

**PROPOSAL TO OFFER A NEW ACADEMIC PROGRAM/ MAJOR IN FALL 2005
(LONG FORM)**

Proposed Name of Degree: Bachelor of Arts in Biology

Options/ Emphases in the Degree: General Biology
Pre-Professional Studies
Subject Matter Preparation in Teaching Biology

Faculty Proposing New Program: Ching-Hua Wang, Professor and Chair of Biology
Amy Denton, Assistant Professor of Biology
Nancy Mozingo, Assistant Professor of Biology

Review and Approval:

1. Curriculum Committee Approval:

Curriculum Chair: _____ Date: _____

2. Academic Senate Approval:

Chair, Academic Senate: _____ Date: _____

3. Administration Approval:

President (or designee): _____ Date: _____

PROCEDURE FOR SUBMITTING PROPOSALS FOR NEW DEGREE MAJOR PROGRAMS

A campus, in accordance with its approved academic master plan, submits detailed proposals for new degree major programs to the Office of Academic Program Planning for review and approval in the academic year preceding projected implementation. Approval of any degree major program is subject to campus assurances that financial support, qualified faculty, physical facilities and library holdings sufficient to establish and maintain the program will be available within current budgetary support levels. The proposal must follow the format below, and four copies should be sent to Academic Program Planning, Office of the Chancellor.

1. Definition of the Proposed Degree Major Program

- a. **Name of the campus submitting the request, the full and exact designation (degree terminology) for the proposed degree major program, and academic year of intended implementation.**

Campus- California State University Channel Islands

Degree- Bachelor of Arts in Biology

Implementation- Fall, 2005

- b. **Name of the department, departments, division or other unit of the campus that would offer the proposed degree major program. Identify the unit that will have primary responsibility.**

Biology Program, Academic Affairs, CSUCI

- c. **Name, title, and rank of the individual(s) primarily responsible for drafting the proposed degree major program.**

Ching-Hua Wang, Professor and Chair of Biology, CSUCI

- d. **Objectives of the proposed degree major program.**

General Objectives

- Provide students with the opportunity to earn a BA degree in Biology from the California State University Channel Islands.
- Equip students with knowledge and skills in life sciences for such diverse vocations as teaching, the health professions, scientific and environmental organizations, public and private sectors.

Learning Objectives

Students graduating from the Biology program will be able to

- Explain the basic structures and fundamental processes of life at molecular, cellular and organismal levels.
- Identify the evolutionary processes that lead to adaptation and biological diversity.
- Describe the relationship between life forms and their environment and ecosystems.
- Demonstrate an acceptable level of competency in laboratory procedures and techniques.
- Collect, analyze, interpret and present quantitative and qualitative data and incorporate them into the broader context of biological knowledge.
- Apply current technology and scientific methodologies for problem solving in various scientific, professional and community settings.
- Effectively use and critically evaluate current research literature, online information, as well as information related to scientific and biological issues in the mass media.
- Integrate and relate knowledge learned from the classroom with real life situations.

- Communicate in written and oral forms with interested citizens and professionals on biological and scientific issues.
- e. **Total number of units required for the major. List of all courses, by catalog number, title, and units of credit, to be specifically required for a major under the proposed degree program. Identify those new courses that are (1) needed to initiate the program and (2) needed during the first two years after implementation. Include proposed catalog descriptions of all new courses.**

REQUIREMENTS FOR THE BACHELOR OF ARTS DEGREE IN BIOLOGY (120 units):

COMMON LOWER DIVISION REQUIREMENTS FOR ALL EMPHASES (8 units):

- BIOL 200* Principles of Organismal and Population Biology (4)
- BIOL 201 Principles of Cell and Molecular Biology (4)

For Emphasis in General Biology:

UPPER DIVISION REQUIREMENTS IN THE MAJOR (37 units):

1. Required Biology Courses (25 units)
 - BIOL 300 Cell Biology (4)
 - BIOL 302 Genetics (4)
 - BIOL 303 Evolutionary Biology (3)
 - BIOL 304 Comparative Animal Physiology (3)
 - BIOL 400 Molecular Biology (4)
 - BIOL 433* Ecology and the Environment (4)

AND

A minimum of 2 units taken from the following:

 - BIOL 492 Internship (2-3)
 - BIOL 494 Independent Research (1-3)
 - BIOL 497 Directed Study (1-3)

AND

 - BIOL 499 Senior Capstone Colloquium (1)
2. Electives in Biology (12 units)

Select at least three courses from the following list, one of which must be a lab course.

 - BIOL 301 Microbiology (4)
 - BIOL 310 Animal Biology and Ecology (4)
 - BIOL 311 Plant Biology and Ecology (4)
 - BIOL 312 Marine Biology (4)
 - BIOL 313 Conservation Biology (4)
 - BIOL 316 Invertebrate Zoology (4)
 - BIOL 317 Parasitology (4)
 - BIOL 401 Biotechnology and Recombinant DNA Techniques (5)
 - BIOL 402 Toxicology (3)
 - BIOL 420 Cellular and Molecular Immunology (4)
 - BIOL 421 Virology (3)
 - BIOL 422 Molecular Plant Physiology (4)
 - BIOL 423 Cellular and Molecular Neurobiology (3)
 - BIOL 424 Human Physiology (3)
 - BIOL 425 Human Genetics (3)
 - BIOL 427 Developmental Biology (4)
 - BIOL 428 Biology of Cancer (3)
 - BIOL 431* Bioinformatics (4)
 - BIOL 432* Principles of Epidemiology and Environmental Health (3)
 - BIOL 450 Ichthyology: The Biology of Fishes (4)

REQUIRED SUPPORTING AND OTHER GE COURSES (53-54 units):

1. Chemistry (8 units)
 - CHEM 121* General Chemistry I (4)
 - CHEM 122 General Chemistry II (4)
2. Mathematics and Statistics (3-4 units)

- Select one of the following:*
BIOL 202* Biostatistics (3)
MATH 105 Pre-Calculus (4)
MATH 150* Calculus I (4)
3. Other GE Courses in Categories A-E (36)
4. American Institutions Requirements (6)

ELECTIVES IN ANY DISCIPLINE (21-22 units)

For Emphasis in Pre-Professional Studies:

UPPER DIVISION REQUIREMENTS IN THE MAJOR (32 units):

1. Required Biology Courses (21-22 units)
BIOL 300 Cell Biology (4)
BIOL 302 Genetics (4)
BIOL 304 Comparative Animal Physiology (3)
BIOL 400 Molecular Biology (4)
AND
Select one of the following:
BIOL 303 Evolutionary Biology (3)
BIOL 433* Ecology and the Environment (4)
AND
A minimum of 2 units taken from the following:
BIOL 492 Internship (2-3)
BIOL 494 Independent Research (1-3)
BIOL 497 Directed Study (1-3)
AND
BIOL 499 Senior Capstone Colloquium (1)
2. Electives in Biology (10-11 units)
Select at least three courses from the following list, one of which must be a lab course.
BIOL 301 Microbiology (4)
BIOL 310 Animal Biology and Ecology (4)
BIOL 311 Plant Biology and Ecology (4)
BIOL 312 Marine Biology (4)
BIOL 313 Conservation Biology (4)
BIOL 316 Invertebrate Zoology (4)
BIOL 317 Parasitology (4)
BIOL 401 Biotechnology and Recombinant DNA Techniques (5)
BIOL 402 Toxicology (3)
BIOL 420 Cellular and Molecular Immunology (4)
BIOL 421 Virology (3)
BIOL 422 Molecular Plant Physiology (4)
BIOL 423 Cellular and Molecular Neurobiology (3)
BIOL 424 Human Physiology (3)
BIOL 425 Human Genetics (3)
BIOL 427 Developmental Biology (4)
BIOL 428 Biology of Cancer (3)
BIOL 431* Bioinformatics (4)
BIOL 432* Principles of Epidemiology and Environmental Health (3)
BIOL 450 Ichthyology: The Biology of Fishes (4)

REQUIRED SUPPORTING AND OTHER GE COURSES (69-70 units):

1. Chemistry (16 units)
CHEM 121* General Chemistry I (4)
CHEM 122 General Chemistry II (4)
CHEM 311 Organic Chemistry I (3)
CHEM 312 Organic Chemistry I Laboratory (1)
CHEM 314 Organic Chemistry II (3)
CHEM 315 Organic Chemistry II Laboratory (1)
2. Mathematics and Statistics (3-4 units)
Select one of the following:
BIOL 202 Biostatistics (3)
MATH 150* Calculus I (4)
(check with professional schools or pre-professional advisor for specific requirements in this category.)
3. Physics (8 units)
PHYS 100 Introduction to Physics I (4)
PHYS 101 Introduction to Physics II (4)
4. Other GE Courses in Categories A-E (36)
5. American Institutions Requirements (6)

ELECTIVES IN ANY DISCIPLINE (10-11 units)

For Emphasis in Subject Matter Preparation in Teaching Biology:

UPPER DIVISION REQUIREMENTS IN THE MAJOR (36 units):

1. Required Biology Courses (24 units)

- BIOL 300 Cell Biology (4)
- BIOL 302 Genetics (4)
- BIOL 303 Evolutionary Biology (3)
- BIOL 304 Comparative Animal Physiology (3)
- BIOL 335* The Biosphere (3)
- BIOL 433* Ecology and the Environment (4)

AND

A minimum of 2 units taken from the following:

- BIOL 492 Internship (2-3)
- BIOL 494 Independent Research (1-3)
- BIOL 497 Directed Study (1-3)

AND

- BIOL 499 Senior Capstone Colloquium (1)

2. Electives in Biology (12 units)

Select at least three courses from the following list, one of which must be a lab course.

- BIOL 301 Microbiology (4)
- BIOL 310 Animal Biology and Ecology (4)
- BIOL 311 Plant Biology and Ecology (4)
- BIOL 312 Marine Biology (4)
- BIOL 313 Conservation Biology (4)
- BIOL 316 Invertebrate Zoology (4)
- BIOL 317 Parasitology (4)
- BIOL 400 Molecular Biology (4)
- BIOL 401 Biotechnology and Recombinant DNA Techniques (5)
- BIOL 402 Toxicology (3)
- BIOL 420 Cellular and Molecular Immunology (4)
- BIOL 421 Virology (3)
- BIOL 422 Molecular Plant Physiology (4)
- BIOL 423 Cellular and Molecular Neurobiology (3)
- BIOL 424 Human Physiology (3)
- BIOL 425 Human Genetics (3)
- BIOL 427 Developmental Biology (4)
- BIOL 428 Biology of Cancer (3)
- BIOL 431* Bioinformatics (4)
- BIOL 432* Principles of Epidemiology and Environmental Health (3)
- BIOL 450 Ichthyology: The Biology of Fishes (4)

REQUIRED SUPPORTING AND OTHER GE COURSES (76 units):

1. Required Education Course (3 units)

- EDUC 330 Introduction To Secondary Schooling (3)

2. Mathematics and Statistics (7 units)

- BIOL 202 Biostatistics (3)

AND

- MATH 105 Pre-Calculus (4)

Or

- MATH 150* Calculus I (4)

3. Physical Sciences (24 units)

- CHEM 121* General Chemistry I (4)
- CHEM 122 General Chemistry II (4)
- GEOL 121 Physical Geology (4)
- PHYS 100 Introduction to Physics I (4)
- PHYS 101 Introduction to Physics II (4)
- PHYS 105 Introduction to the Solar System (4)

4. Other GE Courses in Categories A-E (36)

5. American Institutions Requirements (6)

(Courses with * are double-counted toward GE credits.)

Summary of Program Requirements for Each of the Emphases

Program	Units in the Major	Units in Free Electives	Units in Supporting/GE Courses	Total
General Biology	45	21-22	53-54	120
Pre-Professional	40	10-11	69-70	120
Pre-Teaching Credential	44		76	120

- (1) All lower-division courses are needed for in-coming freshmen beginning in 2005.
- (2) All upper-division required courses and selective elective courses are needed for transfer students.

COURSE DESCRIPTIONS:

(All courses have been approved for the BS in Biology program.)

BIOL 100 EXPLORING THE LIVING WORLD (4)

Three hours lecture and three hours laboratory per week

An overview of biology from the molecular to the ecosystem level. Topics include the origin, diversity and evolution of life, ecology of populations and communities, the structure and function of plant and animal organ systems, biological molecules, cellular structure/function, genetics and cell division. No credit given toward the major in biology. A lab fee is required.

GenEd: B2

BIOL 170 FOUNDATIONS OF LIFE SCIENCE (4)

Three hours lecture and three hours laboratory per week

This course meets the needs of prospective elementary school teachers. The course will cover a broad spectrum of topics including introduction to scientific inquiry with living organisms, physiology, cell biology, genetics, evolution and ecology. Current issues in biology will also be considered. The laboratories will focus on hands-on activities particularly relevant to elementary school students. No credit given toward the major in Biology. A lab fee is required.

GenEd: B2

BIOL 200 PRINCIPLES OF ORGANISMAL AND POPULATION BIOLOGY (4)

Three hours lecture and three hours laboratory per week

An introduction to organismal biology including the diversity, comparative structure, organ system function, development, phylogeny, taxonomy and systematics of prokaryotes, protists, fungi, plants and animals. Discussion of the principles of evolution including speciation and natural selection, the environmental impact and ecosystem interaction of plants and animals, the behavior of animals, population genetics and population biology. A lab fee is required.

GenEd: B2

BIOL 201 PRINCIPLES OF CELL AND MOLECULAR BIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: CHEM 105 or CHEM 121

This course will cover principles of basic chemistry, biological macromolecules, prokaryotic and eucaryotic cell structure and function, homeostasis, metabolism including both respiration and photosynthesis, cell division, signal transduction, Mendelian genetics, molecular genetics including transcription and translation, and a brief introduction to virology and immunology. The philosophy of science, scientific method and experimental design are foundational to the course. A lab fee is required.

GenEd: B2

BIOL 202 BIOSTATISTICS (3)

Three hours lecture/laboratory per week

Prerequisite: A passing score on the Entry Level Mathematics Exam (ELM) or MATH 105 or equivalent

Critical reasoning using a quantitative and statistical problem-solving approach to solve real-world problems. Uses probability and statistics to describe and analyze biological data collected from laboratory or field experiments. Course will cover descriptions of sample data, probability and empirical data distributions, sampling techniques, estimation and hypothesis testing, ANOVA, and correlation and regression analysis. Students will use standard statistical software to analyze real world and simulated data. Same as MATH 202 and PSY 202

GenEd: B3

BIOL 210 HUMAN ANATOMY AND PHYSIOLOGY I (4)

Three hours lecture and three hours laboratory per week.

Study of gross and microscopic anatomy and physiology of the human body. Topics include homeostasis, cell structure/function, histology, the skeletal system, the muscular system, the digestive system and the nervous and sensory systems. A lab fee is required.

BIOL 211 HUMAN ANATOMY AND PHYSIOLOGY II (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 210

Study of gross and microscopic anatomy and physiology of the human body. Topics include the integumentary system, the endocrine system, the circulatory system, the immune system, the respiratory system, the urinary system and the reproductive system. A lab fee is required.

BIOL 212 NEUROBIOLOGY AND COGNITIVE SCIENCE (3)

Three hours lecture per week

Prerequisite: BIOL 100 or BIOL 200 or BIOL 201

Principles of brain organization and function underlying behavior. Topics include neuroanatomy and physiology of language, vision, sexual behavior, memory and abnormal behavior. Same as PSY 212

GenEd: B2, E

BIOL 213 SEX, GERMS AND DISEASES (3)

Three hours lecture/discussion per week

This is a course to introduce biology of sexually transmitted diseases and their impact on society. It covers reproductive system, factors in the spread of diseases, biology and pathogenesis of infectious agents and sexually transmitted diseases caused by bacteria, viruses, fungi and protozoa. Topics also include impact of current biotechnology in relation to vaccine development, treatment and improved diagnostics of these diseases as well as challenges of these diseases to economy, public health system, individuals, and society at large.

GenEd: B2, E

BIOL 214 FROM EGG TO ORGANISM (3)

Three hours lecture per week

How does a single cell give rise to a complex organism? How are stem cells produced and what are possible uses of stem cell lines? How are clones produced and what are the ethical considerations for cloning human beings? How are test tube babies produced? This course will explore answers to these questions by presenting an overview of developmental biology and then focusing on the impact of biotechnology on humankind. No credit given toward the major in biology.

GenEd: B2

BIOL 215 ANIMAL DIVERSITY (4)

Three hours lecture and three hours laboratory per week

This course will survey the animal kingdom emphasizing the continuity of animal life from simple to more complex body forms and life histories. The diversity of animal life is projected on a framework of basic ecological and evolutionary concepts. Human interactions with animals are explored through management and conservation issues as well as historical examples from the sciences of zoology, classification and evolution. Field trips to selected sites will allow direct examination of local animal diversity. A lab fee is required.

GenEd: B2

BIOL 300 CELL BIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 201 with a grade of C or better, CHEM 122

Detailed study of the organization and functioning of cells and cellular organelles at the cellular and molecular levels, emphasizing experimental approaches and structural and functional relationships and their regulation and control. Topics include macromolecules, membrane phenomena, metabolism, enzyme kinetics, and cellular events associated with excitable cells and tissues. A lab fee is required.

BIOL 301 MICROBIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 201 with a grade of C or better and CHEM 122

Study of microorganisms of the environment, including disease-causing organisms, their structures and functions and their interactions to their host animals and the environment. A lab fee is required.

BIOL 302 GENETICS (4)

Three hours lecture and one hour recitation per week

Prerequisite: BIOL 201 with a grade of C or better and CHEM 122

Principles of classical transmission genetics, population genetics, with an introduction to modern molecular genetics.

BIOL 303 EVOLUTIONARY BIOLOGY (3)

Three hours lecture per week

Prerequisite: BIOL 200 and 201

This course will examine principles of biological evolution. Topics include evolutionary genetics, adaptation and natural selection, the fossil record, speciation and macroevolution.

BIOL 304 COMPARATIVE ANIMAL PHYSIOLOGY (3)

Three hours lecture per week

This course will use a comparative approach to examine physiological principles in a variety of vertebrate and invertebrate animals. Topics include homeostasis, respiration, excretion and physiological adaptations to environmental conditions.

BIOL 310 ANIMAL BIOLOGY AND ECOLOGY (4)

Three hours lecture and three hours laboratory per week

Animal adaptation and diversity and their relationship to the development of evolutionary theory and the environment. Identification of the common invertebrates and vertebrate animals. Field trips to local ecosystems will be taken. A lab fee is required.

BIOL 311 PLANT BIOLOGY AND ECOLOGY (4)

Three hours lecture and three hours laboratory per week

A general introduction to diverse structures and functions of plants and their relationship to the environment. Identification of local native plants and plant communities, uses of native plants by Native Americans, and human and environmental impacts on native plant communities. Field trips to local sites will be taken. A lab fee is required.

BIOL 312 MARINE BIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 200

Overview of the complexity of marine life including marine plants and animals and the processes that underlie their distribution and abundance in open oceans, coastal regions, estuaries and wetlands. Topics included diverse interactions of organisms in the intertidal zone, over the continental shelves and in the open oceans. Field trips to local marine environments will be taken. A lab fee is required.

BIOL 313 CONSERVATION BIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 200

This course explores issues surrounding the conservation of biodiversity. Topics to be covered include: species-, population-, and ecosystem-level issues, biodiversity, extinction, sustained yield, exotic species, and reserve design. Management implications and the ecology of issues are integrated throughout the course. Lab fee required. Same as ESRM 313

BIOL 315 INTRODUCTION TO BIOPHYSICS (3)

Three hours lecture and two hours activity per week

Prerequisite: PHYS 200

Co-requisite: BIOL 300

This course will survey physical methods to the study of biological systems, including transport processes and membrane phenomena, bioelectric phenomena, photosynthetic systems and visual systems. Biophysical methods will include the techniques of patch clamping and optical tweezers, and the measurement of action potentials and evoked responses.

There will be an emphasis on modeling and on problem solving, with appropriate mathematics when necessary. The practical activity session will include computer modeling and simulation, and laboratory demonstrations and exercises. Same as PHYS 315

BIOL 316 INVERTEBRATE ZOOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 200

This course will survey invertebrates from simple, single-celled protists to the most complex of invertebrate animals. Over ninety-five percent of the animals on earth are invertebrates -- animals without backbones. Aspects of the ecology, physiology and evolutionary history of this diverse array of animals will be examined. Human interactions with invertebrates and conservation issues will also be highlighted. Field trips will be required. A lab fee is required.

BIOL 317 PARASITOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 200

This course surveys the diversity of parasitic animals and protists. The parasitic life mode is found in a broad range of animal and protistan phyla, as well as some plant groups. Parasite-host relationships are often tightly co-evolved. Parasites have remarkable and complex adaptations to allow survival and successful reproduction and dispersal. Topics examined will include evolution and life histories of representative parasites, along with medical and epidemiological factors of those that affect humans or domestic animals. A lab fee is required.

BIOL 326 SCIENTIFIC AND PROFESSIONAL ETHICS (3)

Three hours lecture per week

Discussion of ethical issues and societal challenges derived from scientific research and professional activities. Examines the sources, fundamental principles, and applications of ethical behavior; the relationship between personal ethics and social responsibility of organizations; and the stakeholder management concept. Applies ethical principles to different types of organizations: business, non-profits, government, health care, science/technology, and other professional groups. Topics also include integrity of scientific research and literature and responsibilities of scientists to society, intellectual property, ethical practices in professional fields, ethical dilemmas in using animal or human subjects in experimentation, gene cloning, animal cloning, gene manipulation, genetic engineering, genetic counseling, and ethical issues of applying biotechnology in agricultural fields. Emphasizes cases to explore ethical issues. Same as CHEM 326 and MGT 326

GenEd: D

BIOL 331 BIOTECHNOLOGY IN THE TWENTY-FIRST CENTURY (3)

Three hours lecture per week

Presentation of recent advances in biotechnology and discussion of societal implications. Topics include the processes and methods used to manipulate living organisms, or the substances and products from them, for use in medicine, agriculture, food production, gene therapy, forensics and warfare. The social, ethical and political issues raised by modern biotechnology will be discussed. No credit given toward the biology major.

GenEd: B2, D and Interdisciplinary

BIOL 332 CANCER AND SOCIETY (3)

Three hours lecture per week

The underlying molecular causes of cancer, the impact of environmental and genetic factors on cancer causation and prevention, recent advances in diagnosis and treatment of the disease, and the impact that this disease, which will affect one in three adults, has on society. No credit given toward the biology major.

GenEd: B2, D, and Interdisciplinary

BIOL 333 EMERGING PUBLIC HEALTH ISSUES (3)

Three hours lecture per week

Discussion of emerging infectious diseases and other health related issues with global concerns such as AIDS, tuberculosis, sexually transmitted diseases, cardiovascular diseases, animal and bird diseases which may be transmitted to people, food and blood safety issues, environmental public health hazards, immigration and public health issues, potential biological weapons and their impact on human and animal populations in the world and the ecosystem.

GenEd: B2, E and Interdisciplinary

BIOL 334 NATURAL HISTORY OF VENTURA COUNTY (3)

Three hours lecture and three hours laboratory per week

This course will explore the biota and ecosystems of Ventura County. Local ecosystems include chaparral, marine, stream, desert, mountain and island. Topics covered will be classification and diversity of conspicuous regional flora and fauna in the field and laboratory, basic ecological and evolutionary principles of botanical and zoological classification, ecosystem diversity and function. Indigenous cultural and colonial era use of biotic resources, history of scientific exploration of the region, conservation and preservation issues, restoration of natural habitats, adaptation, life history and physiology of resident organisms will also be covered. Field trips will be required.

GenEd: B2 and Interdisciplinary

BIOL 342 THE ZOO: CONSERVATION, EDUCATION AND RECREATION (3)

Three hours lecture per week

An interdisciplinary study of zoos and zoological gardens from scientific, managerial, business, recreational and educational perspectives. Analyzes how these perspectives are linked within zoo practices. The course will include an in-depth case study of a local zoo. Field trips to local zoos will be required. Same as BUS 342, ECON 342 and EDUC 342

GenEd: D and Interdisciplinary

BIOL 400 MOLECULAR BIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 300 or 302 with a grade of C or better

Study of informational macromolecules and how they direct molecular processes in both eukaryotic and prokaryotic cells. Topics include structure, function and regulation of the genetic material at the molecular level, gene organization, structures and functions of DNA, RNA and proteins, gene transcription and expression, RNA processing, genomics and proteomics. A lab fee is required

BIOL 401 BIOTECHNOLOGY AND RECOMBINANT DNA TECHNIQUES (5)

Three hours lecture and six hours laboratory per week

Prerequisite: BIOL 300 and 302 with grades of C or better and CHEM 318 or 400

Theory and practice of various biotechnologies and recombinant DNA techniques applicable to research and development, drug discovery, clinical therapies, preventive medicine, agriculture, the criminal justice system and a variety of other fields. Modern techniques in genomics and proteomics will be introduced in the laboratories. A lab fee is required.

BIOL 402 TOXICOLOGY (3)

Three hours lecture per week

Prerequisite: BIOL 201 with a grade of C or better and CHEM 122

An in depth study of toxic chemicals and their interactions within the ecosystems. Topics include the origin, fate, chemical and biological detection, and quantification of pollutants and toxins and their impact on organisms at the molecular, biochemical, cellular, physiological, organismal, and community levels of organization. Basic toxicology, genetic toxicology, environmental mutagenesis and the molecular basis of mutation induction will be covered.

BIOL 416 RADIOBIOLOGY AND RADIONUCLIDES (3)

Three hours lecture per week

Prerequisite: BIOL 300 and PHYS 201

Topics include: nature and effects of ionizing radiation on biomolecular structures and living cells; applied radiobiology and radionuclides; genetic effects of ionizing radiation and methods of protection and dosimetry. Same as PHYS 416

BIOL 420 CELLULAR AND MOLECULAR IMMUNOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 300 with a grade of C or better and CHEM 122

Study of cellular and molecular aspects of the immune system and its responses against infectious agents and/or environmental insults. Included are development of the organs and cells of the immune system, genetics of the molecules of the immune system and their functions and interactions during an immune response, immunological disorders such as immunodeficiencies, autoimmune diseases, transplantation, and contemporary immunological techniques used in clinical diagnosis and other modern research and development applications. A lab fee is required

BIOL 421 VIROLOGY (3)

Three hours lecture per week

Prerequisite: BIOL 301 with a grade of C or better and CHEM 122

Study of aspects of molecular structure, genetics, and replication of viruses and other sub-viral agents such as prions and viroids, virus-host interactions, pathogenesis of viral infections, diagnostic virology, and antiviral vaccines and drugs; emphasis on human pathogens.

BIOL 422 MOLECULAR PLANT PHYSIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 300 with a grade of C or better and CHEM 318 or 400

Study of principles and methods of plant physiology at the molecular level combined with modern plant technology. Topics include plant tissue and cell culture, genetic engineering and transformation, plant defense, genomics and applications of DNA technology. A lab fee is required.

BIOL 423 CELLULAR AND MOLECULAR NEUROBIOLOGY (3)

Three hours lecture per week

Prerequisite: BIOL 300 with a grade of C or better and CHEM 122

Study of the nervous system at cellular and molecular levels including cellular structure of neurons and their function and interactions, neurotransmitters and their function and regulation, chemical agents and their effects on neuronal cells and normal responses by the cells and the molecules of the nervous system and their responses under adverse conditions.

BIOL 424 HUMAN PHYSIOLOGY (3)

Three hours lecture per week

Prerequisite: BIOL 300 with a grade of C or better and CHEM 122

Study of human physiology at both the cellular and organ system levels including neurophysiology, muscle physiology, cardiovascular physiology, respiration, kidney function, hormone function and reproduction.

BIOL 425 HUMAN GENETICS (3)

Three hours lecture per week

Prerequisite: BIOL 300 and 302 with grades of C or better and CHEM 122

Basic principles of human inheritance, including the transmission of genetic traits, chromosomal abnormalities and their effects, gene structure and function, pedigree analysis, gene mapping, cytogenetics, mutations and mutagenic agents, cancer genetics, molecular analysis of inherited diseases and genetically controlled phenomena in humans.

BIOL 427 DEVELOPMENTAL BIOLOGY (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 300 with a grade of C or better and CHEM 122

This course will use descriptive, experimental and comparative approaches in the study of animal development. Developmental stages including gametogenesis, fertilization, cleavage, gastrulation and organogenesis will be discussed in a variety of animal phyla. The molecular and cellular mechanisms underlying morphogenesis and the evolutionary conservation of developmental mechanisms in various animal phyla will be examined. A lab fee is required.

BIOL 428 BIOLOGY OF CANCER (3)

Three hours lecture per week

Prerequisite: BIOL 300 with a grade of C or better and CHEM 122

Principles of oncology are examined. Included are mechanisms of oncogenesis at cellular and molecular levels, characteristics of cancer, advantages and disadvantages of various therapies of cancer treatment.

BIOL 431 BIOINFORMATICS (4)

Four hours lecture in the lab per week

Prerequisite: BIOL 400 with a grade of C or better and CHEM 318 or 400

The rapid expansion of data acquisition for the human genome and proteome has huge implications for our understanding of the most fundamental processes that direct human life. An understanding of the methodologies used to acquire, store and analyze these data bases is of great value for students choosing to pursue careers in molecular biology, genetics and biotechnology. Topics include: regulating the genome, including epigenetic mechanisms, the human genome project, including the clinical genetics databases, bioinformatics tools and databases, identifying functional and structural sequence elements, analysis of gene expression: microarrays and other tools. A lab fee is required.

GenEd: B2, B4, and Interdisciplinary

BIOL 432 PRINCIPLES OF EPIDEMIOLOGY AND ENVIRONMENTAL HEALTH (3)

Three hours lecture per week

Prerequisite: BIOL 201 with a grade of C or better and CHEM 122

Distribution and dynamics of human health problems and principles and procedures used to determine circumstances under which disease occurs or health prevails and to aid in managing and planning health and environmental systems. The broadened scope of epidemiology is examined through case studies and community and environmental health approach.

GenEd: B2, D and Interdisciplinary

BIOL 433 ECOLOGY AND THE ENVIRONMENT (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 200

Ecological characteristics of natural ecosystems and basic effects of human society upon those systems. Plant and animal distribution patterns in relation to past and present physical and biotic factors. Issues of resource management, population, food production, global environmental problems will also be emphasized to explore future directions. Field trips to local ecosystems will be taken. A lab fee is required.

GenEd: B1, B2 and Interdisciplinary

BIOL 434 INTRODUCTION TO BIOMEDICAL IMAGING (3)

Three hours lecture and two hours lab activity per week

Prerequisite: BIOL 210 or PHYS 200

The course will present an overview of biomedical images and imaging systems. The fundamental concepts used in several imaging modalities (such as projection radiography, mammography, DEXA, computed tomography, ultrasonography and magnetic resonance imaging) will be examined: the emphasis will be on an intuitive and descriptive presentation of the main components of these systems. Image formation and reconstruction will be addressed. The resulting clinical images will be correlated with the underlying structure and function of the organs, and the diagnostic utility and limitations of the images will be considered. Same as HLTH 434 and PHYS 434

GenEd: B2, E and Interdisciplinary

BIOL 450 ICHTHYOLOGY: THE BIOLOGY OF FISHES (4)

Three hours lecture and three hours laboratory per week

Prerequisite: BIOL 200

This course will survey the diversity of living and fossil fishes. Fishes are the largest and most diverse group of vertebrate animals. Aspects of the ecology, physiology and evolutionary history of these animals will be examined. Extensive human interactions with fishes and particularly conservation issues will be highlighted. Emphasis will be placed on the identification and biology of California coastal and inland species. Field trips will be required. A lab fee is required.

BIOL 464 MEDICAL INSTRUMENTATION (4)

Three hours lecture and two hours lab activity per week

Prerequisite: PHYS/BIOL/HLTH 434

The detection, acquisition, processing and display of diagnostic clinical images. The course will concentrate on the fundamentals of the design of the instruments and the use of appropriate reconstruction algorithms in (computed) radiography, (digital) fluoroscopy, computed tomography, ultrasound, magnetic resonance imaging and radionuclide imaging. Activities will include image reconstruction examples, investigation of recent innovations, and two trips to local Radiology departments. Same as PHYS 464

BIOL 490 SPECIAL TOPICS (3)

Three hours seminar per week

Prerequisite: Consent of instructor

In-depth analysis of current topics in biology. Topics vary each semester. Repeatable by topic.

BIOL 491 SPECIAL LABORATORY TOPICS (1-3)

Prerequisite: BIOL 300 with a grade of C or better and CHEM 122

Laboratory study of a selected topic, the title of which is to be specified in advance. Repeatable by topic. A lab fee is required.

BIOL 492 INTERNSHIP (2-3)

Prerequisite: Consent of instructor and program approval

Supervised work and study in work situations involving biological research and technical skills. May involve service learning. All students are required to attend the Biology Program Senior Capstone Colloquium to present their projects. Graded Credit/No Credit

BIOL 494 INDEPENDENT RESEARCH (1-3)

Prerequisite: Consent of instructor and program approval

Laboratory and/or library research that may involve service learning in selected areas of biology conducted under the direction of a faculty member. All students are required to attend the Biology Program Senior Capstone Colloquium to present their projects. Graded Credit/No Credit

BIOL 497 DIRECTED STUDY (1-3)

Consent of instructor and program approval

Reading and library research that may involve service learning in selected areas of biology conducted under the direction of a faculty member. All students are required to attend the Biology Program Senior Capstone Colloquium to present their projects. Graded Credit/No Credit

BIOL 499 SENIOR CAPSTONE COLLOQUIUM (1)

One hour lecture per week

Prerequisite: BIOL 492, 494 or 497

Oral and written presentation of completed or work-in-progress projects of BIOL 492, 494, or 497 courses. Graded Credit/No Credit

- f. List of elective courses, by catalog number, title, and units of credit that can be used to satisfy requirements for the major. Identify those new courses that are (1) needed to initiate the program and (2) needed during the first two years after implementation. Include proposed catalog descriptions of all new courses.**

Identify new courses to initiate the program:

None.

Courses needed for the first two years:

All required lower- and upper-division and selective upper-division elective courses are needed in the first two years of implementation of the program so that students can graduate after two years. All courses have been implemented for the BS degree in Biology.

(Note: With regard to Sections 1e and 1f, a proposed program should take advantage of courses already offered in other departments when subject matter would otherwise overlap or duplicate existing course content.)

g. If any formal options, concentrations, or special emphases are planned under the proposed major, explain fully.

We plan to offer a BA degree in Biology with Emphases in General Biology, Pre-Professional Studies and in Subject Matter Preparation in Teaching Biology. See the above requirements. Students in all emphases are required to take 8 units of lower-division core biology courses. The students enrolled in the General Biology Emphasis will be required to take 37 units of upper-division biology courses in the major. The balance of the 120 units would include free electives, required supporting courses and other GE courses. The students enrolled in the Pre-Professional Studies Emphasis will be required to take 32 units of upper-division biology courses in the major with remaining units in free electives, required supporting courses and other GE courses. The students in Subject Matter Preparation in Teaching Biology Emphasis will be required to take 36 units of upper-division courses in the major, with the remaining units in specified subject matter preparation courses, other required supporting courses and GE courses.

h. Course prerequisites and other criteria for admission of students to the proposed degree major program, and for their continuation in it.

- There is no additional course prerequisite or other criterion from the biology program beyond the standard admission criteria of the university.
- Students seeking admission to the Biology BA degree program must be officially accepted into the CSUCI academic program.
- Students must declare themselves as BA in Biology majors.
- Students must remain in good academic standing throughout the duration of their enrollment in CSUCI.
- Students must complete and fulfill the requirements of the BA degree program within a designated period specified by the university.

i. Explanation of special characteristics of the proposed degree major program, e.g., in terminology, units of credit required, types of course work, etc.

The special characteristics of this program are:

- It takes 120 units to complete, which ensures that full-time students can complete the program in 4 years.
- The program allows students to prepare for a wide range of career pathways after graduation so that they could go to graduate schools, professional schools, single subject teaching credential programs or go into careers in public and private sectors.
- One unique emphasis in the major is the Subject-Matter Preparation in Teaching Biology. We designed this emphasis by using the most up-to-date content standards from the California

Commission on Teaching Credentials. A set of disciplinary and interdisciplinary courses have been proposed and approved last year to support this program. Once again, if students graduating from the BA program do not get into the teaching program, they can still use their BA in biology degree to launch a career path aside from teaching biology in secondary education.

- Aside from the conventional General Biology emphasis, we propose a Pre-Professional Studies emphasis for the major. Like the Subject Matter Preparation in Teaching Biology program, students enrolled in this program, if not admitted into a professional school, could still obtain a solid education in biology with the BA degree and could attain numerous career options after graduation.
- The program contains lower-division core courses, upper-division required and elective courses, service learning component in the form of internship, independent research or directed studies, and capstone courses, which will be useful vehicles to carry out community service activities, and formative and summative outcomes assessment for program improvement and quality assurance.
- On top of the 48 units in the General Education courses and the American Institutions requirements, the General Biology program further provides up to 22 units of free electives to allow students to expand the breadth and depth of their education in the areas of their interests. By combining the supporting courses required of their major, General Education courses and the free elective units, they could easily obtain a major in Biology and a minor in another field.
- All courses to be used to support the BA program are already in place for our approved BS program in Biology.

j. For undergraduate programs, provisions for articulation of the proposed major with community college programs.

- For most of the lower-division courses, we have made articulation agreements with all the community colleges in the region.
- We have also articulated chemistry, physics and mathematics courses with the community colleges.

k. Provision for meeting accreditation requirements, where applicable, and anticipated date of accreditation request.

N/A

2. Need for the Proposed Degree Major Program

The primary distinction between a BA and a BS is that of breadth of experience vs. depth of focus. The traditional Bachelor of Arts degree provides a more broadly based experience in the "liberal arts and sciences" -- a college experience that goes beyond the minimum requirements in Arts and Humanities, as a strong complement to exposure to math and science. The Bachelor of Science degree offers a slightly different label for a degree that is more focused in the sciences and mathematics, with less breadth of experience in other areas. ~~As such a BA in Biology would be appropriate for those intending to become teachers, apply to professional schools or enter the workforce in settings such as field work or pharmaceutical sales.~~

~~Our~~The Bachelor of Arts degree is designed for students seeking a broad foundation in biology as part of a liberal education in the arts and sciences. The BA program provides opportunities for students to explore non-science disciplines and interdisciplinary courses to broaden their scope of education. Provided that careful attention is paid to the requirements for advanced (post-baccalaureate) and professional programs, the B.A. degree is appropriate for those students (1) intending to enter the workforce in settings such as field work, pharmaceutical sales, or a variety of career options, (2) seeking a teaching credential, or (3) preparing for professional schools in dentistry, medicine, optometry, pharmacy or veterinary medicine.

a. List of other California State University campuses currently offering or projecting the proposed degree major program; list of neighboring institutions, public and private, currently offering the proposed degree major program.

- There are several CSU campuses across the state that offer a BA in Biology program, including CSUS, CSUSB, SFSU, SJSU, CSUSM, CSU Sonoma, CSU Stanislaus, CSUN, CSUH. Among the neighboring 4-year comprehensive universities, CSUSB, CSUSM and CSUN, UCSB and UCSC, Pepperdine University and California Lutheran University provide students with a BA degree program in Biology.

b. Differences between the proposed program and programs listed in Section 2a above.

- CSUCI is the only four-year public university in Ventura County that will offer a Bachelors of Art Degree in Biology.
- None of the above universities offers students a BA in Biology with an Emphasis in Subject Matter Preparation in Teaching Biology. Some of the programs do offer courses to pre-credential students. However, they are not incorporated as an emphasis in the BA program. We also provide a pre-professional track in addition to the general biology track. All emphases require students to complete a set of essential biology courses and other supporting math and science courses. Hence, students can obtain a quality baccalaureate education in the life science area that they could always rely and build on even if they do not get into professional schools or teaching credential programs.
- Despite the rigor of the curriculum, our general biology program provides up to 22 units of free electives for students to take courses in their particular interests. This allows further expansion of their breadth and depth in areas beyond the required General Education category of courses. Students could easily complete a major in biology and a minor in a secondary field. If they desire, they could obtain a double major in biology and chemistry without too many additional units.
- It provides a solid one-year core biology courses as the lower-division requirements. The two core courses cover organismal, population, cell and molecular biology, which will introduce students in the major with a comprehensive background in biology. This set of courses will allow assessment activities to evaluate the students and the program as a whole during the initial phase of the four-year program.
- It also contains the most up-to-date essential fields in biology such as Cell Biology, Genetics and Evolution, Ecology, and Molecular Biology as required upper-division courses, which will provide students with a solid, rigorous and comprehensive education in biology. Cell Biology provides the fundamentals of the cell, which is the building block of *all* living organisms. This course is required of all students, including transfer students and is used as a prerequisite course for most of the upper-division biology courses. The course therefore provides a mid-program outcomes assessment venue.
- The lower- and upper-core two-tier organization will allow us to carry out learning community activities as well as outcomes assessment. The service-learning and capstone

courses will be highly useful for summative assessment.

f. Professional uses of the proposed degree major program.

- Students in the major will develop analytical skills and expertise in life sciences, which will allow them to further study or work in such diverse areas as field studies, scientific research, science education, consulting, environmental agencies, governmental agencies, biomedical fields, clinics and laboratories, public health organizations, and the various allied health professions.
- Students can use this degree to apply for and gain acceptance into graduate programs at universities as well as professional schools such as medical, dental, pharmacy, optometry, veterinary, and other medically related professional schools.
- Students can also apply for single subject credential programs to become a secondary education teacher in biology.

g. The expected number of majors in the year of initiation and three years and five years thereafter. The expected number of graduates in the year of initiation and three years and five years thereafter.

The rough estimates for the first year, third year and fifth year enrollment are as follows:
Year 1: 30-40; Year 3: 60-80; Year 5: 100-120.

The expected number of graduates in:
Year 1: 5-10, depending on how many juniors will be admitted the first year;
Year 3: 20-30; Year 5: 60-70

3. Existing Support Resources for the Proposed Degree Major Program

a. Faculty members, with rank, appointment status, highest degree earned, date and field of highest degree, and professional experience (including publications if the proposal is for a graduate degree), who would teach in the program.

Ching-Hua Wang
Professor and Chair of Biology
PhD in Immunology, 1986, Cornell University
MD, 1978, Beijing University Medical Center (Former Beijing Medical University)
CSU professor since 1990
Extensive experience in the areas of immunology, virology, infectious diseases, and microbiology.

Amy Denton
Assistant Professor of Biology
PhD in Botany, 1997, University of Washington
Taught biology courses at University of Alaska from 2000-2003
Extensive experience in the field of molecular biology, plant biotechnology, bioinformatics, molecular evolution, plant biology, comparative genomics, plant molecular systematics, population genetics, biogeography and historical demography.

Nancy Mozingo
Assistant Professor of Biology
PhD in Zoology, 1993, Arizona State University
Taught biology courses at graduate and undergraduate levels at Miami University (Oxford, Ohio) from 1998-2002 before joining the CSUCI faculty.
Extensive experience in the field of developmental/cell biology.

Other CSUCI full-time faculty listed below are also involved in teaching some of the relevant pre- and requisite courses:

Simone Aloisio
Assistant Professor of Chemistry
Ph.D in Chemistry, 2000, Purdue University
Chemistry Professor since 2003
Extensive experience in research and education in chemistry.

Geoff Dougherty
Professor of Physics
PhD in Biophysics, University of Keele, 1979
Professor of Medical Imaging since 1990
Extensive experience in medical imaging, image analysis, and bioengineering.

Philip Hampton
Professor of Chemistry
PhD in Chemistry, 1989, Stanford University
Chemistry Professor since 1991
Extensive experience in research and education in chemistry.

Ivona Grzegorzcyk
Professor of Mathematics
PhD in Mathematics, 1990, UC Berkeley
Mathematics Professor since 1992
Extensive experience in mathematics and its applications and mathematics education.

- The resources supporting the BS in Biology will also support the BA program.

4. Additional Support Resources Required

- b. Any special characteristics of the additional faculty or staff support positions needed to implement the proposed program.**

We are in the process of hiring additional faculty to cover some of the courses for the program, including Comparative Animal Physiology.

- c. The amount of additional lecture and/or laboratory space required to initiate and sustain the program over the next five years. Indicate any additional special facilities that will be required. If the space is under construction, what is the projected occupancy date? If the space is planned, indicate campus-wide priority of the facility, capital outlay program priority, and projected date of occupancy.**

No additional resources needed beyond the existing ones to support the BS program.

- d. Additional library resources needed. Indicate the commitment of the campus to purchase or borrow through interlibrary loan these additional resources.**

CSUCI's acquisition of library resources should be sufficient to meet the needs of the program. The program would greatly benefit if the library purchased the full BIOSIS Databases.

- e. Additional equipment or specialized materials that will be (1) needed to implement the program and (2) needed during the first two years after initiation. Indicate the source of funds and priority to secure these resource needs.**

The expected CSUCI budget, state support and the standard lab fees will be able to cover our normal operational expenses.

5. Abstract of the Proposal and Proposed Catalog Description

Attach an abstract of the foregoing proposal, not to exceed two pages, and a complete proposed catalog description, including admission and degree requirements.

Biology is the study of life, its origins, diversity and intricacies. It emphasizes the relationship between structure and function in living systems and the processes by which organisms grow, reproduce and interact with each other and their environment. The discipline is dynamic and rapidly advancing, particularly in the areas of biotechnology and information technology. The Biology Program provides its students with a strong theoretical foundation in biology, combined with extensive hands-on laboratory experiences using state-of-the-art technology. Students take a series of core courses augmented by upper-division electives selected from areas of special interest.

The Bachelor of Arts degree is designed to obtain a general background in both the concepts and the technical skills of modern biology. Students completing the Bachelor of Arts major will find that their strong general background will allow them flexibility in both completing minor fields of study and career choices. The degree prepares graduates for careers in science education, industry or government.

Degree requirements – see above.