California State University Channel Islands

Program Modification

Program Changes must be submitted by November 5, 2007

Date : Oct. 15, 2007 rev 12.5.07 Program Area: Biology Semester /Year First effected: Fall 2008

Instructions: Please use the following format to modify any existing program.

Enter the latest approved version of your entire program in the left and right boxes below.

Make your deletions in the left hand column by using the strike-out feature of Word or underline what you wish to delete, and highlight.

Amendments to the program (on the right side) also need to be highlight in GREY so they can be identified for approval.

Please align your changes so that they appear side-by-side as much as possible for readability. Thank you.

CURRENTLY APPROVED PROGRAM	PROPOSED PROGRAM	
PROGRAMS OFFERED	PROGRAMS OFFERED	
Bachelor of Science in Biology	Bachelor of Science in Biology	
 Bachelor of Science in Biology with an Emphasis in Biotechnology 	Bachelor of Science in Biology with an Emphasis in Biotechnology	
• Bachelor of Science in Biology with an Emphasis in Cell and Molecular Biology	Bachelor of Science in Biology with an Emphasis in Cell and Molecular Biology	
Bachelor of Science in Biology with an Emphasis in Ecology, Evolution and	Bachelor of Science in Biology with an Emphasis in Clinical Laboratory Science	
Organismal Biology	Bachelor of Science in Biology with an Emphasis in Ecology, Evolution and	
 Bachelor of Science in Biology with an Emphasis in Medical Imaging 	Organismal Biology	
 Bachelor of Arts in Biology with an Emphasis in Ecology, Evolution and 	Bachelor of Science in Biology with an Emphasis in Medical Imaging	
Organismal Biology	Bachelor of Arts in Biology with an Emphasis in Ecology, Evolution and	
 Bachelor of Arts in Biology with an Emphasis in General Biology 	Organismal Biology	
 Bachelor of Arts in Biology with an Emphasis in Pre-Professional Studies 	Bachelor of Arts in Biology with an Emphasis in General Biology	
Bachelor of Arts in Biology with an Emphasis in Subject Matter Preparation in	Bachelor of Arts in Biology with an Emphasis in Pre-Professional Studies	
Teaching Biology	Bachelor of Arts in Biology with an Emphasis in Subject Matter Preparation in	
 Master of Science in Biotechnology and Bioinformatics 	Teaching Biology	
 Master of Science in Biotechnology and Master of Business Administration 	Master of Science in Biotechnology and Bioinformatics	
Minor in Biology	Master of Science in Biotechnology and Master of Business Administration	
Certificate in Biotechnology	Minor in Biology	
Honors in Biology	Certificate in Biotechnology	
	Honors in Biology	
PROGRAM DESCRIPTION		
Biology is the study of life, its origins, diversity and intricacies. It emphasizes the	PROGRAM DESCRIPTION	
relationship between structure and function in living systems and the processes, by	Biology is the study of life, its origins, diversity and intricacies. It emphasizes the	

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 undergraduate and graduate students with a strong theoretical foundation in biology, combined with extensive hands-on laboratory experiences using state-ofthe-art technology. Students take a series of core courses augmented by electives selected from areas of special interest.

CAREERS

The Bachelor of Science in Biology is designed for students who wish to enter medical, dental or other health professional or graduate schools, or to seek careers in business, industry or government.

The Bachelor of Science in Biology with an Emphasis in Biotechnology enables students to make a smooth transition from academia to biotechnology industry by understanding the concepts of basic and applied biotechnology. This program allows students to have numerous career avenues and the groundwork for graduate study.

The Bachelor of Science in Biology with an Emphasis in Cell and Molecular Biology offers students an opportunity to study the exciting developments in genetics, molecular biology, cloning, biotechnology and bioinformatics. This program leads to careers in medical sciences, biotechnology, pharmaceuticals, research and development, intellectual property and patent law.

The Bachelor of Science in Biology with an Emphasis in Ecology, Evolution and Organismal Biology allows students to explore biodiversity at multiple levels of organization, from molecules to the biosphere. Students will gain an understanding of the complex interactions among organisms and between organisms and their physical environments. The emphasis prepares students for environmental studies, conservation, research, or education. It also provides preparation for graduate study in biology.

The Bachelor of Science in Biology with an Emphasis in Medical Imaging prepares students for graduate or professional study in the medical sciences (medical imaging, medical physics, health physics, dosimetry, nuclear medicine, radiotherapy, oncology, biomedical engineering), or for entry into professional positions in the clinical environment and in medical imaging research and development.

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 undergraduate and graduate students with a strong theoretical foundation in biology, combined with extensive hands-on laboratory experiences using state-ofthe-art technology. Students take a series of core courses augmented by electives selected from areas of special interest.

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Bachelor of Science in Biology with an Emphasis in Clinical Laboratory Science prepares students for further clinical training and California License Exam in Clinical Laboratory Science or for training and certification in Public Health Microbiology.

The Bachelor of Science in Biology with an Emphasis in Ecology, Evolution and Organismal Biology allows students to explore biodiversity at multiple levels of organization, from molecules to the biosphere. Students will gain an understanding of the complex interactions among organisms and between organisms and their physical environments. The emphasis prepares students for environmental studies, conservation, research, or education. It also provides preparation for graduate study in biology. 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 medical and other health professions (Emphasis in Pre-Professional Studies), science education (Emphasis in Subject Matter Preparation in Teaching Biology), industry or government (Emphasis in General Biology).

Biology as a discipline has been rapidly advancing in the last decade. With the information derived from the sequencing of the genomes of many organisms, it will have far-reaching impacts on the environment, public health, and on local, regional, and global economies. The Biology Minor allows students in majors other than biology to gain an understanding of these exciting developments. It will provide a solid background in biology and the opportunity to explore selected area(s) at a greater depth. Equipped with a minor in biology, students with a major in other disciplines will have a greater understanding and knowledge of the latest advances in many areas of biology and will therefore be more versatile in their career paths. The requirement for a Minor in Biology is 21 units.

The Certificate in Biotechnology will provide students with advanced knowledge and skills in modern biotechnology that will lead to careers in biotechnology as well as pharmaceutical industries.

PROGRAM LEARNING OUTCOMES

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;
- collect, organize, analyze, interpret and present quantitative and qualitative data and incorporate them into the broader context of biological knowledge;
- effectively apply current technology and scientific methodologies for problem solving;
- find, select and evaluate various types of scientific information including primary research articles, mass media sources and world-wide web information; and

The Bachelor of Science in Biology with an Emphasis in Medical Imaging prepares students for graduate or professional study in the medical sciences (medical imaging, medical physics, health physics, dosimetry, nuclear medicine, radiotherapy, oncology, biomedical engineering), or for entry into professional positions in the clinical environment and in medical imaging research and development.

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 medical and other health professions (Emphasis in Pre-Professional Studies), science education (Emphasis in Subject Matter Preparation in Teaching Biology), industry or government (Emphasis in General Biology).

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PROGRAM LEARNING OUTCOMES

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- 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;

communicate effectively in written and oral forms.	 collect, organize, analyze, interpret and present quantitative and qualitative data and incorporate them into the broader context of biological knowledge;
REOUIREMENTS FOR HONORS IN BIOLOGY	 effectively apply current technology and scientific methodologies for problem
Candidacy for honors in biology is voluntary. To be eligible, a student must fulfill	solving;
the following requirements:	• find, select and evaluate various types of scientific information including primary
1 Achieve a minimum grade point average of 3.5 for all courses satisfying the	research articles, mass media sources and world-wide web information; and
requirements for the major as defined above.	 communicate effectively in written and oral forms.
2 Take at least seven courses in the major at this	•
university;	REQUIREMENTS FOR HONORS IN BIOLOGY
3. Satisfactorily complete a Service Learning course from BIOL 492, 494 or 497;	Candidacy for honors in biology is voluntary. To be eligible, a student must fulfill
4. Satisfactorily complete a Senior Capstone course.	the following requirements:
	1. Achieve a minimum grade point average of 3.5 for all courses satisfying the
Application for candidacy must be made at the beginning of the senior year.	requirements for the major as defined above;
Approval of candidacy and of the Service Learning project and project advisor rests	2. Take at least seven courses in the major at this
with the Biology Program. The project advisor will have the sole responsibility for	university;
acceptance of the completed project.	3. Satisfactorily complete a Service Learning course from BIOL 492, 494 or 497;
1 1 5	4. Satisfactorily complete a Senior Capstone course.
The Biology Program may grant honors to exceptional students who have not met	
the above requirements, but who have in the judgment of the Program brought	Application for candidacy must be made at the beginning of the senior year.
distinction upon themselves and the Program in some other significant and	Approval of candidacy and of the Service Learning project and project advisor rests
appropriate manner.	with the Biology Program. The project advisor will have the sole responsibility for
	acceptance of the completed project.
FACULTY	
Ching-Hua Wang, MD, PhD, Professor and	The Biology Program may grant honors to exceptional students who have not met
Chair, Biology Program	the above requirements, but who have in the judgment of the Program brought
Director of MS in Biotechnology and Bioinformatics	distinction upon themselves and the Program in some other significant and
Phone: (805) 437-8870	appropriate manner.
Email: ching-hua.wang@csuci.edu	
	FACULTY
Amy Denton, PhD, Assistant Professor of Biology	Ching-Hua Wang, MD, PhD, Professor and
Phone: (805) 437-8458	Chair, Biology Program
Email: <u>amy.denton@csuci.edu</u>	Director of MS in Biotechnology and Bioinformatics
	Phone: (805) 437-8870
Geoff Dougherty, PhD, Professor of Physics	Email: <u>ching-hua.wang@csuci.edu</u>
Phone: (805) 437-8990	
Email: geoffrey.dougherty@csuci.edu	Amy Denton, PhD, Assistant Professor of Biology
	Phone: (805) 437-8458
Nancy Mozingo, PhD, Associate Professor of Biology	Email: amv.denton@csuci.edu

Phone: (805) 437-8989	
Email: <u>nancy.mozingo@csuci.edu</u>	Geoff Dougherty, PhD, Professor of Physics
	Phone: (805) 437-8990
Nitika Parmar, PhD, Assistant Professor of Biology	Email: geoffrey.dougherty@csuci.edu
Phone: (805) 437-8873 Email: nitika parmar@cusci.edu	Nancy Mazinga DhD. Associate Professor of Biology
Eman. <u>muka.paimai @cusci.edu</u>	Phone: (805) 437-8989
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http://biology.csuci.edu	
biology@csuci.edu	Nitika Parmar, PhD, Assistant Professor of Biology
	Phone: (805) 437-8873
For graduation roadmaps for the B.S. and B.A. programs in Biology, please visit:	Email: <u>nitika.parmar@cusci.edu</u>
http://biology.csuci.edu.	CONTACT INFORMATION
	http://biology.csuci.edu
	biology@csuci.edu
	For graduation roadmaps for the B.S. and B.A. programs in Biology, please visit:
	http://biology.csuci.edu.
REQUIREMENTS FOR THE BACHELOR OF SCIENCE	REQUIREMENTS FOR THE BACHELOR OF SCIENCE
DEGREE IN BIOLOGY (120 LINITS)	DEGREE IN BIOLOGY (120 UNITS)
Common Lower Division Requirements for All Emphases of the	Common Lower Division Requirements for All Emphases of the
Bachelor of Science Degree in Biology (8 Units)	Bachelor of Science Degree in Biology (8 Units)
BIOL 200* Principles of Organismal and Population Biology, GE-B2 (4) BIOL 201 Principles of Cell & Molecular Biology (4)	BIOL 200* Principles of Organismal and Population Biology, GE-B2 (4) BIOL 201 Principles of Cell & Molecular Biology (4)
BIOL 201 Fillicipies of Cell & Molecular Biology (4)	BIOL 201 Finicipies of Cen & Molecular Biology (4)
FOR BACHELOR OF SCIENCE IN BIOLOGY	FOR BACHELOR OF SCIENCE IN BIOLOGY
Upper Division Requirements in the Major	Upper Division Requirements in the Major
(39 Units)	(39 Units)
1. Required Biology Courses (25 units)	1. Required Biology Courses (25 units)
BIOL 300 Cell Biology (4)	BIOL 300 Cell Biology (4)
BIOL 302 Genetics (4)	BIOL 302 Genetics (4)

BIOL 303 Evolutionary Biology (3)	BIOL 303 Evolutionary Biology (3)
BIOL 304 Comparative Animal Physiology (3)	BIOL 304 Comparative Animal Physiology (3)
BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)
BIOL 433* Ecology and the Environment, GE- B2, UDID (4)	BIOL 433* Ecology and the Environment, GE- B2, UDID (4)
BIOL 499 Senior Capstone in Biology (3)	BIOL 499 Senior Capstone in Biology (3)
2 Electives in Biology (14 units)	2 Electives in Biology (14 units)
Select from the following list of courses one of which must be a lab course	Select a minimum of 14 units of biology courses from 300 and 400 levels, one of
BIOL 301 Microbiology (4)	which must be a lab course. Biology courses numbered from 326 to 345 are
$\frac{\text{DIOL}}{210} = \frac{210}{\text{Vertabrate Biology}} (4)$	which must be a lab course. Blology courses humbered from 520 to 545 are
DIOL 310 Veneblate Diology (4) DIOL 211 Dight Diology and Ecology (4)	counted toward GE creatis only and they are not counted towards the 14 units of
BIOL 311 Plant Biology and Ecology (4)	electives. The joinowing courses can be taken as biology electives. However, no
BIOL 312 Marine Biology (4)	more than 2 units taken from the following can be counted towards the 14 units of
BIOL/ 313 Conservation Biology (4)	electives:
ESRM	BIOL 492 Internship (2-3)
BIOL 316 Invertebrate Zoology (4)	BIOL 494 Independent Research (1-3)
BIOL 317 Parasitology (4)	BIOL 497 Directed Study (1-3)
BIOL 401 Biotechnology and Recombinant DNA Techniques (5)	
BIOL 402 Toxicology (3)	Required Supporting and Other GE Courses
BIOL 403 Foundations of Structural Biology (4)	(73 Units)
BIOL 404 Plant and Animal Tissue Culture (3)	1 Chemistry (16 units)
BIOL 405 Biochemical Engineering (4)	CHEM 121* General Chemistry I GE-B1 (4)
BIOL 406 Evolutionary Biogeography (3)	CHEM 122 General Chemistry II GE-B1 (4)
BIOL 407 Behavioral Ecology (3)	CHEM 211 Organia Chemistry I (2)
BIOL 408 Nanobiotechnology (3)	CHEM 311 Organic Chemistry II (5)
BIOL 420 Cellular & Molecular Immunology (4)	CHEM 312 Organic Chemistry II (2)
$\frac{1}{1} \frac{1}{1} \frac{1}$	CHEM 314 Organic Chemistry II (3) CHEM 215 O i Chemistry II (3)
BIOL 422 Molecular Plant Physiology (4)	CHEM 315 Organic Chemistry II Laboratory (1)
BIOL 423 Cellular & Molecular Neurobiology (3)	(A year-long organic chemistry sequence with laboratory taken at a community
BIOL 424 Human Physiology (3)	college may be accepted for the Biology major in lieu of CHEM 311, 312, 314,
$\frac{\text{BIOL}}{\text{PIOL}} = \frac{424 \text{ Human Genetics (3)}}{425 \text{ Human Genetics (3)}}$	315)
BIOL 427 Developmental Biology (4)	
$\frac{\text{BIOL}}{\text{PIOL}} = \frac{427}{228} \frac{\text{Developmental Biology (4)}}{\text{PIOL}}$	2. Physics (8 units)
$\frac{\text{BIOL}}{\text{A23}} \frac{428}{\text{BIOlogy of Calleer (5)}} = \frac{1}{2} \frac{1}{$	Select either
BIOL 431* Bioinformatics, GE-B2, B4, UDID (4)	PHYS 100 Introduction to Physics I, GE-B1 (4)
BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2,	and
<u>D, UDID (3)</u>	PHYS 101 Introduction to Physics II, GE-B1 (4)
BIOL 450 Ichthyology: The Biology of Fishes (4)	or
BIOL 451 Ornithology (4)	PHYS 200 General Physics I, GE-B1 (4)
	and

No more than 2 units taken from the following:	PHYS 201 General Physics II, GE-B1 (4)	
BIOL 492 Internship (2-3)		
BIOL 494 Independent Research (1-3)	3. Statistics and Mathematics (7 units)	
BIOL 497 Directed Study (1-3)	BIOL 203* Quantitative Methods for Biology GE-B3 B4 (3)	
	MATH 150* Calculus I GE-B3 (4)	
Required Supporting and Other GE Courses		
(73 Unite)	4. Other Required GE Courses in Categories A-E	
(15 Omis)	(36 units)	
1. Chemistry (10 units) CHEM 121* Concrel Chemistry L CE D1 (4)	Category A (9 units) -	
CHEM = 122 Ceneral Chemistry I, CE-B1 (4)	For A3, recommend MATH 230 Logic and Mathematical Reasoning (3)	
CIEW 211 Organia Chemistry I (2)	Category C (12 units)	
CHEM 212 Organic Chemistry II (5)	Category D (12 units)	
CHEM 312 Organic Chemistry I Laboratory (1)	Category E (3 units)	
CHEM 215 Organic Chemistry II chemistry (1)		
(A year long organic chemistry sequence with laboratory taken at a community	5. American Institutions Requirement (6 units)	
(A year-long organic chemistry sequence with laboratory laken at a community college may be accepted for the Pieleon major in light of CHEM 211, 212, 214		
Conege may be accepted for the biology major in tieu of CHEM 511, 512, 514, 215)		
515)		
2. Physics (8 units)		
Select either		
PHYS 100 Introduction to Physics I, GE-B1 (4)		
and		
PHYS 101 Introduction to Physics II, GE-B1 (4)		
or		
PHYS 200 General Physics I, GE-B1 (4)		
and		
PHYS 201 General Physics II, GE-B1 (4)		
3. Statistics and Mathematics (7 units)		
BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3)		
MATH 150* Calculus I, GE-B3 (4)		
4. Other Required GE Courses in Categories A-E		
(36 units)		
Category A (9 units)		
Category C (12 units)		
Category D (12 units)		
Category E (3 units)		

5. American Institutions Requirement (6 units)	
FOR EMPHASIS IN BIOTECHNOLOGY	FOR EMPHASIS IN BIOTECHNOLOGY
Upper Division Requirements in the Major	Upper Division Requirements in the Major
(49 Units)	(49 Units)
1. Required Biology Courses (37 units)	1. Required Biology Courses (37 units)
BIOL 300 Cell Biology (4)	BIOL 300 Cell Biology (4)
BIOL 301 Microbiology (4)	BIOL 301 Microbiology (4)
BIOL 302 Genetics (4)	BIOL 302 Genetics (4)
BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)
BIOL 401 Biotechnology and Recombinant DNA Techniques (5)	BIOL 401 Biotechnology and Recombinant DNA Techniques (5)
BIOL 404 Plant and Animal Tissue Culture (3)	BIOL 404 Plant and Animal Tissue Culture (3)
BIOL 405 Biochemical Engineering (4)	BIOL 405 Biochemical Engineering (4)
BIOL 420 Cellular & Molecular Immunology (4)	BIOL 420 Cellular & Molecular Immunology (4)
BIOL 492 Internship (2-3)	BIOL 492 Internship (2-3)
BIOL 499 Senior Capstone in Biology (3)	BIOL 499 Senior Capstone in Biology (3)
2. Electives in Biology and <u>Physics (12 units)</u>	2. Electives (12 units)
Select from the following list of courses:	Select from the following list of courses:
BIOL/315 Introduction to Biophysics (4)	BIOL/315 Introduction to Biophysics (4)
PHYS	PHYS
BIOL 403 Foundations of Structural Biology (4)	BIOL 403 Foundations of Structural Biology (4)
BIOL 408 Nanobiotechnology (3)	BIOL 408 Nanobiotechnology (3)
BIOL 421 Virology (3)	BIOL 421 Virology (3)
BIOL 422 Molecular Plant Physiology (4)	BIOL 422 Molecular Plant Physiology (4)
BIOL 423 Cellular & Molecular Neurobiology (3)	BIOL 423 Cellular & Molecular Neurobiology (3)
BIOL 424 Human Physiology (3)	BIOL 424 Human Physiology (3)
BIOL 425 Human Genetics (3) BIOL 428 Biology of Cancer (2)	BIOL 425 Human Genetics (3) BIOL 426 Hamatology (4)
BIOL 420 DIOLOgy OF Calleer (3) BIOL 421* Bioinformatics GE B2 B4 UDID (4)	$\frac{\text{DIOL}}{\text{RIOL}} = \frac{420}{28} \frac{\text{Riology}(4)}{\text{Riology}(5)}$
MCT = 471 Division Management (3)	BIOL 420 DIOLOGY OF CALCER (5) BIOL 421* Bioinformatics GE B2 B4 LIDID (4)
BIOL 503 Biotechnology Law and Regulation (3)	MGT 471 Project Management (3)
BIOL 505 BIORCHIOIOgy Law and Regulation (5)	BIOL 503 Biotechnology I aw and Regulation (3)

Required Supporting and Other GE Courses		
(63 Units)	Required Supporting and Other GE Courses	
1 Chamiotry (14 unite)	(63 Units)	
1. Chemistry (14 units) CHEM 121* General Chemistry I GE-B1 (4)	1 Chemistry (14 units)	
CHEM 122 General Chemistry II GE-B1 (4)	CHEM 121* General Chemistry I GE-B1 (4)	
CHEM 311 Organic Chemistry I (3)	CHEM 122 General Chemistry II GE-B1 (4)	
CHEM 318 Biological Chemistry (3)	CHEM 311 Organic Chemistry I (3)	
(An organic chemistry taken at a community college may be accepted for the	CHEM 318 Biological Chemistry (3)	
Biology major in lieu of CHEM 311)	(An organic chemistry taken at a community college may be accepted for the	
	Biology major in lieu of CHEM 311)	
2. Statistics, Mathematics and Computer Applications		
(7 units)	2. Statistics, Mathematics and Computer Applications	
BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3)	(7 units)	
MATH 150* Calculus I, GE-B3 (4)	BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3)	
	MATH 150* Calculus I, GE-B3 (4)	
3. Other Required GE Courses in Categories A-E		
(36 units)	3. Other Required GE Courses in Categories A-E	
Category A (9 units)	(36 units)	
Category C (12 units)	Category A (9 units)-	
Category D (12 units)	For A3, recommend MATH 230 Logic and Mathematical Reasoning (3)	
Category E (3 units)	Category C (12 units)	
	Category D (12 units)	
4. American Institutions Requirement (6 units)	Category E (3 units)	
	4. American Institutions Requirement (6 units)	
FOR EMPHASIS IN CELL AND		
MOLECULAR BIOLOGY	FOR EMPHASIS IN CELL AND MOLECULAR BIOLOGY	
Upper Division Requirements in the Major	Upper Division Requirements in the Major	
(40 Units)	(40 Units)	
1. Required Biology Courses (31 units)	1. Required Biology Courses (31 units)	
BIOL 300 Cell Biology (4)	BIOL 300 Cell Biology (4)	
BIOL 301 Microbiology (4)	BIOL 301 Microbiology (4)	
BIOL 302 Genetics (4)	BIOL 302 Genetics (4)	
BIOL 303 Evolutionary Biology (3)	BIOL 303 Evolutionary Biology (3)	
BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)	

BIOL	401 Biotechnology and Recombinant DNA Techniques (5)	BIOL 401 Biotechnology and Recombinant DNA Techniques (5)
BIOL	431* Bioinformatics, GE-B2, B4, UDID (4)	BIOL 431* Bioinformatics, GE-B2, B4, UDID (4)
BIOL	499 Senior Capstone in Biology (3)	BIOL 499 Senior Capstone in Biology (3)
2. Elective	es in Biology (9 units)	2. Electives in Biology (9 units)
Select f	rom the following list of courses:	Select from the following list of courses:
BIOL	402 Toxicology (3)	BIOL 402 Toxicology (3)
BIOL	403 Foundations of Structural Biology (4)	BIOL 403 Foundations of Structural Biology (4)
BIOL	404 Plant and Animal Tissue Culture (3)	BIOL 404 Plant and Animal Tissue Culture (3)
BIOL	405 Biochemical Engineering (4)	BIOL 405 Biochemical Engineering (4)
BIOL	408 Nanobiotechnology (3)	BIOL 408 Nanobiotechnology (3)
BIOL	416 Radiobiology and Radionuclides (3)	BIOL / 416 Radiobiology and Radionuclides (3)
PHYS		PHYS
BIOL	420 Cellular & Molecular Immunology (4)	BIOL 420 Cellular & Molecular Immunology (4)
BIOL	421 Virology (3)	BIOL 421 Virology (3)
BIOL	422 Molecular Plant Physiology (4)	BIOL 422 Molecular Plant Physiology (4)
BIOL	423 Cellular & Molecular Neurobiology (3)	BIOL 423 Cellular & Molecular Neurobiology (3)
BIOL	424 Human Physiology (3)	BIOL 424 Human Physiology (3)
BIOL	425 Human Genetics (3)	BIOL 425 Human Genetics (3)
BIOL	427 Developmental Biology (4)	BIOL 426 Hematology (4)
BIOL	428 Biology of Cancer (3)	BIOL 427 Developmental Biology (4)
BIOL	432* Principles of Epidemiology and Environmental Health, GE-B2,	BIOL 428 Biology of Cancer (3)
	D, UDID (3)	BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2,
BIOL	433* Ecology and the Environment, GE-B2, UDID (4)	D, UDID (3)
No mo	re than 2 units taken from the following:	BIOL 433* Ecology and the Environment, GE-B2, UDID (4)
BIOL	492 Internship (2-3)	No more than 2 units taken from the following:
BIOL	494 Independent Research (1-3)	BIOL 492 Internship (2-3)
BIOL	497 Directed Study (1-3)	BIOL 494 Independent Research (1-3)
	• • •	BIOL 497 Directed Study (1-3)
Required	Supporting and Other GE Courses	
(72 Units		Required Supporting and Other GE Courses
1 Chemis	y (minimum 15 units)	(72 Units)
CHEM	121* General Chemistry I GE-B1 (4)	1 Chemistry (minimum 15 units)
CHEM	122 General Chemistry II GE-B1 (4)	CHEM 121* General Chemistry I GE-B1 (4)
CHEM	311 Organic Chemistry I (3)	CHEM 122 General Chemistry II GE-B1 (4)
CHEM	312. Organic Chemistry I Laboratory (1)	CHEM 311 Organic Chemistry I (3)
Select	either	CHEM 312 Organic Chemistry I Laboratory (1)
CHEM	318 Biological Chemistry (3)	Select either
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BIOL 302 Genetics (4)
BIOL 303 Evolutionary Biology (3)
BIOL 317 Parasitology (4)
BIOL 318 Medical Mycology (4)
BIOL 420 Cellular and Molecular Immunology (4)
BIOL 421 Virology (3)
BIOL 426 Hematology (4)
BIOL 432* Principles of Epidemiology and Environmental Health, GE-
B2, D, UDID (3)
2. Other Required Courses in Biology (4 - 6 units)
If one chooses to complete CHEM 318 and BIOL 203, one needs to complete a
minimum of 6 units from the following courses. Otherwise, one needs to complete a
minimum of 4 units from the following courses):
BIOL 400 Molecular Biology (4)
BIOL 424 Human Physiology (3)
BIOL 425 Human Genetics (3)
Required Supporting and Other GE Courses (69-71 Units)
1. Chemistry (19 -20 units)
CHEM 121* General Chemistry I. GE-B1 (4)
CHEM 122 General Chemistry II GE-B1 (4)
CHEM 250 Quantitative Analysis (2)
CHEM 251 Quantitative Analysis Laboratory (2)
CHEM 311 Organic Chemistry I (3)
CHEM 312 Organic Chemistry I Laboratory (1)
and
CHEM 318 Biological Chemistry (3)
Or
CHEM 460 Biochemistry I (4)
(An organic chemistry course with laboratory taken with a laboratory at a
community college may be accepted for the Biology major in lieu of CHEM 311 and
312.)
2. Physics (8 units)
PHYS 100 Introduction to Physics I. GE-B1 (4)
PHYS 101 Introduction to Physics II, GE-B1 (4)

	 3. Statistics and Mathematics (3 - 4 units) Select one of the following courses: BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3) MATH 150* Calculus I, GE-B3 (4) 4. Other Required GE Courses in Categories A-E (33 units) Category A (9 units)- For A3, recommend MATH 230 Logic and Mathematical Reasoning (3) Category C (12 units) Category D (9 units) Category E (3 units)
	5. American Institutions Requirement (6)
	(Courses with * are double-counted toward GE credits.)
FOR EMPHASIS IN ECOLOGY, EVOLUTION AND ORGANISMAL BIOLOGY	FOR EMPHASIS IN ECOLOGY, EVOLUTION AND ORGANISMAL BIOLOGY
Upper Division Requirements in the Major (42-44 Units)	Upper Division Requirements in the Major (42-44 Units)
 Required Core Courses (26 units) BIOL 301 Microbiology (4) BIOL 302 Genetics (4) BIOL 303 Evolutionary Biology (3) BIOL 311 Plant Biology and Ecology (4) <i>and</i> BIOL 310 Vertebrate Biology (4) <i>or</i> BIOL 316 Invertebrate Zoology (4) <i>and</i> BIOL 433* Ecology and the Environment, GE- B2, UDID (4) BIOL 499 Senior Capstone in Biology (3) 	 Required Core Courses (26 units) BIOL 301 Microbiology (4) BIOL 302 Genetics (4) BIOL 303 Evolutionary Biology (3) BIOL 311 Plant Biology and Ecology (4) <i>and</i> BIOL 310 Vertebrate Biology (4) <i>or</i> BIOL 316 Invertebrate Zoology (4) <i>and</i> BIOL 433* Ecology and the Environment, GE- B2, UDID (4) BIOL 499 Senior Capstone in Biology (3)
 2. Ecology/Evolution Select two courses from the following list (6-7 units): BIOL/ 313 Conservation Biology (4) 	 2. Ecology/Evolution Select two courses from the following list (6-7 units): BIOL/ 313 Conservation Biology (4)

ESRM	ESRM
ESRM 352 Theory and Practice of Ecological Restoration (3)	ESRM 352 Theory and Practice of Ecological Restoration (3)
BIOL 406 Evolutionary Biogeography (3)	BIOL 406 Evolutionary Biogeography (3)
BIOL 407 Behavioral Ecology (3)	BIOL 407 Behavioral Ecology (3)
3. Organismal Biology	3. Organismal Biology
Select one course from the following list (4 units):	Select one course from the following list (4 units):
BIOL 310 Vertebrate Biology (4) (<i>if not taken as part of core</i>)	BIOL 310 Vertebrate Biology (4) (<i>if not taken as part of core</i>)
BIOL 312 Marine Biology (4)	BIOL 312 Marine Biology (4)
BIOL 316 Invertebrate Zoology (4) (<i>if not taken as part of core</i>)	BIOL 316 Invertebrate Zoology (4) (<i>if not taken as part of core</i>)
BIOL 317 Parasitology (4)	BIOL 317 Parasitology (4)
BIOL 450 Ichthyology: The Biology of Fishes (4)	BIOL 450 Ichthyology: The Biology of Fishes (4)
BIOL 451 Ornithology (4)	BIOL 451 Ornithology (4)
4. Physiology/Developmental/Molecular Biology	4. Physiology/Developmental/Molecular Biology
Select one course from the following list (3-4 units):	Select one course from the following list (3-4 units):
BIOL 300 Cell Biology (4)	BIOL 300 Cell Biology (4)
BIOL 304 Comparative Animal Physiology (3)	BIOL 304 Comparative Animal Physiology (3)
BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)
BIOL 422 Molecular Plant Physiology (4)	BIOL 422 Molecular Plant Physiology (4)
BIOL 427 Developmental Biology (4)	BIOL 427 Developmental Biology (4)
5. Cross-Disciplinary	5. Cross-Disciplinary
Select one course from the following list (3-4 units):	Select one course from the following list (3-4 units):
CHEM 301 Environmental Chemistry (3)	CHEM 301 Environmental Chemistry (3)
GEOL 321 Environmental Geology, GE-B1 (4)	GEOL 321 Environmental Geology, GE-B1 (4)
ESRM 328 Introduction to Geographic Information Systems (3)	ESRM 328 Introduction to Geographic Information Systems (3)
	Loravi 520 maloadedon to Geographic miormaton Systems (5)
Required Supporting and Other GE Courses	Required Supporting and Other GE Courses
(63 Units)	(63 Units)
1. Required Supporting Courses (21 units)	1. Required Supporting Courses (21 units)
CHEM 121* General Chemistry I, GE-B1 (4)	CHEM 121* General Chemistry I, GE-B1 (4)
CHEM 122 General Chemistry II, GE-B1 (4)	CHEM 122 General Chemistry II, GE-B1 (4)
CHEM 311 Organic Chemistry I (3)	CHEM 311 Organic Chemistry I (3)
GEOL 122* Historical Geology, GE-B1 (3)	GEOL 122* Historical Geology, GE-B1 (3)
BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3)	BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3)
MATH 150* Calculus I, GE-B3 (4)	MATH 150* Calculus I, GE-B3 (4)

(An organic chemistry taken at a community college may be accepted for the	(An organic chemistry taken at a community college may be accepted for the
Biology major in lieu of CHEM 311)	Biology major in lieu of CHEM 311)
2. Other Required GE Courses in Categories A-E	2. Other Required GE Courses in Categories A-E
(36 units)	(36 units)
Category A (9 units)	Category A (9 units)-
Category C (12 units)	For A3, recommend MATH 230 Logic and Mathematical Reasoning (3)
Category D (12 units)	Category C (12 units)
Category E (3 units)	Category D (12 units)
	Category E (3 units)
3. American Institutions Requirement (6 units)	
	3. American Institutions Requirement (6 units)
Electives in Any Discipline (4-7 units)	
	Electives in Any Discipline (4-7 units)
FOR EMPHASIS IN MEDICAL IMAGING	FOR EMPHASIS IN MEDICAL IMAGING
Additional Lower Division Requirements	Additional Lower Division Requirements
in the Major (8 Units)	in the Major (8 Units)
BIOL 210 Human Anatomy and Physiology I (4)	BIOL 210 Human Anatomy and Physiology I (4)
BIOL 211 Human Anatomy and Physiology II (4)	BIOL 211 Human Anatomy and Physiology II (4)
Upper Division Requirements in the Major	Upper Division Requirements in the Major
(38 Units)	(38 Units)
1. Required Biology and Physics Courses (30 units)	1. Required Biology and Physics Courses (30 units)
BIOL 300 Cell Biology (4)	BIOL 300 Cell Biology (4)
BIOL 301 Microbiology (4)	BIOL 301 Microbiology (4)
BIOL 302 Genetics (4)	BIOL 302 Genetics (4)
BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)
BIOL/ 416 Radiobiology and Radionuclides (3)	BIOL/ 416 Radiobiology and Radionuclides (3)
PHYS	PHYS
BIOL/ 434* Introduction to Biomedical Imaging,	BIOL/ 434* Introduction to Biomedical Imaging,
HLTH/PHYS GE-B1, E, UDID (4)	HLTH/PHYS GE-B1, E, UDID (4)
BIOL/ 464 Biomedical Instrumentation (4)	BIOL/ 464 Biomedical Instrumentation (4)
PHIS PIOL 400 Series Constants in Pickers (2)	PHIS PIOL 400 Senior Constants in Dielegy (2)
$DIOL \qquad 433 \text{ senior Capstone in Diology (s)}$	DIOL 499 Senior Capsione in Diology (5)

2. Electives	s in Biology and Physics (8 units)	2. Electives	s in Biology and Physics (8 units)
Select fre	om the following list of courses:	Select fre	om the following list of courses:
BIOL/	315 Introduction to Biophysics (4)	BIOL/	315 Introduction to Biophysics (4)
PHYS		PHYS	
BIOL	401 Biotechnology and Recombinant DNA Techniques (5)	BIOL	401 Biotechnology and Recombinant DNA Techniques (5)
BIOL	420 Cellular & Molecular Immunology (4)	BIOL	420 Cellular & Molecular Immunology (4)
BIOL	421 Virology (3)	BIOL	421 Virology (3)
BIOL	423 Cellular & Molecular Neurobiology (3)	BIOL	423 Cellular & Molecular Neurobiology (3)
BIOL	424 Human Physiology (3)	BIOL	424 Human Physiology (3)
BIOL	425 Human Genetics (3)	BIOL	425 Human Genetics (3)
BIOL	427 Developmental Biology (4)	BIOL	427 Developmental Biology (4)
BIOL	428 Biology of Cancer (3)	BIOL	428 Biology of Cancer (3)
BIOL	431* Bioinformatics, GE-B2, B4, UDID (4)	BIOL	431* Bioinformatics, GE-B2, B4, UDID (4)
BIOL	432* Principles of Epidemiology and Environmental Health, GE-B2,	BIOL	432* Principles of Epidemiology and Environmental Health, GE-B2,
	D, UDID (3)		D, UDID (3)
BIOL	433* Ecology and the Environment, GE-B2, UDID (4)	BIOL	433* Ecology and the Environment, GE-B2, UDID (4)
PHYS	445* Image Analysis and Pattern	PHYS	445* Image Analysis and Pattern
COMP/	MATH Recognition, GE-B1, B4, UDID (3)	COMP/	MATH Recognition, GE-B1, B4, UDID (3)
No more	e than 2 units taken from the following:	No more	e than 2 units taken from the following:
PHYS	492 Physics Internship (3)	PHYS	492 Physics Internship (3)
BIOL	494 Independent Research (1-3)	BIOL	494 Independent Research (1-3)
or		or	
PHYS	494 Independent Research (1-3)	PHYS	494 Independent Research (1-3)
BIOL	497 Directed Study (1-3)	BIOL	497 Directed Study (1-3)
or		or	
PHYS	497 Directed Study (1-3)	PHYS	497 Directed Study (1-3)
Required 3	Supporting and Other GE Courses	Required S	Supporting and Other GE Courses
(66 Units)		(66 Units)	
1. Chemist	ry (15 units)	1. Chemist	ry (15 units)
CHEM	121* General Chemistry I, GE-B1 (4)	CHEM	121* General Chemistry I, GE-B1 (4)
CHEM	122 General Chemistry II (4)	CHEM	122 General Chemistry II (4)
CHEM	311 Organic Chemistry I (3)	CHEM	311 Organic Chemistry I (3)
CHEM	312 Organic Chemistry I Laboratory (1)	CHEM	312 Organic Chemistry I Laboratory (1)
CHEM	318 Biological Chemistry (3)	CHEM	318 Biological Chemistry (3)
(An orga	unic chemistry I-equivalent course with laboratory taken at a community	(An orga	nic chemistry I-equivalent course with laboratory taken at a community

college may be accepted for the Biology major in lieu of CHEM 311 and 312.)
2. Mathematics (4 units) MATH 150* Calculus I, GE-B3 (4)
 3. Physics (8 units) Select either PHYS 100 Introduction to Physics I, GE-B1 (4) and PHYS 101 Introduction to Physics II, GE-B1 (4) or PHYS 200 General Physics I, GE-B1 (4) and PHYS 201 General Physics II, GE-B1 (4)
 4. Other Required GE Courses in Categories A-D (33 units) Category A (9 units)- For A3, recommend MATH 230 Logic and Mathematical Reasoning (3) Category C (12 units) Category D (12 units) Category E- covered by a required GE course for the degree program 5. American Institutions Requirement (6 units) (<i>Courses with * are double-counted toward GE credits.</i>)
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, GE-B2 (4) BIOL 201 Principles of Cell and Molecular Biology (4)

FOR EMPHASIS IN ECOLOGY, EVOLUTION AND	FOR EMPHASIS IN ECOLOGY, EVOLUTION AND
ORGANISMAL BIOLOGY	ORGANISMAL BIOLOGY
Upper Division Requirements in the Major	Upper Division Requirements in the Major
(36-38 Units)	(36-38 Units)
 Required Biology Core Courses (26 units)	 Required Biology Core Courses (26 units)
BIOL 301 Microbiology (4)	BIOL 301 Microbiology (4)
BIOL 302 Genetics (4)	BIOL 302 Genetics (4)
BIOL 303 Evolutionary Biology (3)	BIOL 303 Evolutionary Biology (3)
BIOL 311 Plant Biology and Ecology (4)	BIOL 311 Plant Biology and Ecology (4)
BIOL310Vertebrate Biology (4) orBIOL316Invertebrate Zoology (4)	BIOL310Vertebrate Biology (4) orBIOL316Invertebrate Zoology (4)
BIOL433* Ecology and the Environment, GE- B2, UDID (4)BIOL499Senior Capstone (3)	BIOL433* Ecology and the Environment, GE- B2, UDID (4)BIOL499Senior Capstone (3)
 2. Ecology/Evolution	 2. Ecology/Evolution
Select one course from the following list (3-4 units):	Select one course from the following list (3-4 units):
BIOL/ 313 Conservation Biology (4)	BIOL/ 313 Conservation Biology (4)
ESRM	ESRM
BIOL 406 Evolutionary Biogeography (3)	BIOL 406 Evolutionary Biogeography (3)
BIOL 407 Behavioral Ecology (3)	BIOL 407 Behavioral Ecology (3)
 3. Organismal Biology	 3. Organismal Biology
Select one course from the following list (4 units):	Select one course from the following list (4 units):
BIOL 310 Vertebrate Biology (4) (if not taken as part of core)	BIOL 310 Vertebrate Biology (4) (if not taken as part of core)
BIOL 312 Marine Biology (4) BIOL 316 Invertebrate Zoology (4) (if not taken as part of core)	BIOL 312 Marine Biology (4) BIOL 316 Invertebrate Zoology (4) (if not taken as part of core)
BIOL 317 Parasitology (4) BIOL 450 Ichthyology: The Biology of Fishes (4) BIOL 451 Ornithology (4)	BIOL 317 Parasitology (4) BIOL 450 Ichthyology: The Biology of Fishes (4) BIOL 451 Ornithology (4)
 4. Physiology/Developmental/Molecular Biology Select one course from the following list (3-4 units) BIOL 300 Cell Biology (4) BIOL 304 Comparative Animal Physiology (3) 	 4. Physiology/Developmental/Molecular Biology Select one course from the following list (3-4 units) BIOL 300 Cell Biology (4) BIOL 304 Comparative Animal Physiology (3)

BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)
BIOL 422 Molecular Plant Physiology (4)	BIOL 422 Molecular Plant Physiology (4)
BIOL 427 Developmental Biology (4)	BIOL 427 Developmental Biology (4)
Required Supporting and Other GE Courses	Required Supporting and Other GE Courses
(56 Units)	(56 Units)
1. Required Supporting Courses (14 units)	1. Required Supporting Courses (14 units)
CHEM 121* General Chemistry I, GE-B1 (4)	CHEM 121* General Chemistry I, GE-B1 (4)
CHEM 122 General Chemistry II, GE-B2 (4)	CHEM 122 General Chemistry II, GE-B2 (4)
GEOL 122* Historical Geology, GE-B1 (3)	GEOL 122* Historical Geology, GE-B1 (3)
BIOL 203* Quantitative Methods for Biology,	BIOL 203* Quantitative Methods for Biology,
GE-B3, B4 (3)	GE-B3, B4 (3)
2. Other Required GE Courses in Categories A-E	2. Other Required GE Courses in Categories A-E
(36 units)	(36 units)
Category A (9 units)	Category A (9 units)-
Category C (12 units)	For A3, recommend MATH 230 Logic and Mathematical Reasoning (3)
Category D (12 units)	Category C (12 units)
Category E (3 units)	Category D (12 units)
	Category E (3 units)
3. American Institutions Requirement (6 units)	
	3. American Institutions Requirement (6 units)
Electives in Any Discipline (18-20 units)	
	Electives in Any Discipline (18-20 units)
FOR EMPHASIS IN GENERAL BIOLOGY	FOR EMPHASIS IN GENERAL BIOLOGY
Opper Division Requirements in the Major	Upper Division Requirements in the Major
(3/Units)	(37 Units)
1. Required Biology Courses (25 units)	1. Required Biology Courses (25 units)
BIOL 300 Cell Biology (4)	BIOL 300 Cell Biology (4)
BIOL 302 Genetics (4)	BIOL 302 Genetics (4)
BIOL 303 Evolutionary Biology (3)	BIOL 303 Evolutionary Biology (3)
BIOL 304 Comparative Animal Physiology (3)	BIOL 304 Comparative Animal Physiology (3)
BIOL 400 Molecular Biology (4)	BIOL 400 Molecular Biology (4)

BIOI	433* Ecology and the Environment, GE-B2, UDID (4)	BIOL 433* Ecology and the Environment, GE-B2, UDID (4)
BIOL	499 Senior Capstone in Biology (3)	BIOL 499 Senior Capstone in Biology (3)
2. Electi	ves in Biology (12 units)	2. Electives in Biology (12 units)
Select	t at least three courses from the following list, one of which must be a lab	Select a minimum of 12 units of biology courses from 300 and 400 levels, one of
cours	е.	which must be a lab course. Biology courses numbered from 326 to 345 are
BIOI	2 301 Microbiology (4)	counted toward GE credits only and they are not counted towards the 12 units of
BIOI	310 Vertebrate Biology (4)	electives. The following courses can be taken as biology electives. However, no
BIOI	311 Plant Biology and Ecology (4)	more than 2 units taken from the following can be counted towards the 12 units of
BIOI	312 Marine Biology (4)	electives:
BIOI	/ 313 Conservation Biology (4)	No more than 2 units taken from the following:
ESRI	M	BIOL 492 Internship (2-3)
BIOI	316 Invertebrate Zoology (4)	BIOL 494 Independent Research (1-3)
BIOI	317 Parasitology (4)	BIOL 497 Directed Study (1-3)
BIOI	401 Biotechnology and Recombinant DNA Techniques (5)	· · · · · · · · · · · · · · · · · · ·
BIOI	402 Toxicology (3)	Required Supporting and Other GE Courses
BIOI	403 Foundations of Structural Biology (4)	(53-54 Units)
BIOI	404 Plant and Animal Tissue Culture (3)	1 Chemistry (8 units)
BIOI	405 Biochemical Engineering (4)	CHEM 121* General Chemistry I GE-B1 (4)
BIOI	406 Evolutionary Biogeography (3)	CHEM 121 General Chemistry II GE-B1 (4)
BIOI	407 Behavioral Ecology (3)	CTILINI 122 Octorial Chemistry II, OL-DI (4)
BIOL	408 Nanobiotechnology (3)	2 Mathematics and Statistics (3-4 units)
BIOI	420 Cellular & Molecular Immunology (4)	Select one of the following:
BIOL	421 Virology (3)	BIOI 203* Quantitative Methods for Biology GF-B3 B4 (3)
BIOI	422 Molecular Plant Physiology (4)	MATH 105 Pre-Calculus (4)
BIOL	423 Cellular & Molecular Neurobiology (3)	MATH 150* Calculus L GE-B3 (4)
BIOI	424 Human Physiology (3)	MATTI 150 Calculus I, OL D5 (4)
BIOL	425 Human Genetics (3)	3 Other Required GE Courses in Categories A-E (36 units)
BIOL	2 427 Developmental Biology (4)	Category A (9 units) -
BIOI	428 Biology of Cancer (3)	For A3 recommend MATH 230 Logic and Mathematical Reasoning (3)
BIOL	431* Bioinformatics, GE-B2, B4, UDID (4)	Category C (12 units)
BIOL	432* Principles of Epidemiology and Environmental Health, GE-B2,	Category D (12 units)
	<u>D, UDID (3)</u>	Category E (3 units)
BIOL	450 Ichthyology: The Biology of Fishes (4)	
BIOI	451 Ornithology (4)	4 American Institutions Requirements (6 units)
No m	ore than 2 units taken from the following:	
BIOL	492 Internship (2-3)	Electives in Any Discipline (21-22 units)
BIOI	494 Independent Research (1-3)	Licenves in rany Discipline (21-22 units)
	-	

BIOL 497 Directed Study (1-3)	
 Required Supporting and Other GE Courses (53-54 Units) 1. Chemistry (8 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II, GE-B1 (4) 	
 2. Mathematics and Statistics (3-4 units) Select one of the following: BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3) MATH 105 Pre-Calculus (4) MATH 150* Calculus I, GE-B3 (4) 	
 3. Other Required GE Courses in Categories A-E (36 units) Category A (9 units) Category C (12 units) Category D (12 units) Category E (3 units) 	
4. American Institutions Requirements (6 units)	
Electives in Any Discipline (21-22 units)	
FOR EMPHASIS IN PRE-PROFESSIONAL STUDIES	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) <i>Select one of the following:</i> BIOL 303 Evolutionary Biology (3) BIOL 433* Ecology and the Environment, GE-B2, UDID (4) <i>and</i>	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) <i>Select one of the following:</i> BIOL 303 Evolutionary Biology (3) BIOL 433* Ecology and the Environment, GE-B2, UDID (4) <i>and</i> BIOL 499 Senior Capstone in Biology (3)

BIOL 499 Senior Capstone in Biology (3)	
	2. Electives in Biology (10-11 units)
2. Electives in Biology (10-11 units)	Select a minimum of 10-11 units of biology courses from 300 and 400 levels, one
Select at least three courses from the following list, one of which must be a lab	of which must be a lab course. Biology courses numbered from 326 to 345 are
course.	counted toward GE credits only and they are not counted towards the 10-11 units
BIOL 301 Microbiology (4)	of electives. The following courses can be taken as biology electives. However,
BIOL 310 Vertebrate Biology (4)	no more than 2 units taken from the following can be counted towards the 10-11
BIOL 311 Plant Biology and Ecology (4)	units of electives:
BIOL 312 Marine Biology (4)	BIOL 492 Internship (2-3)
BIOL/ 313 Conservation Biology (4)	BIOL 494 Independent Research (1-3)
ESRM	BIOL 497 Directed Study (1-3)
BIOL 316 Invertebrate Zoology (4)	
BIOL 317 Parasitology (4)	Required Supporting and Other GE Courses
BIOL 401 Biotechnology and Recombinant DNA Techniques (5)	(69-70 Units)
BIOL 402 Toxicology (3)	(0) (0) (0) (0) (0) (0) (0) (0) (0) (0) (0)
BIOL 403 Foundations of Structural Biology (4)	CHEM 121* General Chemistry I GE-B1 (1)
BIOL 404 Plant and Animal Tissue Culture (3)	CHEM 121 General Chemistry II GE B1 (4)
BIOL 405 Biochemical Engineering (4)	CHEM 311 Organic Chemistry I (3)
BIOL 406 Evolutionary Biogeography (3)	CHEM 312 Organic Chemistry I (3) CHEM 312 Organic Chemistry I aboratory (1)
BIOL 407 Behavioral Ecology (3)	CHEM 312 Organic Chemistry II (3)
BIOL 408 Nanobiotechnology (3)	CHEM 315 Organic Chemistry II Laboratory (1)
BIOL 420 Cellular & Molecular Immunology (4)	(A year long organic chemistry sequence with laboratory taken at a community
BIOL 421 Virology (3)	(A year-tong organic chemisity sequence with aboratory taken at a community college may be accepted for the Biology major in lieu of CHEM 311, 312, 314
BIOL 422 Molecular Plant Physiology (4)	315)
BIOL 423 Cellular & Molecular Neurobiology (3)	515)
BIOL 424 Human Physiology (3)	2 Mathematics and Statistics (3.4 units)
BIOL 425 Human Genetics (3)	2. Mathematics and Statistics (5-4 diffes) Select one of the following:
BIOL 427 Developmental Biology (4)	BIOI 203* Quantitative Methods for Biology
BIOL 428 Biology of Cancer (3)	$GE_{B3} BA(3)$
BIOL 431* Bioinformatics, GE-B2, B4, UDID (4)	MATH = 150* Calculus I CE-B3 (A)
BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2,	(Check with professional schools or pre-professional advisor for specific
D, UDID (3)	(Check with projessional schools of pre-projessional davisor for specific
BIOL 450 Ichthyology: The Biology of Fishes (4)	requirements in this category.)
BIOL 451 Ornithology (4)	2 Develop (Quante)
No more than 2 units taken from the following:	PHVS 100 Introduction to Physics I GE-B1 (4)
BIOL 492 Internship (2-3)	PHVS 101 Introduction to Physics II GE-B1 (4)
BIOL 494 Independent Research (1-3)	$\frac{11115}{101} \frac{101}{100} 1000000000000000000000000000000000000$
BIOL 497 Directed Study (1-3)	4. Other Required GE Courses in Categories A-E (36 units)

	Category A (9 units) -	
Required Supporting and Other GE Courses	For A3, recommend MATH 230 Logic and Mathematical Reasoning (3)	
(60 70 Unite)	Category C (12 units)	
(09-70 UIIIS)	Category D (12 units)	
CHEM 121* Concel Chamistry I CE D1 (4)	Category E (3 units)	
CHEM 121" General Chemistry I, GE-B1 (4)		
CHEM 122 General Chemistry II GE-B1 (4)	5. American Institutions Requirements (6 units)	
CHEM 311 Organic Chemistry I (5)	······································	
CHEM 312 Organic Chemistry I Laboratory (1)	Electives in Any Discipline (10-11 Units)	
CHEM 314 Olganic Chemistry II Laboratory (1)		
(A year long organic chemistry requires with laboratory taken at a community		
(A year-iong or game chemistry sequence with adoratory taken at a community		
215		
515)		
2 Mathematics and Statistics (3-4 units)		
Select one of the following:		
BIOL 203* Quantitative Methods for Biology		
GF-B3 B4 (3)		
MATH 150* Calculus I GE-B3 (4)		
(Check with professional schools or pre-professional advisor for specific		
reauirements in this category.)		
3. Physics (8 units)		
PHYS 100 Introduction to Physics I, GE-B1 (4)		
PHYS 101 Introduction to Physics II, GE-B1 (4)		
4. Other Required GE Courses in Categories A-E (36 units)		
Category A (9 units)		
Category C (12 units)		
Category D (12 units)		
Category E (3 units)		
5. American Institutions Requirements (6 units)		
Electives in Any Discipline (10-11 Units)		
FOR EMPHASIS IN SUBJECT MATTER PREPARATION IN		

TEACHING BIOLOGY	FOR EMPHASIS IN SUBJECT MATTER PREPARATION IN
	TEACHING BIOLOGY (PENDING CCTC APPROVAL)
Upper Division Requirements in the Major	
(36 Units)	Upper Division Requirements in the Major
1. Required Biology Courses (24 units)	(36 Units)
BIOL 300 Cell Biology (4)	1. Required Biology Courses (24 units)
BIOL 302 Genetics (4)	BIOL 300 Cell Biology (4)
BIOL 303 Evolutionary Biology (3)	BIOL 302 Genetics (4)
BIOL 304 Comparative Animal Physiology (3)	BIOL 303 Evolutionary Biology (3)
BIOL 335* The Biosphere, GE-B2, UDID (3)	BIOL 304 Comparative Animal Physiology (3)
BIOL 433* Ecology and the Environment, GE-B2, UDID (4)	BIOL 335* The Biosphere, GE-B2, UDID (3)
BIOL 499 Senior Capstone in Biology(3)	BIOL 433* Ecology and the Environment, GE-B2, UDID (4)
	BIOL 499 Senior Capstone in Biology(3)
2. Electives in Biology (12 units)	
<u>Select at least three courses from the following list, one of which must be a lab</u>	2. Electives in Biology (12 units)
<u>course.</u>	Select a minimum of 12 units of biology courses from 300 and 400 levels, one
BIOL <u>301</u> Microbiology (4)	of which must be a lab course. Biology courses numbered from 326 to 345, with
BIOL 310 Vertebrate Biology (4)	the exception of BIOL 335 for this emphasis, are counted toward GE credits only
BIOL 311 Plant Biology and Ecology (4)	and they are not counted towards the 12 units of electives. The following courses
BIOL 312 Marine Biology (4)	can be taken as biology electives. However, no more than 2 units taken from the
BIOL/ 313 Conservation Biology (4)	following can be counted towards the 12 units of electives:
ESRM	BIOL 492 Internship (2-3)
BIOL <u>316</u> Invertebrate Zoology (4)	BIOL 494 Independent Research (1-3)
BIOL 317 Parasitology (4)	BIOL 497 Directed Study (1-3)
BIOL 400 Molecular Biology (4)	
BIOL 401 Biotechnology and Recombinant DNA Techniques (5)	Required Supporting and Other GE Courses (76 units)
$\frac{\text{BIOL}}{2} = \frac{402}{10 \times 10^{-5}} \frac{100}{100} 1$	1. Required Education Course (3 units)
BIOL 403 Foundations of Structural Biology (4)	EDUC 330* Introduction to Secondary Schooling, GE-D, UDID (3)
BIOL 404 Plant and Animal Tissue Culture (3)	
BIOL 405 Biocnemical Engineering (4)	2. Mathematics and Statistics (7 units)
BIOL 400 Evolutionary Biogeography (5) BIOL 407 Dehavioral Evolution (2)	BIOL 203* Quantitative Methods for Biology, GE-B3, B4 (3)
$\frac{BIOL}{407} = \frac{407}{Benavioral Ecology} (2)$	and
BIOL 408 Nationolociecitiology (5) BIOL 420. Cellular & Molecular Immunology (4)	MATH 105 Pre-Calculus (4)
BIOL 420 Centular & Molecular Immunology (4) BIOL 421 Virology (2)	or
$\frac{DOL}{421} + \frac{421}{1000gy} (5)$ BIOL 422 Molecular Plant Physiology (4)	MATH 150* Calculus I, GE-B3 (4)
BIOL 422 Molecular Franci Hystology (4) BIOL 423 Callular & Molecular Neurobiology (3)	
BIOL 425 Centulai & Moleculai Neurobiology (5) BIOL 424 Human Physiology (3)	3. Physical Sciences (24 units)
10L +24 Human Hystology (3)	

BIOL 425 Human Genetics (3)	CHEM 121* General Chemistry I. GE-B1 (4)
BIOL 427 Developmental Biology (4)	CHEM 122 General Chemistry II, GE-B1 (4)
BIOL 428 Biology of Cancer (3)	GEOL 121 Physical Geology (4)
BIOL 431* Bioinformatics, GE-B2, B4, UDID (4)	PHYS 100 Introduction to Physics I. GE-B1 (4)
BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2.	PHYS 101 Introduction to Physics II. GE-B1 (4)
D, UDID (3)	PHYS/ 105 Introduction to the Solar System, GE-
BIOL 450 Ichthyology: The Biology of Fishes (4)	ASTR B1 (4)
BIOL 451 Ornithology (4)	
No more than 2 units taken from the following:	
BIOL 492 Internship (2-3)	4. Other Required GE Courses in Categories A-E (36 units)
BIOL 494 Independent Research (1-3)	Category A (9 units) -
BIOL 497 Directed Study (1-3)	For A3, recommend MATH 230 Logic and Mathematical Reasoning (3)
	Category C (12 units)
Required Supporting and Other GE Courses	Category D (12 units)
(76 units)	Category E (3 units)
1 Required Education Course (3 units)	
EDLIC 330* Introduction to Secondary Schooling GE-D LIDID (3)	5. American Institutions Requirements (6 units)
EDGC 550 Indoduction to Secondary Schooling, GL-D, ODID (5)	
2 Mathematics and Statistics (7 units)	(Courses with * are double-counted toward GE credits.)
BIOL 203* Quantitative Methods for Biology GE-B3 B4 (3)	
and	
MATH 105 Pre-Calculus (4)	
or	
MATH 150* Calculus I GE-B3 (4)	
3. Physical Sciences (24 units)	
CHEM 121* General Chemistry I. GE-B1 (4)	
CHEM 122 General Chemistry II, GE-B1 (4)	
GEOL 121 Physical Geology (4)	
PHYS 100 Introduction to Physics I. GE-B1 (4)	
PHYS 101 Introduction to Physics II. GE-B1 (4)	
PHYS/ 105 Introduction to the Solar System. GE-	
ASTR B1 (4)	
4. Other Required GE Courses in Categories A-E (36 units)	
Category A (9 units)	
Category C (12 units)	

Category D (12 units) Category E (3 units)

5. American Institutions Requirements (6 units)

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

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOTECHNOLOGY & BIOINFORMATICS (33-34 UNITS)

PROGRAM DESCRIPTION

The Master of Science in Biotechnology and Bioinformatics is a professional degree program designed to meet the needs of biotechnology industry and related public and private agencies and organizations. The program combines rigorous scientific training in interdisciplinary areas in biotechnology and bioinformatics with course work and experience in business management and regulatory affairs. The program includes a set of core courses with two emphases to choose from: biotechnology and bioinformatics, and several elective courses.

Biotechnology is centered in the laboratory and employs sophisticated molecular biology techniques for applications in human and animal health, agriculture, environment, and specialty biochemical manufacturing. In the next century, the major driving force for biotechnology will be the strategic use of the data derived from large-scale genome sequencing projects. Bioinformatics turns raw data from genome sequencing and new experimental methodologies such as microarrays and proteomics into useful and accessible information about gene function, protein structure, molecular evolution, drug targets and disease mechanisms using computational analyses, statistics, and pattern recognition. Our approach also includes team projects drawn from biotechnology industries to focus on real-world problems and applications of biological and computational sciences and to inculcate interpersonal as well as problem-solving skills using multiple perspectives.

Graduates from this program will develop analytical, managerial and interpersonal skills along with sophisticated expertise in biotechnology and bioinformatics. They will be ready to make immediate contributions to scientific research and development, management in biotechnological, biomedical and pharmaceutical industries, biotechnology law and regulations, governmental or environmental

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOTECHNOLOGY & BIOINFORMATICS (33-34 UNITS)

PROGRAM DESCRIPTION

The Master of Science in Biotechnology and Bioinformatics is a professional degree program designed to meet the needs of biotechnology industry and related public and private agencies and organizations. The program combines rigorous scientific training in interdisciplinary areas in biotechnology and bioinformatics with course work and experience in business management and regulatory affairs. The program includes a set of core courses with two emphases to choose from: biotechnology and bioinformatics, and several elective courses.

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Graduates from this program will develop analytical, managerial and interpersonal skills along with sophisticated expertise in biotechnology and bioinformatics. They will be ready to make immediate contributions to scientific research and

agencies, research institutes, consulting firms, research and clinical laboratories, private and public health organizations, or education.

ADMISSION REQUIREMENTS

- 1. Applicants must have a BS/BA degree in Biology, Computer Science, Chemistry, Biochemistry, or Mathematics. Alternatively, applicants with a BA/BS degree in any field and equivalent work experiences in one of the above fields may be granted conditional admission, and they must fulfill all conditional requirements before they can be fully classified.
- 2. Applicants seeking admission to the professional MS in Biotechnology and Bioinformatics program must be officially accepted into the CSUCI academic program.
- 3. Applicants must declare themselves as graduate students in the professional MS degree program in Biotechnology and Bioinformatics.
- 4. Applicants will be evaluated by the program admissions committee which will consider the applicants in the context of the total applicant pool using our general admission standards. The following materials are required for our evaluation and admission process:
 - Applicants must submit their transcript from their undergraduate institution, Graduate Record Examinations (GRE) General Test scores or the Medical College Admission Test (MCAT) scores.
 - Applicants who have received their undergraduate degrees from a university where English is not the language of instruction, or have studied fewer than two years at a university where instruction is in English, must submit their Test of English as a Foreign Language (TOEFL) scores for evaluation.
 - Applicants must submit a one page "Statement of Purpose" and two letters of recommendations from people able to judge the applicant's capacity for both academic and professional success.

DEGREE REQUIREMENTS

Common Core Courses (16 units)

- BINF 500 DNA & Protein Sequence Analysis (3)
- BIOL 502 Techniques in Genomics & Proteomics (2)
- BIOL 503 Biotechnology Law and Regulation (3)
- MGT 471 Project Management (3)
- BIOL 600 Team Project (4)
- BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)

development, management in biotechnological, biomedical and pharmaceutical industries, biotechnology law and regulations, governmental or environmental agencies, research institutes, consulting firms, research and clinical laboratories, private and public health organizations, or education.

ADMISSION REQUIREMENTS

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DEGREE REQUIREMENTS

Common Core Courses (16 units)

- BINF 500 DNA & Protein Sequence Analysis (3)
- BIOL 502 Techniques in Genomics & Proteomics (2)
- BIOL 503 Biotechnology Law and Regulation (3)
- MGT 471 Project Management (3) BIOL 600 Team Project (4)

FOR BIOTECHNOLOGY EMPHASIS (17 UNITS)	BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)
Paguirad Courses (7 unite)	FOR BIOTECHNOLOGY EMPHASIS (17 UNITS)
Nequired Courses (7 units)	
BIOL 504 Molecular Cell Blology (5) DIOL 505 Molecular Structure (4)	Pequired Courses (7 units)
BIOL 505 Molecular Structure (4)	PIOL 504 Molecular Coll Piology (2)
Electives (10 units)	BIOL 505 Molecular Structure (4)
A minimum of 10 units chosen from the following courses and/or from the	
alasting courses under the Disinformation Frunchasian	Electives (10 units)
elective courses under the Bioinformatics Emphasis:	A minimum of 10 units chosen from the following courses and/or from the
BIOL 506 Molecular Evolution (4)	elective courses under the Dicinformatics Emphasics
BIOL 50/ Pharmacogenomics and Pharmacoproteomics (3)	Plot 500 M 1 1 F 1 i (1)
BIOL 508 Advanced Immunology (4)	BIOL 506 Molecular Evolution (4)
BIOL 509 Plant Biotechnology (4)	BIOL 507 Pharmacogenomics and Pharmacoproteomics (3)
MG1 421 Human Resource Management (3)	BIOL 508 Advanced Immunology (4)
BIOL 490 Special Topics (1-3)	BIOL 509 Plant Biotechnology (4)
	BIOL 510 Tissue Culture Techniques and Stem Cell Technology (3)
FOR BIOINFORMATICS EMPHASIS (18 UNITS)	MG1 421 Human Resource Management (5)
	BIOL 490 Special Topics (1-5)
Required Courses (12 units)	
BINF 501 Biological Informatics (3)	FOR BIOINFORMATICS EMPHASIS (18 UNITS)
BINF 510 Database Systems for Bioinformatics (3)	
BINF 511 Computational Genomics (3)	Required Courses (12 units)
BINF 513 Programming for Bioinformatics (3)	BINF 501 Biological Informatics (3)
	BINF 510 Database Systems for Bioinformatics (3)
Electives (6 units)	BINF 511 Computational Genomics (3)
A minimum of two courses chosen from the following and/or from the elective	BINF 513 Programming for Bioinformatics (3)
courses under the Biotechnology Emphasis, with at least one course in the BINF	
category:	Electives (6 units)
BINF 512 Algorithms for Bioinformatics (3)	A minimum of two courses chosen from the following and/or from the elective
BINF 514 Statistical Methods in Computational Biology (3)	courses under the Biotechnology Emphasis, with at least one course in the BINF
PHYS 445 Image Analysis & Pattern Recognition (3)	category:
COMP/MATH GE-B1, B4, UDID (3)	BINF 512 Algorithms for Bioinformatics (3)
MGT 421 Human Resource Management (3)	BINF 514 Statistical Methods in Computational Biology (3)
BIOL 490 Special Topics (1-3)	PHYS 445 Image Analysis & Pattern Recognition (3)
	COMP/MATH GE-B1, B4, UDID (3)
	MGT 421 Human Resource Management (3)
	BIOL 490 Special Topics (1-3)

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOTECHNOLOGY AND MASTER OF BUSINESS ADMINISTRATION (71 UNITS*)

*Assumes that at least one set of the Foundation Courses listed below has been completed in a business or science undergraduate degree program.

PROGRAM DESCRIPTION

The Master of Science in Biotechnology and Master of Business Administration is a dual professional degree program designed to meet the needs of biotechnology industry and related public and private agencies and organizations. The program combines rigorous scientific training in biotechnology with graduate course work and experience in business management and regulatory affairs. The program includes the foundation courses for the dual degree program, a set of graduate level core courses in both biotechnology and business, and several elective courses.

Our approach includes team projects drawn from biotechnology industries to focus on real-world problems and applications of biological sciences and business. We approach interpersonal skills and problem-solving skills from multiple perspectives.

ADMISSION REQUIREMENTS

- Applicants must have a BS/BA. degree in Biology, Chemistry, Biochemistry, or Business/ Economics related discipline. Alternatively, applicants with a BA/BS degree in any field and equivalent work experiences in one of the above fields may be admitted and must fulfill the foundation course requirements before taking the core courses and electives in the degree program.
- 2. Applicants seeking admission to the dual degree program must be officially accepted into CSUCI as graduate students.
- 3. Applicants must declare themselves as graduate students in the dual degree program.
- 4. Applicants will be evaluated by the program admissions committee which will consider the applicants in the context of the total applicant pool using our general admission standards. The following materials are required for our evaluation and admission process:
 - Applicants must submit their transcript(s) from their undergraduate institution(s) and Graduate Record Examinations (GRE) General Test scores.
 - · Applicants who have received their undergraduate degrees from a university

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOTECHNOLOGY AND MASTER OF BUSINESS ADMINISTRATION (71 UNITS*)

*Assumes that at least one set of the Foundation Courses listed below has been completed in a business or science undergraduate degree program.

PROGRAM DESCRIPTION

The Master of Science in Biotechnology and Master of Business Administration is a dual professional degree program designed to meet the needs of biotechnology industry and related public and private agencies and organizations. The program combines rigorous scientific training in biotechnology with graduate course work and experience in business management and regulatory affairs. The program includes the foundation courses for the dual degree program, a set of graduate level core courses in both biotechnology and business, and several elective courses.

Our approach includes team projects drawn from biotechnology industries to focus on real-world problems and applications of biological sciences and business. We approach interpersonal skills and problem-solving skills from multiple perspectives.

ADMISSION REQUIREMENTS

- 1. Applicants must have a BS/BA. degree in Biology, Chemistry, Biochemistry, or Business/ Economics related discipline. Alternatively, applicants with a BA/BS degree in any field and equivalent work experiences in one of the above fields may be admitted and must fulfill the foundation course requirements before taking the core courses and electives in the degree program.
- 2. Applicants seeking admission to the dual degree program must be officially accepted into CSUCI as graduate students.
- 3. Applicants must declare themselves as graduate students in the dual degree program.
- 4. Applicants will be evaluated by the program admissions committee which will consider the applicants in the context of the total applicant pool using our general admission standards. The following materials are required for our evaluation and admission process:
 - Applicants must submit their transcript(s) from their undergraduate

DEGREE REQUIREMENTS	academic and professional success.		
Required Foundation Courses (16 Units)	DEGREE REQUIREMENTS		
1. Required Foundation Courses in Biology and Chemistry for students without a B.S. in Biology or Chemistry (16 units)	Required Foundation Courses (16 Units)		
CHEM 110 Chemistry of Life (4)	1 Required Foundation Courses in Biology and Chemistry for students without a		
BIOL 201 Principles of Cell and Molecular Biology (4)	B S in Biology or Chemistry (16 units)		
BIOL 300 Cell Biology (4)	CHEM 110 Chemistry of Life (4)		
BIOL 400 Molecular Biology (4)	BIOL 201 Principles of Cell and Molecular Biology (4)		
	BIOL 300 Cell Biology (4)		
2. Required Foundation Courses in Business/Economics for students without a	BIOL 400 Molecular Biology (4)		
BS/BA in Business or Economics or a related discipline (16 units)			
BUS 500 Economics for Managers (3)	2. Required Foundation Courses in Business/Economics for students without a		
BUS 502 Quantitative Methods for Decision-Making (3)	BS/BA in Business or Economics or a related discipline (16 units)		
BUS 504 Introduction to Accounting and Finance (4)	BUS 500 Economics for Managers (3)		
BUS 506 Principles of Management and Marketing (3)	BUS 502 Quantitative Methods for Decision-Making (3)		
BUS 508 Business Ethics and Law (3)	BUS 504 Introduction to Accounting and Finance (4)		
	BUS 506 Principles of Management and Marketing (3)		
CORE COURSES	BUS 508 Business Ethics and Law (3)		
Common Required Courses in the Dual Degree Program (9 Units)			
MGT 471 Project Management (3)	CORE COURSES		
BIOL/ 610 Capstone Project for MS/MBA Dual	Common Required Courses in the Dual Degree Program (9 Units)		
BUS Degree (6)	MGT 471 Project Management (3)		
	BIOL/ 610 Capstone Project for MS/MBA Dual		
Required Courses in the Master of Science in Biotechnology (22 Units)	BUS Degree (6)		
1 Derwined Core Courses (15 unite)	Derwined Courses in the Master of Science in Distachards (22 U-it)		
1. Required Core Courses (15 units) DIME 500 DNA & Drotain Seguence Analysis (2)	required Courses in the Master of Science in Diotechnology (22 Units)		
BINF 500 DINA & Protein Sequence Analysis (3) PIOL 502 Techniques in Commiss/Proteomics (2)	1 Beginized Corres Courses (15 unite)		
DIOL 502 rechniques in Genomics/Proteomics (2)	1. Required Core Courses (15 units)		

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institution(s) and Graduate Record Examinations (GRE) General Test scores.

Applicants who have received their undergraduate degrees from a university

where English is not the language of instruction, or have studied fewer than

two years at a university where instruction is in English, must submit their

• Applicants must submit a one page "Statement of Purpose" and two letters of

recommendations from people able to judge the applicant's capacity for both

Test of English as a Foreign Language (TOEFL) scores.

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• Applicants must submit a one page "Statement of Purpose" and two letters of

recommendations from people able to judge the applicant's capacity for both

Test of English as a Foreign Language (TOEFL) scores.

academic and professional success.

BIOL 503 Biotechnology Law and Regulation (3)	BINF 500 DNA & Protein Sequence Analysis (3)		
BIOL 504 Molecular Cell Biology (3)	BIOL 502 Techniques in Genomics/Proteomics (2)		
BIOL 510 Tissue Culture Techniques and Stem Cell Technology (3)	BIOL 503 Biotechnology Law and Regulation (3)		
BIOL 601 Seminar in Biotechnology and Bioinformatics (1)	BIOL 504 Molecular Cell Biology (3)		
	BIOL 510 Tissue Culture Techniques and Stem Cell Technology (3)		
2. Elective Courses (7 units)	BIOL 601 Seminar in Biotechnology and Bioinformatics (1)		
A minimum of seven units from the following courses:			
BIOL 505 Molecular Structure (4)	2. Elective Courses (7 units)		
BIOL 507 Pharmacogenomics and Pharmacoproteomics (3)	A minimum of seven units from the following courses:		
BIOL 508 Advanced Immunology (4)	BIOL 505 Molecular Structure (4)		
BIOL 509 Plant Biotechnology (4)	BIOL 507 Pharmacogenomics and Pharmacoproteomics (3)		
	BIOL 508 Advanced Immunology (4)		
Required Courses in the Master of Business Administration (24 Units)	BIOL 509 Plant Biotechnology (4)		
1. Required Core Courses (18 units)	Required Courses in the Master of Business Administration (24 Units)		
BUS 510 High Performance Management (3)			
BUS 520 Strategy and Leadership (3)	1. Required Core Courses (18 units)		
BUS 530 Managing Business Operations (3)	BUS 510 High Performance Management (3)		
BUS 540 Financial Reporting and Analysis (3)	BUS 520 Strategy and Leadership (3)		
BUS 550 The Contemporary Firm (3)	BUS 530 Managing Business Operations (3)		
BUS 560 The Entrepreneurial Manager (3)	BUS 540 Financial Reporting and Analysis (3)		
	BUS 550 The Contemporary Firm (3)		
2. Elective Courses (6 units)	BUS 560 The Entrepreneurial Manager (3)		
Double-counted courses:			
BINF 500 DNA & Protein Sequence Analysis (3)	2. Elective Courses (6 units)		
BIOL 503 Biotechnology Law and Regulation (3)	Double-counted courses:		
	BINF 500 DNA & Protein Sequence Analysis (3)		
	BIOL 503 Biotechnology Law and Regulation (3)		
REQUIREMENTS FOR THE			
MINOR IN BIOLOGY (21 LINITS)			
	REOUIREMENTS FOR THE		
	MINOR IN BIOLOGY (21 UNITS)		
LOWER DIVISION REQUIREMENTS (8 UNITS)			
BIOL 200* Principles of Organismal and			
Population Biology, GE-B2 (4)	LOWER DIVISION REQUIREMENTS (8 UNITS)		
BIOL 201 Principles of Cell and Molecular	BIOL 200* Principles of Organismal and		
Biology, GE-B2 (4)	Population Biology, GE-B2 (4)		
	BIOL 201 Principles of Cell and Molecular		

UPPER DIVISION REQUIREMENTS (13 UNITS)	Biology, GE-B2 (4)	
1. Biology (8 units)		
BIOL 300 Cell Biology (4)	UPPER DIVISION REQUIREMENTS (13 UNITS)	
BIOL 302 Genetics (4)	1. Biology (8 units) $P(O_1 = 200, C_2 \parallel P(z) = 1 + z_2 \cdot (4)$	
2 Piology Electives (5 units)	BIOL 300 Cell Biology (4) BIOL 302 Consticut (4)	
2. Diology Electives (5 units) A minimum of 5 units of 300 400 level biology courses, with no more than one	BIOL 302 Geneucs (4)	
course selected from BIOL 331-345	2 Biology Electives (5 units)	
	A minimum of 5 units of 300-400 level biology courses, with no more than one	
	course selected from BIOL 331-345.	
REOUIREMENTS FOR THE CERTIFICATE		
IN BIOTECHNOLOGY (25-27 UNITS)		
	- REQUIREMENTS FOR THE CERTIFICATE	
(For students with a P S degree in biology pursuing a cartificate in biotechnology)	IN BIOTECHNOLOGY (25-27 UNITS)	
(For students with a B.S. degree in biology pursuing a certificate in biolectinology)		
1. B.S. degree in biology (may be concurrent):	(For students with a B.S. degree in biology pursuing a certificate in biotechnology)	
2. Completion of the following courses with C or better grades (16-17 units):	1. B.S. degree in biology (may be concurrent);	
BIOL 401 Biotechnology and Recombinant DNA Techniques (5)		
BIOL 420 Cellular & Molecular Immunology (4)	2. Completion of the following courses with C or better grades (16-17 units):	
BIOL 431 Bioinformatics (4)	BIOL 401 Biotechnology and Recombinant DNA Techniques (5)	
CHEM 318 Biological Chemistry (3)	BIOL 420 Cellular & Molecular Immunology (4)	
	BIOL 431 Bioinformatics (4) CUEN $(210 \text{ Bi} + 1 \text{ CH})$ (2)	
CHEM 460 Biochemistry I (4)	CHEM 318 Biological Chemistry (3)	
3. Complete another 4 units of upper-division biology course in consultation with	Or CHEM 460 Biochemistry I (4)	
the program (4).	CHEW 400 Diochemistry I (4)	
	3. Complete another 4 units of upper-division biology course in consultation with	
4. Complete BIOL 492 Internship (2-3 units);	the program (4);	
5. Complete BIOL 499 Senior Capstone in Biology (3 units);	4. Complete BIOL 492 Internship (2-3 units);	
o. Approval by the Biology program.	5. Complete BIOL 499 Senior Capstone in Biology (3 units);	
	6 Approval by the Biology program	
	o. Approva by the biology program.	

SUMMARY OF CHANGES

1. We are proposing to offer a new Emphasis in Clinical Laboratory Science within the BS in Biology program. This emphasis takes 120 units to complete. All, except two, courses supporting this emphasis are already being offered by various programs in biology, chemistry, physics and mathematics.

2. We are proposing to add a recommended course, MATH 230 Logic and Mathematics Reasoning, for A3 Category of GE requirements for all the undergraduate biology programs.

3. We included a course, BIOL 510 Tissue Culture Techniques and Stem Cell Technology that is required for the MS Biotechnology/MBA dual degree program, as an elective course for the MS Biotechnology and Bioinformatics program.

4. We have deleted the long list of elective courses in biology in several emphases and replaced it with a general statement to shorten the program description.

JUSTIFICATION

1. In August, 2007, a research report was completed by Continuing and Professional Education Program. The research assessed the occupational projections in California and the region. It indicates that there is an immediate and long-term need in healthcare-related educational programming in this region. Clinical laboratory science (CLS) is one of the fields identified in the report. The average age of professionals working in the field of CLS is 53. There is also a strong need in public health professionals who are trained to deal with epidemics and potential biological disasters, man-made or other wise, caused by microorganisms. In order to become a licensed CLS or public health microbiologist and be able to work in hospitals/clinics and public health organizations, students need to take a set of required courses in biology, chemistry, physics and mathematics and get a BS degree in Biology. Once they complete their BS degree with the highly prescribed and required courses, they would be able to apply for and get admitted into CLS or public health programs offered by various hospitals and professional institutions to obtain further clinical training and pass the examination to acquire a license to become a practicing CLS programs have been providing incentives by paying for qualified students to join their programs. The preparation for both professions at the undergraduate level is essentially the same. Most of the courses required by this emphasis are already being offered by biology, chemistry, physics and mathematics programs. The only additional required courses are BIOL 318 Medical Mycology and BIOL 426 Hematology.

2. We believe that as science majors, our students will benefit from taking MATH 230. They would learn deductive reasoning and critical thinking skills by taking this course. As a recommended course, students still have flexibility to take other courses in the A3 category.

3. BIOL 510 is a required course for the MS Biotechnology and MBA dual degree program. We believe that with the new development in stem cell technology, it is to the benefit of our students in the MS Biotechnology and Bioinformatics program to make this course available as an elective course.

4. The statement serves the same purpose of the long list of elective courses.

Ching-Hua Wang 10/15/07 Proposer of Program Modification Date

Program:

Program Chair		
	Signature	Date
	Signature	Date
Curriculum Chair		
	Oi and a trans	Dete
	Signature	Date
Dean of Faculty		
	Signature	Date