to plant and animal adaptations.
- evaluate the importance of biodiversity to ecosystem health.
- record observations on adaptations and ecology in natural environments.
- discover and explain the importance of biodiversity to the maintenance of healthy ecosystems.

## BIOL 308 Contemporary Biology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC                              |
| <b>Prerequisite:</b>      | None.                                     |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better   |
| <b>Transferable:</b>      | CSU; UC                                   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B |
| <b>Catalog Date:</b>      | June 1, 2020                              |

This course is a survey of biological science intended to equip the student to think and act intelligently with respect to contemporary issues in biology. Biological topics are introduced in a framework of natural selection. The course is for those not intending to major in biological sciences, particularly liberal studies majors. Genetics is a significant focus of the course, as are origin of cellular life, cellular physiology, and diversity of organisms. An optional laboratory illustrating these principles introduced is offered as a separate, one-unit course (BIOL 309).

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- use the scientific method to pose questions and test hypotheses about the natural world.
- evaluate the design, analysis, and interpretation of scientific experiments.
- recognize and define a core set of biological terms and principles.
- relate the structure of biological molecules such as DNA, proteins, carbohydrates, and lipids to their functions in cells.
- comprehend some aspects of human physiology based on one or more of the body systems such as the digestive, nervous, immune, and reproductive systems.
- analyze problems involving inherited traits by utilizing the basic principles of Mendelian genetics.
- outline the basic cellular processes involved in cell division and the production of sex cells.
- construct diagrams that outline the roles of DNA, RNA, and proteins in the expression of inherited traits.
- explain the process of biological evolution by the mechanism of natural selection.
- interpret "tree of life" diagrams representing the evolutionary history of a group of organisms.
- evaluate new developments in biology in areas such as infectious disease, genetics, biotechnology, origin of life, and environmental studies.

## BIOL 309 Contemporary Biology Laboratory

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 1  |
| <b>Hours:</b>             | 54 hours LAB   |
| <b>Prerequisite:</b>      | None.  |
| <b>Corequisite:</b>       | BIOL 308   |
| <b>Transferable:</b>      | CSU; UC  |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B3; IGETC Area 5B; IGETC Area 5C |
| <b>Catalog Date:</b>      | June 1, 2020   |

This course is an optional laboratory accompaniment to BIOL 308. The sessions will illustrate biological phenomena and their relationship to contemporary concerns and discoveries in biology.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- use the scientific method to pose questions and test hypothesis about the natural world.
- comprehend experimental design and critically evaluate experimental results.
- perform simple laboratory skills such as observation, precision measurement, and aseptic techniques.
- use the compound light microscope to view living organisms at the cellular level.
- integrate the biological concepts introduced in Contemporary Biology based on the hands-on experience of the laboratory setting.
- evaluate information in the media about contemporary issues in biology that affect human societies such as epidemiology and prevention of disease, human genetics, genetic engineering, the Theory of Evolution vs. creationism, and biodiversity.

## BIOL 310 General Biology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 4   |
| <b>Hours:</b>             | 54 hours LEC; 54 hours LAB                          |
| <b>Prerequisite:</b>      | None.   |
| <b>Advisory:</b>          | ENGWR 300 and MATH 100 with grades of "C" or better |
| <b>Transferable:</b>      | CSU (effective Summer 2020)                         |
| <b>General Education:</b> | AA/AS Area IV                                       |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course introduces the major concepts of biological science with an emphasis on human biology. It is intended for non-science majors and disciplines requiring a broad overview of Biology or to meet transfer requirements. Topics covered include: scientific inquiry and literacy, cell biology, metabolism, Mendelian and molecular genetics, evolution, anatomy and physiology, animal behavior, and ecology. The laboratory activities are designed to further investigate and illuminate each topic area. Students may be required to purchase eye protection and disposable gloves. Field trips outside of class time may be required. Additionally, students may be required to provide their own transportation to field trip sites.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain major molecular, cellular, physiological, ecological, and evolutionary principles.
- apply major molecular, cellular, physiological, ecological, and evolutionary principles to basic biological questions.
- apply the scientific method to biological problems and interpret scientific data from a variety of sources for scientific validity and meaning.
- analyze particular biological structures and explain functions of those structures.
- assess information to evaluate scientific hypothesis investigated in the laboratory using inquiry, data collection, and analysis.
- develop scientific literacy by understanding and utilizing the basic vocabulary of the biological sciences and critically assess biological information relevant to life.

# BIOL 314 Dinosaurs and the Science of Life

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC  |
| <b>Prerequisite:</b>      | None.   |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B                     |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course investigates the evolution, form, function, and extinction of dinosaurs as a means of introducing students to scientific principles that are common to all forms of life on Earth. Topics will include scientific methodology; the mechanisms of evolution; the structure, early history, and geologic processes of the Earth; the evolutionary history of life on Earth; the diversity, ecology, physiology and behavior of dinosaurs; birds as dinosaurs. Additional topics will include proposed mechanisms of dinosaur extinction including meteorite impacts, volcanic plume events, global winters, global climate change, acid rain, and how each may occur today; genetics, the structure and function of DNA, cellular reproduction, cloning and stem cell technologies and whether they can be used to resurrect extinct organisms such as dinosaurs.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- use the scientific method to pose questions and test hypotheses about the natural world.
- explain the mechanisms of evolution and discuss the evolutionary history of life on earth.
- integrate an understanding of basic geologic processes and ecological principles into a global view of how they influence the evolution of organisms.
- distinguish major groups of living organisms as well as specific types of dinosaurs and other ruling reptiles.
- explain the basic mechanisms of animal form and function, especially as related to vertebrates such as dinosaurs.
- assess the environmental disturbances proposed to have driven dinosaurs to extinction, and evaluate how many of these disturbances are occurring today as a result of man's influence on the environment.
- incorporate knowledge of the basic principles of genetics, DNA, and cloning and stem cell technologies into an understanding of what scientists are presently and potentially capable of doing with such technologies.

# BIOL 315 Dinosaurs and the Science of Life Laboratory

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 1   |
| <b>Hours:</b>             | 54 hours LAB  |
| <b>Prerequisite:</b>      | None.   |
| <b>Corequisite:</b>       | BIOL 314 or prior completion of BIOL 314 with a grade of "C" or better. |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better           |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | CSU Area B3; IGETC Area 5C  |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course is an optional laboratory component to accompany BIOL 314. The laboratory sessions will allow students to engage in hands-on investigations to broaden and deepen their understanding of concepts discussed and developed in BIOL 314. Students may take this course either concurrently with or any time after completion of BIOL 314.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- use the scientific method to pose questions and test hypotheses about the natural world.
- explain the mechanisms of evolution and discuss the evolutionary history of life on earth.
- integrate understanding of basic geologic processes and ecological principles into a global view of how they influence the evolution of organisms.
- distinguish major groups of living organisms as well as specific types of dinosaurs and other ruling reptiles.
- explain the basic mechanisms of animal form and function, especially as related to vertebrates such as dinosaurs.
- assess the environmental disturbances proposed to have driven dinosaurs to extinction and evaluate how many of these disturbances are occurring today as a result of mans influence on the environment.
- incorporate knowledge of the basic principles of genetics, cellular reproduction, DNA, and cloning and stem cell technologies into an understanding of what scientists are presently and potentially capable of doing with such technologies.

# BIOL 320 Field Botany

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 3  |
| <b>Hours:</b>             | 36 hours LEC; 54 hours LAB                                     |
| <b>Prerequisite:</b>      | None.  |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better. |
| <b>Transferable:</b>      | CSU  |
| <b>General Education:</b> | AA/AS Area IV  |
| <b>Catalog Date:</b>      | June 1, 2020   |

This course is designed for both science and nonscience students to learn about plant taxonomy. Students will learn about the classification of flowering plants, how to identify plant species, and will become familiar with native plants of California as well as their ecological relationships and historical uses. A plant collection and a minimum of 10 field trips are required. Field trip locations may include Table Mountain, Marin Headlands, vernal pool sites, and other locations where plants can be observed in their natural surroundings.

# Student Learning Outcomes

Upon completion of this course, the student will be able to:

- classify plants into their correct groups: gymnosperms, angiosperms, monocots, eudicots, and others.
- explain flower characteristics, leaf shapes, and other characteristics used in the classification of flowering plants.
- examine unknown plants to determine their flower characteristics, leaf shapes, and other characteristics used in the classification of flowering plants.
- diagnose the correct family and species of unknown plants using a vascular plant dichotomous key.
- compare and contrast the characteristics of at least 25 flowering plant families.
- recognize the correct family of unknown plants by using the learned plant family characteristics.
- recognize common California plants to correct genera and species.
- compare the different plant habitats of California on types of plants, physical environments, and stresses placed on the plants.
- compile a collection of correctly identified plants.

## BIOL 321 Advanced Field Botany

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3                                       |
| <b>Hours:</b>             | 36 hours LEC; 54 hours LAB              |
| <b>Prerequisite:</b>      | BIOL 320 with a grade of "C" or better  |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better |
| <b>Transferable:</b>      | CSU; UC                                 |
| <b>General Education:</b> | AA/AS Area IV                           |
| <b>Catalog Date:</b>      | June 1, 2020                            |

This course is designed for both science and non-science students to broaden and deepen their knowledge of plant taxonomy. Students will learn the technical aspects of the dynamic nature of the classification of flowering plants and expand their ability to identify plant families, genera, and species in the field. Students will become familiar with additional native and non-native plants of California as well as their ecological relationships and conservation status. The role of herbaria in the conservation of plant taxa and plant communities will be addressed and students will practice mounting and labeling plant specimens for inclusion in an herbarium collection. A plant collection and a minimum of seven (7) field trips are required. Field trip locations may include Table Mountain, Marin Headlands, Jepson Prairie, Traverse Creek, and other locations where plants can be observed in their natural surroundings.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate an understanding of the scientific method and its role in biological studies.
- analyze adaptations of organisms to their environments.
- compare and contrast current scientific hypotheses on emerging biological topics.
- integrate new data into a better understanding of current and topical biological issues.
- analyze the methodology used in various biological investigations.
- explain ecological roles of organisms within communities.
- recognize taxonomic groups for identification of organisms.
- state the conservation status of taxa and explain reasons for designation of rare and endangered taxa.

## BIOL 326 Ethnobotany

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 3  |
| <b>Hours:</b>             | 54 hours LEC   |
| <b>Prerequisite:</b>      | None.  |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better. |
| <b>Transferable:</b>      | CSU; UC  |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B                      |
| <b>Catalog Date:</b>      | June 1, 2020   |

This introductory lecture course focuses on the concepts, questions, and methods of ethnobotany (the scientific study of the interactions between plants and humans). Students will use the scientific method to investigate the ecological and biological traits of plants, how these traits have shaped multicultural human use, and, in turn, been affected by humans. Topics include plant structure and reproduction, biodiversity and plant evolution in natural and cultivated systems, traditional ecological knowledge and management techniques, ethnobotanical research methods and ethical issues, and a comparison of plant use by various cultures for food, medicine, shelter, basketry, and dyes.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- define ethnobotany and discuss the various disciplines included in this area of study.
- examine how ethnocentricity and reactivity can influence ethnobotanical research.
- design a simple ethnobotanical research project that includes scientific methods of collecting ethnobotanical data and ethical issues involved in conducting ethnobotanical research in the field.
- analyze flowering plant parts to determine their classification as to vegetative modifications, flower parts, and/or fruit types.
- discriminate between plant families of ethnobotanical and economic importance.
- categorize plant compounds into primary or secondary compounds, and, if secondary, into their correct type of secondary compound.
- evaluate the effectiveness and ecological impacts of traditional harvesting and management practices compared to current European/North American practices and how traditional ecological knowledge has helped to maintain viable populations of many plant species.

- compare and contrast plant use by various peoples (Anasazi, Cochimi, Miwok, and other groups of interest to the students), and relate this to the ecological constraints of the environment and the values of the particular culture.

## BIOL 327 Ethnobotany Laboratory

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 1   |
| <b>Hours:</b>             | 54 hours LAB  |
| <b>Prerequisite:</b>      | None.   |
| <b>Corequisite:</b>       | BIOL 326 or prior completion of BIOL 326 with a grade of "C" or better. |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better.          |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B3; IGETC Area 5C                               |
| <b>Catalog Date:</b>      | June 1, 2020  |

This introductory laboratory course is designed to be taken after or concurrently with BIOL 326 (Ethnobotany). This course focuses on the concepts, questions, and methods of ethnobotany (the scientific study of the interactions between plants and humans). Students will use the scientific method to investigate the ecological and biological traits of plants, how these traits have shaped multicultural human use, and, in turn, been affected by humans. Topics include plant structure and reproduction, biodiversity and plant evolution in natural and cultivated systems, traditional ecological knowledge and management techniques, ethnobotanical research methods, and investigation of plant use for food, medicine, dyes, shelter, and other uses.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- design a simple ethnobotany experiment including methods of collecting ethnobotanical data and a discussion of ethical issues involved in doing this research.
- discriminate between different vegetative modifications, flower parts, fruit types, and plant families of ethnobotanical and economical importance.
- apply the use of dichotomous keys to identify locally useful plants and plant families.
- identify by sight plants used by the Miwok and explain the uses of these plants.
- test whether or not certain plant extracts have antibiotic properties and evaluate the results of these tests.
- evaluate the presence of selected plant food compounds such as proteins, amino acids, and lipids, by performing and analyzing laboratory tests.
- create models of the human nervous system and use these to help explain the effects of various plant chemicals on the human body.
- hypothesize about a plant's usefulness (as food, dye, fiber, or other use) based on its chemical, cellular, and morphological properties.

## BIOL 330 Introduction to Entomology

|                           |               |
|---------------------------|---------------|
| <b>Units:</b>             | 3             |
| <b>Hours:</b>             | 54 hours LEC  |
| <b>Prerequisite:</b>      | None.         |
| <b>Transferable:</b>      | CSU; UC       |
| <b>General Education:</b> | AA/AS Area IV |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course provides an introduction to the science of entomology. Entomology examines the great diversity of insects, both in numbers as well as their life histories. The course introduces students to the variety found in insects: their structure and functions, their habits, their evolutionary biology, and their significance to humans. In addition, students will learn to identify orders and major families of insects. Due to their diversity and presence in all kinds of environments, insects provide a good framework for making scientific observations and for applying the scientific method to their studies. Attendance of one field trip may be required to complete the semester project.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain fundamental biological terms, concepts, and principles through the study of insect diversity in form and function and through application of the scientific method.
- recognize the importance of insects in their beneficial and adverse interactions with the human environment.
- analyze and identify the role of morphological, physiological, and behavioral adaptations of insects to environmental pressures and through the natural selection and artificial selection processes.
- examine the high level of diversity found in insects and their fundamental roles in ecosystem function.
- assess the characteristics of the major groups of insect fauna.
- assemble a collection of common insects that are identified to order and family.
- label the primary diagnostic physical characteristics of the various orders of insects.
- compare specimens from various insect orders to understand diagnostic features for identification purposes.
- apply the principles of natural selection to examine how insects rapidly adapt to environmental changes.

## BIOL 332 Introduction to Ornithology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 4   |
| <b>Hours:</b>             | 54 hours LEC; 54 hours LAB  |
| <b>Prerequisite:</b>      | None.   |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better                               |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course investigates the evolution, ecology, and conservation of birds as a means of introducing scientific principles common to all life forms. Using birds as models, lecture and lab topics

include scientific methodology; evolutionary principles including evolutionary mechanisms and phylogenetics; the structure and function of physiological and sensory systems; behavioral ecology such as foraging, competition, migration and navigation, breeding, social behavior, communication, and intelligence; and current research and conservation topics. Laboratory work teaches the scientific method; evolutionary mechanisms; and taxonomic classification and identification of birds, particularly those found in California and the western United States. Several field trips to study wild birds in regional habitats are required (total cost per student for field trips is approximately \$25-\$40). This course may be used as an elective by students in the Field Ecology Certificate Program or majoring in Biology, and also is suitable for non-majors.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain evolutionary principles including causes of evolution, evidence for evolution, and phylogenetics.
- use the scientific method to generate hypotheses, collect and analyze data generated through active experimentation, and draw conclusions.
- examine current scientific hypotheses regarding the evolution of birds and flight and evaluate the evidence supporting these views.
- describe avian adaptations for flight.
- describe the major avian physiological systems, including the digestive, respiratory, circulatory, and sensory systems.
- use general principles of behavioral ecology to understand avian foraging, competition, social and reproductive behavior, parenting, migration, navigation, and intelligence.
- determine the major conservation issues in the field of ornithology.
- discuss the role of citizen science in understanding, researching, and conserving natural communities.
- demonstrate proper use of binoculars, field guides, and field journals while identifying birds in the field.
- identify and taxonomically classify bird species based on diagnostic field morphology and behavior, especially those species found in California and the western U.S.
- differentiate between the Orders of North American birds and determine their defining characteristics.

## BIOL 342 The New Plagues: New and Ancient Infectious Diseases Threatening World Health

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 3  |
| <b>Hours:</b>             | 54 hours LEC   |
| <b>Prerequisite:</b>      | None.  |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better. |
| <b>Transferable:</b>      | CSU; UC  |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area E1; IGETC Area 5B         |
| <b>Catalog Date:</b>      | June 1, 2020   |

This course will explore the biology, epidemiology, and pathology of selected pathogenic prions, viruses, bacteria, protozoa, and helminthes threatening public health worldwide. The course will also explore how human behavior and human activities have catalyzed the emergence of new infectious diseases and re-emergence of ancient plagues.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- examine information on the biology, pathogenesis, and transmission of infectious disease agents threatening global health.
- explain how the human immune system responds to infectious agents, what factors affect the ability of the immune system to respond to infectious agents, and what factors affect the ability of the immune system to combat infectious disease agents.
- assess factors leading to the emergence or re-emergence of infectious diseases worldwide including rapid global transport, the effects of malnutrition, poverty, war, urbanization, pollution, government health policies, use/overuse of pesticides and antibiotics, encroachment of wilderness areas, and intensification of animal agriculture.
- explore how the spread of infectious disease agents can be controlled or prevented through medical intervention such as vaccination, antimicrobial therapy, and behavioral and social changes.
- demonstrate expertise with regard to a specific infectious disease by writing a research report.
- design and create a poster or slide presentation illustrating the main points of the natural history of a specific infectious disease agent.
- report results of infectious disease research project.

## BIOL 349 Applied Microbiology: Scientific Literacy through Practical Uses of Microbiology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC  |
| <b>Prerequisite:</b>      | None.   |
| <b>Advisory:</b>          | BIOL 308, BIOL 342, BIOL 402, BIOL 440, or CHEM 400 with a grade of "C" or better     |
| <b>Transferable:</b>      | CSU; UC (effective Summer 2020)   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2 (effective Fall 2020); IGETC Area 5B (effective Fall 2020) |
| <b>Catalog Date:</b>      | June 1, 2020  |

In this course, the student will use applied microbiology as a means for learning scientific literacy. The student will learn microbiology fundamentals, including relevant genetics and biochemistry, as it is applied to a range of topics such as bioremediation, medicine and fuel production, and genetically modified organisms (GMOs). Most importantly, the student will learn how to connect ideas, evaluate scientific evidence, and think critically about controversial issues relevant to microbiology such as bioremediation, diminishing global food and fuel resources, and gene editing. This fast-paced course is intended for ambitious non-science majors who are interested in gaining scientific literacy by exploring the non-infectious-disease applications of microbiology, understanding the connection between science and the media, and how microbiology affects our everyday lives.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- evaluate the connection between science in original research and mainstream news, and how bias can affect both.
- cite key discoveries and events in microbiology history.
- find, read, and comprehend simple peer-reviewed scientific journal articles.
- analyze information using the Scientific Method, while incorporating the Nature of Science.
- demonstrate qualities of basic scientific literacy such as how to ask and answer questions, determine suitable controls, and effectively assess evidence.
- compare and contrast a variety of technologically useful microorganisms including bacteria, yeast, and algae.
- describe in general terms how microbes are engineered for a new purpose.
- identify basic features of enzymes and biochemical pathways, and describe how they can be engineered for a new purpose.
- discuss what GMO (genetically modified organism) means, and cite examples of GM (genetically modified) products common to modern culture.
- explain how engineered microbes are applied for use in fields such as bioremediation, biofuels, food science, human health, and biotherapeutics.
- evaluate and discuss the role of microbiology in controversial issues such as GM food, human gene editing (CRISPR), global warming, and diminishing global fuel resources.

## BIOL 350 Environmental Biology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC                              |
| <b>Prerequisite:</b>      | None.                                     |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better   |
| <b>Transferable:</b>      | CSU; UC                                   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B |
| <b>Catalog Date:</b>      | June 1, 2020                              |

This course provides both biology majors and non-majors with instruction in human interactions with the environment and resolutions to potential conflicts that develop due to this interaction. Understanding how life affects environments and ecosystems is an integral part of the biological sciences. To achieve this understanding, biological and ecological principles are examined as they relate to the natural environment. Major topics include the function and structure of ecosystems and ecological processes, the effects of natural selection on populations, the role of biodiversity on the maintenance of ecosystems, the variety of human impacts on terrestrial, aquatic, and atmospheric systems, potential solutions to adverse impacts, and the application of the scientific method in the examination of these effects. Attendance on one class field trip is required in this course.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain fundamental ecological terms, concepts, and principles through the study of environmental biology.
- examine the various human-caused environmental impacts on biological communities and the environment.
- assess the techniques and practices humans are utilizing to alleviate and mitigate environmental damage.
- review the various historical and current environmental issues.
- compare environmental, social, and economic conditions between the developed world and the developing world.
- describe world population trends and their relationship to environmental degradation.
- apply ecological concepts during critical thinking simulations of real world issues.
- predict the economic and ecological outcomes of changes to consumptive patterns in our lives.
- define the various terminologies used in environmental science and in applications of the scientific method.
- propose sustainable solutions to environmental issues at the personal and societal levels.

## BIOL 351 Global Climate Change

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC                              |
| <b>Prerequisite:</b>      | None.                                     |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better   |
| <b>Transferable:</b>      | CSU; UC                                   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B |
| <b>Catalog Date:</b>      | June 1, 2020                              |

This interdisciplinary course explores the natural and human factors causing the Earth's climate to change. Whether alarmed, skeptical, or just curious about climate change, students will acquire the scientific tools to analyze the evidence that climate change is a looming threat. Through lectures, readings, discussions and projects, students will examine the Earth's present and past climates as well as the influence of climate on the geographical distribution and diversity of plants and animals, extinction, and on human societies.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain the physical factors that affect climate and how geographic variation of solar energy receipt affects temperature, precipitation, and ecosystems.
- diagram the carbon cycle; explain where carbon is naturally stored in the environment, and how carbon is moved both physically and biologically.
- describe the various layers of the atmosphere and explain their role in producing the greenhouse effect and anthropogenic climate change.
- apply principles of meteorology and global oceanic circulation to hypothesize how terrestrial and marine biotic communities may be impacted by climate change.
- correlate how atmospheric carbon dioxide levels may affect the acidity of oceans and the structure of marine communities.
- understand how scientists collect modern and paleoclimatologic data to determine the history of the earth's climate and biogeography, and apply scientific reasoning to assess the evidence for human induced climate change.

- analyze the complexities, variables and other difficulties encountered in constructing climate change models and assess why it is difficult to predict the specific future effects of climate change.
- describe global political efforts to deal with the causes and effects of climate change.
- identify how climate change will likely affect human lives and civilizations and develop effective short and long-term strategies for mitigating the effects of climate change.

## BIOL 352 Conservation Biology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC                              |
| <b>Prerequisite:</b>      | None.                                     |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better   |
| <b>Transferable:</b>      | CSU; UC                                   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B |
| <b>Catalog Date:</b>      | June 1, 2020                              |

This introductory course covers biological and ecological principles involved in understanding and analyzing environmental problems and exploring scientifically sound conservation techniques. Major topics include the nature of science, basic principles of ecology, genetics and evolution, patterns of biodiversity and extinction, and the interdependence between humans and our environment. This course places emphasis on scientific processes and methodology and the application of science to conservation issues. Two field trips and/or a semester project may be required. Field trips may incur a program cost (such as admission to a museum, aquarium, or zoo) which will be announced at the beginning of the semester.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate basic principles of ecology, population genetics, and evolution/natural selection to the analysis of conservation issues.
- explain the basic concepts of population, community, and ecosystem ecology and apply these to the understanding of conservation issues.
- examine biodiversity in terms of the structure and function of biological systems.
- incorporate concepts of genetic/species diversity in the application of conservation principles.
- appraise patterns of community diversity and community stability.
- apply elements of landscape diversity to healthy ecosystems and community diversity.
- analyze the relationship between the impact of human populations and ecosystem health as it applies to threats on biodiversity.
- explain aspects of economics, law, and resource consumption as they relate to impacts on conservation.
- evaluate the use of protected areas and ex situ conservation strategies in species conservation.
- discriminate and interpret scientific data using the scientific method to develop questions and reach reasoned conclusions in biological conservation.
- analyze conservation case studies and evaluate the effectiveness of conservation strategies.

## BIOL 360 Environmental Regulations

|                      |  |
|----------------------|--|
| <b>Units:</b>        | 3  |
| <b>Hours:</b>        | 54 hours LEC   |
| <b>Prerequisite:</b> | None.  |
| <b>Advisory:</b>     | BIOL 305 (Natural History) and ENGWR 300 (College Composition) with grades of "C" or better. |
| <b>Transferable:</b> | CSU  |
| <b>Catalog Date:</b> | June 1, 2020   |

This course examines the environmental regulatory process in California with applicable Federal and California environmental laws being studied and discussed. Relevant Federal regulations include: The National Environmental Policy Act, Federal Endangered Species Act, Marine Mammal Protection Act, Clean Water Act, Clean Air Act, Fish and Wildlife Coordination Act, Coastal Zone Management Act, Resource Conservation and Recover Act, Superfund, and the Rivers and Harbors Act. Relevant California regulations include: California Environmental Quality Act, California Endangered Species Act, California Coastal Act, Natural Communities Conservation Planning process, Streambed Alteration Agreements, and California Water Law. In addition, the jurisdictional wetland delineation process will be studied in detail including field work to demonstrate the process. Students will be introduced to these regulations during lectures and will participate in discussions of the regulatory process. One field trip is required.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- explain the background, requirements, and implementation of environmental regulations.
- demonstrate selected field techniques and data gathering methods for wetland delineations.
- assess the process of preparation of environmental documentation for both Federal and California processes.
- define the numerous acronyms that are most commonly used in the environmental regulatory process.
- examine the structure of the U.S. and California governments and their regulatory responsibilities.
- evaluate the policies of various governmental agencies as they pertain to environmental laws enacted by Congress and by California.
- compile a folder/binder of the various federal and state regulations discussed in class and the policy interpretations of those regulations by applicable agencies.
- prioritize governmental regulations, laws, treaties, state constitutions, federal constitution, and state laws in order of legal strength.
- discuss the role of the California Environmental Quality Act in addressing climate change concerns.
- examine the role of public meetings/hearings in the environmental process through attendance at a public sector meeting.
- explain the process of how laws are promulgated by the Legislative branch of government and how the regulations to implement legislation are developed by the Executive branch of government.
- write a public comment letter regarding pending legislation or pending environmental evaluation of the students' choice.

# BIOL 362 Field Methods in Ecology

|                      |  |
|----------------------|--|
| <b>Units:</b>        | 4  |
| <b>Hours:</b>        | 54 hours LEC; 54 hours LAB   |
| <b>Prerequisite:</b> | BIOL 305 (Natural History) AND BIOL 320 (Field Botany) or equivalent college-level courses (college-level ecology course with lecture and lab may substitute for BIOL 305; plant taxonomy course using the Jepson Manual may substitute for BIOL 320) with a grade of "C" or better. |
| <b>Advisory:</b>     | Students must be in good health and be able to hike moderate distances through rough terrain.  |
| <b>Transferable:</b> | CSU  |
| <b>Catalog Date:</b> | June 1, 2020   |

This course is an introduction to methods for sampling and studying a variety of organisms in the field with a particular emphasis on the vegetation, macroinvertebrates, fish, and wildlife of the area. The goals are to gain experience and develop skills in the following areas: Identification of plants and animals, first-hand knowledge of a wide array of organism life histories, quantitative field research techniques and procedures applicable to plants and animals, and recording of data and observations in a field notebook. Required field trips (approximately eight) to local and regional habitats focus on seasonally relevant events, processes, and appropriate methodologies to study these communities. Extensive field work is required; therefore, students need to be in appropriate physical condition to successfully navigate uneven ground and withstand adverse weather conditions.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- apply quantitative field research methods to analyze wildlife habitat.
- identify local plants and animals and knowledge of their life histories.
- design and prepare field sampling programs and record, analyze, and interpret data from the sampling programs.
- evaluate survey methods for appropriateness to various habitats and species and justify the selection of specific methodologies.
- inventory plant and animal species in local habitats.
- record findings in a field notebook for later analysis.
- analyze information derived from field measurements through statistical and mapping techniques.
- synthesize field data and translate for use in habitat management applications.
- be able to work with others in a cooperative manner.
- identify individual baseline characteristics and protocols for field measures.
- assess plant and animal communities for production of monitoring reports to federal and state resource agencies.
- record and analyze survey results pertaining to vegetation, fisheries, and wildlife of study parcels.

# BIOL 364 Restoration Ecology

|                      |  |
|----------------------|--|
| <b>Units:</b>        | 2  |
| <b>Hours:</b>        | 27 hours LEC; 27 hours LAB                                     |
| <b>Prerequisite:</b> | None.  |
| <b>Advisory:</b>     | ENGWR 300 (College Composition) with a grade of "C" or better. |
| <b>Transferable:</b> | CSU  |
| <b>Catalog Date:</b> | June 1, 2020   |

Restoration ecology is the science of creation, management, and perpetuation of wildlife and wetland habitat. This course will examine this subject through lectures providing requisite knowledge of principles in ecology, evolution, and biodiversity. These principles are applied to existing and on-going habitat restoration techniques in the Sacramento area. Several field trips to local restoration sites occur during the course.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- analyze the basic principles of ecology in the context of restored ecosystems.
- assess methods and describe materials for restoration of wildlife habitats and ecosystems.
- examine the interactions between humans and the environment, in particular, the detrimental impacts to ecosystems and the resolution of such conflicts.
- critique proposed restoration projects for viability.
- explain how ecological processes such as the hydrologic cycle, nutrient cycle, ecosystem succession, and geological cycles affect the habitat restoration process.
- write a prospectus and conceptual restoration design plan for a restoration project of a hypothetical degraded/damaged habitat.
- develop restoration proposals for stream, riparian, and wetland areas.

# BIOL 370 Marine Biology

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 4  |
| <b>Hours:</b>             | 54 hours LEC; 54 hours LAB   |
| <b>Prerequisite:</b>      | None.  |
| <b>Advisory:</b>          | ENGWR 300 with a grade of "C" or better; Students must be in good health and be able to hike moderate distances through tough terrain. |
| <b>Transferable:</b>      | CSU; UC  |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C  |
| <b>Catalog Date:</b>      | June 1, 2020   |

This course is an introduction to marine biology and oceanography. It includes the study of marine vertebrates and invertebrates, tide pool and coastal ecology, sea water, tides, currents, marine geology, and coastal processes. Instruction includes both lab and lecture and required field trips to study intertidal plants and animals and coastal ecology. Three field trips are required. Two of these involve tent camping over one two-day and one three-day weekend and will focus on the North and Central California Coast. Students must supply their own food, tents, and

sleeping bags. Students are responsible for field trip costs for camping, tours, and parking (approximately \$50 - \$80 per student). Field trip dates will be announced at the first class meeting.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- integrate the relationships between the physical aspects (tides, currents, waves, etc.) and biological aspects of the marine environment.
- demonstrate a basic understanding of chemistry, biological organization, and ecology as they apply to the marine environment.
- differentiate the various life forms found in and associated with the marine environment through the use of taxonomic identification and classification.
- discriminate among the various adaptations of marine organisms and associate the adaptations to success in the specific habitats within the ocean ecosystems.
- integrate ecological and human resource perspectives regarding the marine environment.
- research the effects of resource exploitation on specific marine species for presentation.
- examine the coastal marine environment first-hand through field exploration.
- identify the benefits and challenges of learning in group situations during extended field investigations.
- evaluate information from field investigations and incorporate it into a field journal.

## BIOL 402 Cell and Molecular Biology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 5   |
| <b>Hours:</b>             | 54 hours LEC; 108 hours LAB   |
| <b>Prerequisite:</b>      | CHEM 400 with a grade of "C" or better                                |
| <b>Advisory:</b>          | ENGWR 300 (College Composition) with a grade of "C" or better         |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C |
| <b>C-ID:</b>              | C-ID BIOL 190   |
| <b>Catalog Date:</b>      | June 1, 2020  |

This is the first semester of a three-semester sequence in general biology designed for biology majors. It is an introduction to many aspects of living cells, with an emphasis on the molecular level of organization. Topics include an introduction to biological molecules, enzymes, cell structure, respiration, photosynthesis, reproduction, genetics, and statistical analysis. The course also covers molecular genetics, structure and function of viruses, DNA technology, and genetic engineering techniques.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- use the scientific method to pose questions and test hypotheses about the natural world.
- evaluate the design, analysis, and interpretation of scientific experiments.
- outline the process of biological evolution by the mechanism of natural selection.
- demonstrate a set of laboratory techniques including light microscopy, spectrophotometry, electrophoresis, aseptic cell culture and transformation, and statistical analysis of data.
- recognize and define a core set of biological terms and principles.
- relate the structures of biological molecules such as DNA, proteins, carbohydrates, and lipids to their physical properties and functions in cells.
- comprehend metabolic processes based on an understanding of core concepts of thermodynamics, enzyme biochemistry, photosynthesis, and respiration.
- apply knowledge of the major cell structural components such as organelles and the cytoskeleton in order to comprehend and synthesize new information in cell biology.
- describe the fundamental cellular processes involved in cell reproduction and the production of sex cells.
- analyze problems involving inherited traits, including dihybrid (two gene) crosses, a variety of dominance patterns, gene interactions, and linkage by utilizing the basic principles of Mendelian genetics.
- integrate the principles of genetics with the roles of DNA, RNA, and proteins in the expression of inherited traits.
- discuss recent developments in DNA technology and genetic engineering.
- explain the distinction between eukaryotic cells, prokaryotic cells, and viruses and evaluate new information based on their structural and functional characteristics.
- evaluate new developments in biology in areas such as gene expression and cancer, stem cell research, infectious diseases, molecular genetics, biotechnology, origin of life, and genomics.

## BIOL 412 Plant Biology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 5   |
| <b>Hours:</b>             | 54 hours LEC; 108 hours LAB   |
| <b>Prerequisite:</b>      | BIOL 402 or equivalent course with a grade of "C" or better.          |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C |
| <b>C-ID:</b>              | C-ID BIOL 155   |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course is part of a three-semester general biology sequence designed for biology majors. BIOL 412 and BIOL 422 may be taken in any order after completion of BIOL 402 with a grade of C or better. BIOL 412 builds upon and applies concepts developed in Cell and Molecular Biology to the study of plants and general ecology. Topics covered include the diversity, taxonomy, and evolutionary trends observed among the cyanobacteria, algae, fungi, and plants, with special emphasis on higher plants; the comparative anatomy and physiology of higher plants; and general ecology, including population, community, and ecosystem dynamics. Two field trips are required. Possible locations include Pt. Reyes, Calaveras Big Trees, UC Davis, and others.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- examine the plant form, anatomy, and function of plants, fungi, algae, and cyanobacteria.

- integrate prior acquired knowledge of cell structure and function with knowledge of plant cell structure and function.
- classify organisms studied in this course into their appropriate domains, kingdoms, and phyla on the basis of their characteristics.
- analyze the evolutionary trends observed among the cyanobacteria, algae, fungi, and plants.
- generate hypotheses relating to general ecology (including non-photosynthetic organisms) or to the physiology of plants.
- evaluate hypotheses by performing experiments and analyzing the collected data.
- apply at least one ecological principle or hypothesis, such as but not limited to top-down control or indirect effects, to contemporary published journal articles or experiments.

## BIOL 422 Animal Biology

|                           |  |
|---------------------------|--|
| <b>Units:</b>             | 5  |
| <b>Hours:</b>             | 54 hours LEC; 108 hours LAB  |
| <b>Prerequisite:</b>      | BIOL 402 or an equivalent college-level Cell and Molecular Biology course with a grade of "C" or better. |
| <b>Transferable:</b>      | CSU; UC  |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B; IGETC Area 5C                                    |
| <b>C-ID:</b>              | C-ID BIOL 150  |
| <b>Catalog Date:</b>      | June 1, 2020   |

This is part of a three-semester sequence in general biology designed for biology majors. BIOL 412 and BIOL 422 may be taken in any order after completion of BIOL 402 with a grade of C or better. BIOL 422 builds upon and applies concepts developed in BIOL 402 to the study of animals and evolution. Topics covered include principles of evolution such as mechanisms of microevolutionary and macroevolutionary change, population genetics, speciation, extinction, and classification and phylogenetics; a survey of animal phyla and unicellular non-photosynthetic eukaryotic taxa; and animal embryology, development, life cycles, comparative anatomy and physiology, and behavior. Emphasis will be placed on the evolutionary relationships among animals, their adaptations to different environments and modes of life, and the evolutionary origins of novel characteristics throughout Animalia.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- evaluate and discuss the concepts and mechanisms of microevolution and macroevolution, adaptation, population genetics, speciation, classification, and phylogenetics.
- provide evidence for evolution.
- understand and compare different patterns of animal development, life cycles, and asexual and sexual reproduction.
- understand the role of gene expression in animal development and evolution.
- examine the characteristics of representative unicellular non-photosynthetic eukaryotes, understand their phylogenetic relationships, and describe the origin of multicellularity.
- construct and interpret phylogenies, understand and diagram the phylogenetic relationships among the major animal phyla and in relation to non-photosynthetic unicellular eukaryotes, and explain the lines of evidence and research used to determine such relationships.
- describe the characteristics, body plans, life cycles, and behavior of the major animal phyla.
- analyze evolutionary transitions in the animal lineage and the evolutionary origins of novel animal body plans and characteristics.
- describe, compare, and contrast the anatomy and functions of the major physiological systems of various animal taxa, including nervous, endocrine, sensory, and immune function; movement; circulation; gas exchange; nutrient acquisition; excretion; and reproduction.
- identify examples of animal behavior and explain the evolutionary significance of particular behaviors.
- use microscopy and dissection methods to identify anatomical structures in animals and describe the functions of those structures.
- apply scientific methodology and reasoning through active experiments, investigations, and critical thinking activities relating to evolution and animal biology.
- acquire, use, and cite scientific literature appropriately in scientific writing.

## BIOL 430 Anatomy and Physiology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 5   |
| <b>Hours:</b>             | 54 hours LEC; 108 hours LAB   |
| <b>Prerequisite:</b>      | CHEM 305, 309, or 400 with a grade of "C" or better                   |
| <b>Advisory:</b>          | AH 110, BIOL 100, BIOL 290, or CHEM 306 with a grade of "C" or better |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B                |
| <b>C-ID:</b>              | C-ID BIOL 115S  |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course is an introduction to normal structure and function in humans. The course emphasizes an understanding of physiological principles as related to body structure. The course includes study of the basic principles of physiology and anatomy, general histology, and the integumentary, skeletal, muscular, and nervous systems. BIOL 431 follows BIOL 430 and is necessary for completion of the study of human anatomy and physiology.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate a comprehensive understanding of the overall organization of the human body, its organ systems, and organs.
- demonstrate a fundamental understanding of homeostasis and feedback loops using diagrams.
- demonstrate the ability to properly use a microscope to view histological specimens.
- differentiate the main histological characteristics of tissues in the adult body and relate the characteristics to the function of the tissue.
- analyze and discuss data pertaining to osmosis.
- identify all bones and their features and most muscles by name.
- measure basic auditory functions using tuning forks.
- associate a specific disease with the body system involved.

- demonstrate an understanding of the intricacy and functional interrelationships that exist between the various body systems.

## BIOL 431 Anatomy and Physiology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 5   |
| <b>Hours:</b>             | 54 hours LEC; 108 hours LAB   |
| <b>Prerequisite:</b>      | CHEM 305 or CHEM 309 or CHEM 400 and BIOL 430 or the equivalent with grades of "C" or better. |
| <b>Advisory:</b>          | AH 110 with a grade of "C" or better  |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B  |
| <b>C-ID:</b>              | C-ID BIOL 115S  |
| <b>Catalog Date:</b>      | June 1, 2020  |

This course continues the study of normal structure and function in humans. Included in the course is the study of the circulatory, respiratory, digestive, urinary, reproductive, and endocrine systems. Special topics included in the course are pH, fluids, and electrolytes.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- evaluate the fundamental background of human structure and function at both the gross and microscopic levels.
- demonstrate an understanding of the functional interrelationships among the various body systems.
- analyze various physiological processes of the body.
- identify gross and microscopic anatomy of the heart including anatomy of blood vessels and physiological mechanisms of the vascular system.
- research respiratory physiology through data acquisition and analysis from volunteer subjects.
- collect research data pertaining to digestive functions and interpret the results.
- evaluate the chemical processes and components of artificial urine as part of studies in the gross and microscopic anatomy of the urinary system.
- explain the human reproductive system from fertilization to birth.

## BIOL 434 Pathology: The Study of Disease

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 3   |
| <b>Hours:</b>             | 54 hours LEC                              |
| <b>Prerequisite:</b>      | BIOL 431 with a grade of "C" or better    |
| <b>Transferable:</b>      | CSU; UC                                   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; IGETC Area 5B |
| <b>Catalog Date:</b>      | June 1, 2020                              |

This course applies physiological concepts to the development of disease in humans. This course includes the pathogenesis, signs and symptoms, and treatment and care of major diseases and cancers of the organ systems of the body. Biochemical, cellular, and organ changes that take place during disease development will also be emphasized. This course is intended for students who are about to enter an allied health program.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- examine cellular and biochemical changes that take place as a result of injury.
- compare specific disease processes to those of normal body function and homeostasis.
- identify microscopic and gross changes that take place during disease processes.
- assess how the systems of the body work together to maintain health.
- examine the effects of disease on all related systems.
- relate physical signs and symptoms to the disease process taking place within the body.
- hypothesize the possible etiology of disease given the clinical manifestations.

## BIOL 440 General Microbiology

|                           |   |
|---------------------------|---|
| <b>Units:</b>             | 4   |
| <b>Hours:</b>             | 54 hours LEC; 72 hours LAB  |
| <b>Prerequisite:</b>      | CHEM 305 or CHEM 309 or CHEM 400 or equivalent with a grade of "C" or better. |
| <b>Transferable:</b>      | CSU; UC   |
| <b>General Education:</b> | AA/AS Area IV; CSU Area B2; CSU Area B3; IGETC Area 5B                        |
| <b>Catalog Date:</b>      | June 1, 2020  |

The course includes the study of selected evolutionary, ecological, morphological, physiological, and biochemical aspects of representative micro-organisms. The laboratory includes staining, microscopic examination and identification of microbes, prokaryotic ecology, aseptic technique and isolation of microbes, microbial growth media, control of microbial growth including antibiotic sensitivity testing, metabolism, genetics, taxonomy, protists, fungi, helminths, and arthropod vectors. This course is intended for students in allied health majors.

### Student Learning Outcomes

Upon completion of this course, the student will be able to:

- survey important "milestones" in the history of microbiology.
- compare and contrast the structures and functions of macromolecules found as components of microbial agents/microorganisms.

- compare and contrast different types of metabolism/metabolic pathways employed by different types of microbes.
- compare and contrast different types of microbial agents and microorganisms with respect to morphology, physiology, and phylogeny.
- integrate concepts of gene expression, natural selection, and evolution in the context of microbiological organisms.
- operate a microscope to examine microscopic life including bacteria, protozoa, algae, fungi, helminths, and arthropod vectors.
- differentiate bacterial cultures by using staining techniques.
- compare the use of different types of microbial media for isolation and identification of bacteria and fungi.
- classify unknown bacteria by performing metabolic tests.
- incorporate aseptic/sterile techniques in all laboratory experiments.
- compare and explain the effects of physical and chemical factors in controlling microbial growth and perform antibiotic sensitivity tests.
- explain the role of bacteria in biofilm formation and nitrogen cycling as important aspects of prokaryotic ecology.
- explain aspects of host non-specific and specific defenses against microbial pathogens.

## BIOL 494 Topics in Biology

|                      |                  |
|----------------------|------------------|
| <b>Units:</b>        | 0.5 - 4          |
| <b>Hours:</b>        | 9 - 36 hours LEC |
| <b>Prerequisite:</b> | None.            |
| <b>Transferable:</b> | CSU              |
| <b>Catalog Date:</b> | June 1, 2020     |

This course is designed to enable both science and non-science students to learn about recent developments in biology. Selected topics will not include those that are part of current course offerings. This course may be taken four times for credit providing there is no duplication of topics. UC transfer credit will be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 units required for admissions.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- discuss the scientific method and its role in biological studies.
- describe a contemporary or relevant biological/ecological topic.
- compare and contrast current scientific hypotheses on a biological topic and evaluate the evidence for each hypothesis
- integrate new data into a better understanding of current and topical biological issues.
- analyze the methodology used in various biological investigations.
- assess and critique current papers (both scientific and layperson) in biological research.

## BIOL 495 Independent Studies in Biology

|                               |  |
|-------------------------------|--|
| <b>Units:</b>                 | 1 - 3  |
| <b>Hours:</b>                 | 54 - 162 hours LAB   |
| <b>Prerequisite:</b>          | None.  |
| <b>Enrollment Limitation:</b> | Student must obtain approval from an instructor to conduct an independent study with the appropriate instructor or instructors. Specific projects may not be available to a student. |
| <b>Transferable:</b>          | CSU  |
| <b>Catalog Date:</b>          | June 1, 2020   |

This course is for students who wish to develop an in-depth understanding in fundamental topics of biology and to learn to work in a collaborative atmosphere with instructors and other students. The independent studies may be pursued in the classroom, laboratory, and/or field studies. This is particularly valuable for biology and ecology students in preparation for independent research as part of their advanced degrees. Instructor approval is required to enroll in this course. UC transfer credit will be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 units required for admissions.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- conceive and implement a study design using the scientific method for a biological investigation or an education investigation in a biological or ecological topic.
- evaluate data collected as part of a biological/ecological study utilizing the scientific method.
- demonstrate an understanding of a contemporary and relevant biological/ecological topic.
- be able to work with others in a collaborative manner.
- record high quality notes of data and findings.
- prepare a product from a study - such as a paper, scientific poster, presentation, collection, etc.
- examine literature sources pertinent to the study hypothesis, methodology, and data results.

## BIOL 498 Work Experience in Biology

|                      |  |
|----------------------|--|
| <b>Units:</b>        | 1 - 4  |
| <b>Hours:</b>        | 60 - 240 hours LAB   |
| <b>Prerequisite:</b> | BIOL 305, 320, 360, and 362 with grades of "C" or better; A minimum of two of the following courses must be completed with grades of "C" or better: BIOL 305 (Natural History), BIOL 320 (Field Botany), BIOL 360 (Environmental Regulations), and BIOL 362 (Field Methods in Ecology); and, additionally a minimum of two of the elective courses in the Field Ecology Certificate program must be completed with a grade of "C" or better. |

|                      |  |
|----------------------|--|
| <b>Advisory:</b>     | ENGWR 300 with a grade of "C" or better. |
| <b>Transferable:</b> | CSU                                      |
| <b>Catalog Date:</b> | June 1, 2020                             |

This course provides students with the opportunity to obtain work experience through internships with various resource agencies and private environmental companies and non-profits. The course and internships are strongly correlated with the Field Ecology Certificate program and multiple pre-requisites must be met to qualify for enrollment in this course. Internship sponsors assist students in the acquisition of job skills and the application of knowledge obtained from coursework. This class is available only through instructor consent and an application must be submitted to be considered for internships. The application is available through the Biology Department and can be obtained by emailing a request to wyattd@scc.losrios.edu (David Wyatt).

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- experience the responsibilities of employment in field biology.
- develop applied skills through a supervised workplace environment.
- apply academic and practical knowledge obtained in the Field Ecology Certificate program to a specific work experience.
- create in the student a dynamic and evolving set of professional goals as they obtain applied experiences in the workplace.
- obtain professional recognition and networking opportunities as the student furthers their academic and professional objectives.
- discover a sense of responsibility towards their chosen profession and specific workplace experience.
- choose specific fields of study to concentrate further academic and professional endeavors.
- examine the various job duties in the field of biology.

## BIOL 499 Experimental Offering in Biology

|                      |              |
|----------------------|--------------|
| <b>Units:</b>        | 0.5 - 4      |
| <b>Prerequisite:</b> | None.        |
| <b>Transferable:</b> | CSU; UC      |
| <b>Catalog Date:</b> | June 1, 2020 |

## Biology - Field Studies (BIOLFS)

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### BIOLFS 310 Natural History Field Study: Mojave Desert

|                               |   |
|-------------------------------|---|
| <b>Units:</b>                 | 2   |
| <b>Hours:</b>                 | 18 hours LEC; 54 hours LAB  |
| <b>Prerequisite:</b>          | None.   |
| <b>Enrollment Limitation:</b> | This course requires completion of a course application that can be obtained from the instructor.   |
| <b>Advisory:</b>              | Students must be in good health and be able to hike moderate distances through a desert environment with uneven ground and in temperatures often above 100 degrees. |
| <b>Transferable:</b>          | CSU   |
| <b>Catalog Date:</b>          | June 1, 2020  |

This field course explores the plants, animals, and geological features of the Mojave Desert. Two lectures occur at Sacramento City College with a mandatory field trip of eight days to the Mojave Desert in Southern California. Accommodations are in a combination of outdoor tent camping for two nights and five nights at the Desert Studies Center field station or other lodging. Students provide their own tents, personal items, and personal field equipment. The course involves moderately strenuous hikes over uneven ground in the desert environment in temperatures that typically exceed 100 degrees F. A field station expense fee is due up to four weeks before the first day of class to cover the cost of accommodations, the cost of meals while at the Desert Studies Center, entrance fees to National Parks and Preserves, and transportation to and from the desert. If you have questions or need additional information, please contact David Wyatt at (916) 558-2406 or by e-mail at wyattd@scc.losrios.edu.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- demonstrate an understanding of the interrelationships between organisms (interspecific and intraspecific relationships).
- analyze the interrelationships between organisms and their abiotic environment.
- research the natural history and ecological importance of specifically assigned organisms.
- investigate the effects of past and present human use of the desert ecosystem.
- identify organisms representative of the various habitats present in the Mojave Desert.
- use a field journal to record all observations, investigations, and field activities.
- conceive and execute investigations of ecological interactions in the Mojave Desert.
- apply scientific methodologies to the analysis and interpretation of observations.
- be able to work with others in a group living and learning environment.
- create an educational presentation regarding a species or ecological process that occurs in the Mojave Desert and present the research to classmates while at the field station.

### BIOLFS 311 Natural History Field Study: Advanced Study of the Mojave Desert

|               |   |
|---------------|---|
| <b>Units:</b> | 2 |
|---------------|---|

|                               |   |
|-------------------------------|---|
| <b>Hours:</b>                 | 18 hours LEC; 54 hours LAB  |
| <b>Prerequisite:</b>          | BIOLFS 310 with a grade of "B" or better  |
| <b>Enrollment Limitation:</b> | This course requires completion of a course application that can be obtained from the instructor.   |
| <b>Advisory:</b>              | BIOL 305 with a grade of "C" or better; students must be in good health and be able to hike moderate distances through a desert environment with uneven ground and in temperatures often above 100 degrees. |
| <b>Transferable:</b>          | CSU   |
| <b>Catalog Date:</b>          | June 1, 2020  |

This multi-day field course provides an advanced opportunity for students to understand in greater detail ecological concepts associated with the xeric environment of the Mojave Desert. Examples of advanced research topics include: interspecific interactions, relationships between a species and their physical environment, desert resource management concerns, and effects of climate change on desert environments. BIOLFS 311 is an advanced extension of BIOLFS 310, Natural History Field Study: Mojave Desert, and provides the student with opportunities to mentor new students in BIOLFS 310 and serve in leadership roles during group learning exercises. These applied experiences and mentoring opportunities are highly desirable to natural resource agencies and to private environmental consultants. Prior completion of BIOLFS 310 (or equivalent) with an A or B grade is a pre-requisite for this course. This course provides elective units involving field experience for students in the Field Ecology Certificate program.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify organisms representative of the various habitats present in the Mojave Desert.
- research the natural history and ecological importance of specifically assigned organisms or interacting organism groups (guilds).
- analyze the interrelationships between communities of organisms and their abiotic environment.
- demonstrate an understanding of the interrelationships between organisms - both interspecific and intraspecific relationships.
- investigate resource management needs and implications in desert environments with a specific emphasis on Mojave National Preserve.
- examine the effects of climate change on desert ecosystems.
- use a field journal to record all observations, investigations, and field activities.
- conceive and execute investigations of ecological interactions in the Mojave Desert.
- apply scientific methodologies to the analysis and interpretation of observations.
- mentor students new to the Mojave Desert and provide leadership during group learning exercises.
- be able to work with others in a group living and learning environment.

## BIOLFS 312 Natural History Field Study: Baja California

|                               |   |
|-------------------------------|---|
| <b>Units:</b>                 | 4   |
| <b>Hours:</b>                 | 36 hours LEC; 108 hours LAB   |
| <b>Prerequisite:</b>          | None.   |
| <b>Enrollment Limitation:</b> | This course requires completion of a written course application that can be obtained from the instructor.   |
| <b>Advisory:</b>              | Students must be in good health and be able to hike moderate distances through a desert environment with uneven ground and in temperatures often above 100 degrees F. |
| <b>Transferable:</b>          | CSU   |
| <b>Catalog Date:</b>          | June 1, 2020  |

This field course explores the natural history of plants and animals of the desert and marine ecosystems of Baja California, Mexico, as well as historic and cultural sites. Three pre-trip lecture meetings will be held at Sacramento City College accompanied by a mandatory field trip of 14 days in Baja California. Accommodations include a combination of up to four nights in motels (during transit to and from Mexico) and ten nights at the field station in Bahia de Los Angeles (Baja California, Mexico). Students will supply their own bedding, personal items (toiletries, etc), and a limited amount of field equipment for use while at the field station. The course involves moderately strenuous hiking in temperatures generally in the high-90s to low-100s (with high humidity) as well as moderate swimming activities during snorkeling expeditions. The program cost to the student will cover accommodations, meals at the field station, and fees required in Mexico. Transportation may also be covered by the program cost. A valid passport for entry to Mexico and re-entry into the United States is required. For any questions or additional information, please contact Steve James at (916) 650-2776 or by e-mail at james@scscc.losrios.edu.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- interpret the interrelationships between organisms (interspecific and intraspecific relationships) and the evolutionary significance of these interrelationships.
- analyze the interrelationships between organisms and their abiotic environment.
- research the natural history and ecological importance of specifically assigned organisms.
- examine the interactions of organisms and physical processes at the interface between the desert and marine ecosystems.
- investigate the effects of past and present human use of the desert ecosystem and the Gulf of California.
- identify organisms representative of the various habitats present in Baja California and the Gulf of California.
- use a field journal to record all observations, investigations, and field activities.
- conceive and execute investigations of ecological interactions in the desert and marine environment of Baja California.
- apply the scientific method to the analysis and interpretation of observations.
- associate closely with others in a group living and learning environment.
- create an educational presentation regarding a species or ecological process that occurs in this area of Baja California and present the research to classmates while at the field station.
- partner with the nearby natural history museum in public outreach efforts with the local community.

## BIOLFS 324 Natural History Field Study: Sutter Buttes

|               |                           |
|---------------|---------------------------|
| <b>Units:</b> | 1                         |
| <b>Hours:</b> | 9 hours LEC; 27 hours LAB |

|                               |   |
|-------------------------------|---|
| <b>Prerequisite:</b>          | None.   |
| <b>Enrollment Limitation:</b> | This course requires completion of a written course application that can be obtained from the instructor. |
| <b>Advisory:</b>              | Students must be in good health and be able to hike moderate distances through rough and uneven terrain.  |
| <b>Transferable:</b>          | CSU   |
| <b>Catalog Date:</b>          | June 1, 2020  |

This field course explores the plants, animals, and geological features of the Sutter Buttes, called by many people the "world's smallest mountain range." This is a small, isolated cluster of eroded volcanic lava domes in the middle of the northern portion of California's Central Valley. Several lectures will occur at Sacramento City College with two mandatory field trips occurring during weekends. The field trips will occur over three days and will explore the habitats and organisms in a portion of the Sutter Buttes. The course involves moderately strenuous hikes over uneven ground thus students need to be in good health for these hikes. A \$20 landowner access cost is required to enter the private properties in the Sutter Buttes. If you have questions or need additional information, please contact David Wyatt at (916) 558-2406 or by email at wyattd@scc.losrios.edu.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- interpret the interrelationships between discussed organisms both interspecifically and intraspecifically.
- examine the interrelationships between organisms and their abiotic environment.
- identify organisms that can be found in the Sutter Buttes.
- understand the effects of past and present human use of the habitats found in the Sutter Buttes.
- apply scientific methodologies to the analysis and interpretation of observations.
- record all observations, investigations, and field activities in a field journal.

## BIOLFS 350 Natural History Field Study: Sierra Nevada Plants

|                               |   |
|-------------------------------|---|
| <b>Units:</b>                 | 2   |
| <b>Hours:</b>                 | 18 hours LEC; 54 hours LAB  |
| <b>Prerequisite:</b>          | None.   |
| <b>Enrollment Limitation:</b> | This course requires completion of a written course application.  |
| <b>Advisory:</b>              | Students must be in good health and able to hike moderate distances in a high elevation environment with uneven ground and variable temperatures. |
| <b>Transferable:</b>          | CSU   |
| <b>Catalog Date:</b>          | June 1, 2020  |

This field course explores the plants of the Sierra Nevada and surrounding areas. Two to three lectures will occur at Sacramento City College with a mandatory field trip of eight days to the Sierra Nevada. No previous plant identification experience is required, yet intermediate as well as beginning students will benefit from this course. Topics include the identification and keying of plant species, plant adaptations and communities, and uses of plants. Accommodations will be primarily at field research stations (dorms or cabins), but may include outdoor tent camping, as needed. Students will provide their own sleeping bags and field gear. This course involves moderately strenuous hikes in the mountains and desert environments. A field station fee is due before the first pre-trip meeting to cover the cost of accommodations, meals, entrance fees, and transportation. If you have questions or need additional information, please contact Lisa Serafini at serafil@scc.losrios.edu. This course was formerly known as BIOL 398.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- identify flowering or gymnosperm plants to correct species and family.
- explain the abiotic and biotic factors that determine the distribution of plant communities in the Sierra Nevada and nearby areas.
- diagnose the correct family and/or species of a plant by using The Jepson Manual: Vascular Plants of California.
- discriminate between different flowering and gymnosperm plant families.
- explain the interrelationship of plants and other organisms in representative communities.
- associate plants with the community or communities in which they usually occur.
- research natural history, ecological importance, and ethnobotany of specific plants.

## BIOLFS 495 Independent Studies in Field Biology

|                               |  |
|-------------------------------|--|
| <b>Units:</b>                 | 1 - 3  |
| <b>Hours:</b>                 | 54 - 162 hours LAB   |
| <b>Prerequisite:</b>          | None.  |
| <b>Enrollment Limitation:</b> | The student must obtain approval from an instructor prior to enrollment in the course.   |
| <b>Advisory:</b>              | Student must obtain approval from an instructor to conduct an independent study in field biology with that instructor or a combination of instructors. In addition, the student is advised to have previously completed a biology field studies course or have previous biological field experiences prior to enrollment in this course. |
| <b>Transferable:</b>          | CSU  |
| <b>Catalog Date:</b>          | June 1, 2020   |

This course is for students who wish to develop an in-depth understanding in fundamental topics of field biology and to learn and work in a collaborative atmosphere with instructors and other students. Independent studies are conducted in the field and in the laboratory. This is particularly valuable for biology and ecology students in preparation for independent research as part of their advanced degrees. Instructor approval is required to enroll in this course. Additionally the student is advised to have completed a prior field study course or have previous biological field experiences before enrolling in BIOLFS 495. An independent study project may involve extensive field activities that may occur in rugged and harsh conditions. Therefore, students would need to be in good physical health for most projects. UC transfer credit can be awarded only after the course has been evaluated by the enrolling UC campus. The units completed for this course cannot be counted towards the minimum 60 semester units required for admissions.

## Student Learning Outcomes

Upon completion of this course, the student will be able to:

- conceive and implement a study design for a biological field investigation in a biological or ecological topic.
- evaluate data collected as part of a biological or ecological study utilizing the scientific method.
- demonstrate an understanding of a contemporary and relevant biological or ecological topic.
- collaboratively work with an instructor or instructors and other students.
- record high quality notes of the data and findings.
- utilize a field journal of the research in a manner consistent with scientific research.
- prepare a product from the study, such as a paper, scientific poster, presentation, or collection.
- examine literature sources pertinent to the study hypothesis, methodology, and data results.

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