CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

PROGRAM MODIFICATION

DATE: DECEMBER 7, 2005 PROGRAM AREA: BIOLOGY

Please use the following format to modify any existing program. Any deletions from an existing program need to be underlined (left hand column), and any additions/changes to the program need to be in CAPS (right hand column).

| EXISTING PROGRAM | PROPOSED PROGRAM | | | |
|---|--|--|--|--|
| Name of Degree Program | Name of Degree Program | | | |
| Bachelor of Science in Biology Bachelor of Science in Biology with an Emphasis in Cell and Molecular Biology Bachelor of Science in Biology with an Emphasis in Medical Imaging Bachelor of Arts in Biology with an Emphasis in General Biology Bachelor of Arts in Biology with an Emphasis in Pre-Professional Studies Bachelor of Arts in Biology with an Emphasis in Pre-Nursing Studies Bachelor of Arts in Biology with an Emphasis in Subject Matter Preparation in Teaching Biology Master of Science in Biotechnology and Bioinformatics Minor in Biology Honors in Biology | Bachelor of Science in Biology Bachelor of Science in Biology with a Emphasis in Cell and Molecular Biology Bachelor of Science in Biology with a Emphasis in Medical Imaging Bachelor of Arts in Biology with a Emphasis in General Biology Bachelor of Arts in Biology with a Emphasis in Pre-Professional Studies Bachelor of Arts in Biology with a Emphasis in Pre-Nursing Studies Bachelor of Arts in Biology with a Emphasis in Subject Matter Preparatio in Teaching Biology Master of Science in Biotechnology an Bioinformatics Minor in Biology Honors in Biology | | | |
| Catalog Description of the Program 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 5/25/2004 cp | Catalog Description of the Program 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 UNDERGRADUATE AND GRADUATE students with a strong theoretical foundation in biology, combined with extensive hands-on laboratory experiences using state-of-the-art technology. | | | |

<u>upper-division</u> electives selected from areas of special interest.

The Master of Science Degree 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.

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 largescale 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 problemsolving skills using multiple perspectives.

CAREERS: No changes made.

| | BIOL 312 Marine Bio |
|-------------------------------------|----------------------------|
| Requirements for the Degree Program | BIOL 313 Conservation |
| Requirements for the Degree Frogram | BIOL 316 Invertebrate |
| COMMON LOWER DIVISION | BIOL 317 Parasitology |
| REQUIREMENTS FOR ALL EMPHASES | BIOL 401 Biotechnolo |
| OF THE BACHELOR OF SCIENCE | DNA Techniques (5) |
| DEGREE IN BIOLOGY (8 UNITS). | BIOL 402 Toxicology |
| | BIOL 420 Cellular and |
| | (4) |

Students take a series of core courses augmented by electives selected from areas of special interest.

CAREERS: No changes made.

Requirements for the Degree Program

COMMON LOWER DIVISION REQUIREMENTS FOR ALL EMPHASES OF THE BACHELOR OF SCIENCE DEGREE IN BIOLOGY (8 UNITS):

BIOL 200* Principles of Organismal and Population Biology, GE-B2 (4)

BIOL 201 Principles of Cell and Molecular Biology (4)

FOR BACHELOR OF SCIENCE IN BIOLOGY: UPPER DIVISION REQUIREMENTS IN THE MAJOR (39 units)

 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, GE-B2, UDID (4) BIOL 499 Senior Capstone (3)
 Electives in Biology (14 units) Select from the following list of courses, 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

BIOL 200* Principles of Organismal and BIOL 421 Virology (3) Population Biology, GE-B2 (4) BIOL 422 Molecular Plant Physiology (4) BIOL 201 Principles of Cell and Molecular BIOL 423 Cellular and Molecular Neurobiology Biology (4) (3)BIOL 424 Human Physiology (3) FOR BACHELOR OF SCIENCE IN BIOL 425 Human Genetics (3) **BIOLOGY:** BIOL 427 Developmental Biology (4) UPPER DIVISION REQUIREMENTS IN BIOL 428 Biology of Cancer (3) THE MAJOR (39 units) BIOL 431* Bioinformatics, GE-B2, B4, UDID (4) 1. Required Biology Courses (25 units) BIOL 432* Principles of Epidemiology and BIOL 300 Cell Biology (4) Environmental Health, GE-B2, D, UDID (3) **BIOL 302 Genetics (4)** BIOL 450 Ichthyology: The Biology of Fishes BIOL 303 Evolutionary Biology (3) (4)BIOL 304 Comparative Animal Physiology (3) NO MORE THAN 2 UNITS TAKEN FROM THE BIOL 400 Molecular Biology (4) FOLLOWING: BIOL 433* Ecology and the Environment, GE-BIOL 492 INTERNSHIP (2-3) B2, UDID (4) **BIOL 494 INDEPENDENT RESEARCH (1-3)** AND **BIOL 497 DIRECTED STUDY (1-3)** A MINIMUM OF 2 UNITS TAKEN FROM THE FOLLOWING: **REQUIRED SUPPORTING AND OTHER** BIOL 492 Internship (2-3) **GE COURSES (73 units)** BIOL 494 Independent Research (1-3) 1. Chemistry (16 units) BIOL 497 Directed Study (1-3) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) AND CHEM 311 Organic Chemistry I (3) BIOL 499 Senior Capstone Colloquium (1) CHEM 312 Organic Chemistry I Laboratory 2. Electives in Biology (14 units) (1)Select from the following list of courses, one of CHEM 314 Organic Chemistry II (3) which must be a lab course. CHEM 315 Organic Chemistry II Laboratory BIOL 301 Microbiology (4) (1)BIOL 310 Animal Biology and Ecology (4) 2. Physics (8 units) BIOL 311 Plant Biology and Ecology (4) select either BIOL 312 Marine Biology (4) PHYS 100 Introduction to Physics I (4) **BIOL 313 Conservation Biology (4)** PHYS 101 Introduction to Physics II (4) BIOL 316 Invertebrate Zoology (4) or BIOL 317 Parasitology (4) PHYS 200 General Physics I (4) BIOL 401 Biotechnology and Recombinant PHYS 201 General Physics II (4) DNA Techniques (5) 3. Statistics and Mathematics (7 units) BIOL 402 Toxicology (3) **BIOL 203* QUANTITATIVE METHODS BIOL 420 Cellular and Molecular Immunology** FOR BIOLOGY, GE-B3 (3) (4) MATH 150* Calculus I, GE-B3 (4) BIOL 421 Virology (3) 4. Other Required GE Courses in Categories A-E BIOL 422 Molecular Plant Physiology (4) (36 BIOL 423 Cellular and Molecular Neurobiology units) (3) Category A (9) BIOL 424 Human Physiology (3) Category C (12) BIOL 425 Human Genetics (3) Category D (12) **BIOL 427 Developmental Biology (4)**

| BIOL 428 Biology of Cancer (3) | Category E (3) | | |
|---|---|--|--|
| BIOL 431* Bioinformatics GE-B2 B4 LIDID | 5 American Institutions Requirement (6 units) | | |
| (A) | 5. A merican institutions requirement (6 units) | | |
| (+) PIOL 422* Dringinlag of Enidemiology and | | | |
| Environmental Health CE D2 D UDID (2) | EOD EMDITACIÓ IN CELL AND | | |
| Environmental Health, GE-B2, D, UDID (3) | FOR EMPHASIS IN CELL AND | | |
| BIOL 450 Ichthyology: The Biology of Fishes | MOLECULAR BIOLOGY: | | |
| (4) | | | |
| | UPPER DIVISION REQUIREMENTS IN | | |
| REQUIRED SUPPORTING AND OTHER | THE MAJOR (40 units) | | |
| GE COURSES (73 units) | | | |
| 1. Chemistry (16 units) | 1. Required Biology Courses (31 units) | | |
| CHEM 121* General Chemistry I, GE-B1 (4) | BIOL 300 Cell Biology (4) | | |
| CHEM 122 General Chemistry II (4) | BIOL 301 Microbiology (4) | | |
| CHEM 311 Organic Chemistry I (3) | BIOL 302 Genetics (4) | | |
| CHEM 312 Organic Chemistry I Laboratory | BIOL 303 Evolutionary Biology (3) | | |
| (1) | BIOL 400 Molecular Biology (4) | | |
| CHEM 314 Organic Chemistry II (3) | BIOL 401 Biotechnology and Recombinant | | |
| CHEM 315 Organic Chemistry II Laboratory | DNA Techniques (5) | | |
| (1) | DIA Iteliniques (5) DIA 421* Dicinformatica CE D2 D4 | | |
| 2 Physics (8 units) | LIDID (4) | | |
| solact aithor | $\begin{array}{c} \text{UDID}(4) \\ \text{PIOL}(400 \text{ G} + 100 \text{ G}) \end{array}$ | | |
| DHVS 100 Introduction to Dhusing $I(4)$ | BIOL 499 Senior Capstone (3) | | |
| DIVE 101 Introduction to Physics I (4) | | | |
| PHYS 101 Introduction to Physics II (4) | 2. Electives in Biology (9 units) | | |
| | Select from the following list of courses: | | |
| PHYS 200 General Physics I (4) | BIOL 402 Toxicology (3) | | |
| PHYS 201 General Physics II (4) | BIOL 416 Radiobiology and Radionuclides | | |
| 3. Statistics and Mathematics (7 units) | (3) | | |
| BIOL 202 Biostatistics (3) | BIOL 420 Cellular and Molecular | | |
| MATH 150* Calculus I, GE-B3 (4) | Immunology (4) | | |
| 4. Other GE Courses in Categories A-E (36 | BIOL 421 Virology (3) | | |
| units) | BIOL 422 Molecular Plant Physiology (4) | | |
| Category A (9) | BIOL 423 Cellular And Molecular | | |
| Category B- covered by required courses for | Neuropiology (3) | | |
| the degree program | BIOL 424 Human Physiology (3) | | |
| Category C (12) | BIOL 425 Human Genetics (3) | | |
| Category D (12) | BIOL 427 Developmental Biology (4) | | |
| Category E (3) | BIOL 427 Developmental Biology (4) BIOL 428 Biology of Cancer (3) | | |
| 5 American Institutions Requirement (6 units) | BIOL 428 Dividence of Enidemiology and | | |
| 5. American institutions requirement (6 amis) | Function and the state of Epidemiology and | | |
| FOR EMPHASIS IN CELL AND | Environmental Health, GE-B2, D, UDID (3) | | |
| MOLECULAR BIOLOGY: | BIOL 433* Ecology and the Environment, | | |
| MOLLEULIK DIOLOGI | GE-B2, UDID (4) | | |
| LIPPER DIVISION REALIDEMENTS IN | NO MORE THAN 2 UNITS TAKEN FROM THE | | |
| THE MALOD (40 mits) | FOLLOWING: | | |
| THE MAJOR (40 UIIIS) | BIOL 492 INTERNSHIP (2-3) | | |
| 1 $\mathbf{D}_{\mathbf{r}}$ and $\mathbf{D}_{\mathbf{r}}$ is a second seco | BIOL 494 INDEPENDENT RESEARCH (1-3) | | |
| 1. Required Biology Courses (31 units) | BIOL 497 DIRECTED STUDY (1-3) | | |
| BIOL 300 Cell Biology (4) | | | |
| BIOL 301 Microbiology (4) | REQUIRED SUPPORTING AND OTHER | | |
| BIOL 302 Genetics (4) | | | |

GE COURSES (72 units): BIOL 303 Evolutionary Biology (3) BIOL 400 Molecular Biology (4) **BIOL 401 Biotechnology and Recombinant** 1. Chemistry (minimum 15 units) DNA Techniques (5) CHEM 121* General Chemistry I, GE-B1 (4) BIOL 431* Bioinformatics, GE-B2, B4, CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) UDID (4) CHEM 312 Organic Chemistry I Laboratory AND A MINIMUM OF 2 UNITS TAKEN FROM (1)*the following:* AND select either BIOL 492 Internship (2-3) CHEM 318 Biological Chemistry (3) **BIOL 494 Independent Research (1-3)** or BIOL 497 Directed Study (1-3) CHEM 314 Organic Chemistry II (3) CHEM 315 Organic Chemistry II Laboratory AND BIOL 499 Senior Capstone Colloquium (1) (1)(A year-long organic chemistry sequence with 2. Electives in Biology (9 units) laboratory taken at a community college may be Select from the following list of courses: accepted for the Biology major in lieu of BIOL 402 Toxicology (3) CHEM 311, 312, 314, 315.) BIOL 416 Radiobiology and Radionuclides (3) 2. Physics (8 units) **BIOL 420 Cellular and Molecular Immunology** select either (4)PHYS 100 Introduction to Physics I (4) BIOL 421 Virology (3) PHYS 101 Introduction to Physics II (4) BIOL 422 Molecular Plant Physiology (4) or **BIOL 423 Cellular And Molecular Neurobiology** PHYS 200 General Physics I (4) (3)PHYS 201 General Physics II (4) BIOL 424 Human Physiology (3) 3. Statistics and Mathematics (7 units) BIOL 425 Human Genetics (3) **BIOL 203* QUANTITATIVE METHODS** BIOL 427 Developmental Biology (4) FOR BIOLOGY, GE-B3 (3) BIOL 428 Biology of Cancer (3) MATH 150* Calculus I, GE-B3 (4) BIOL 432* Principles of Epidemiology and 4. Other Required GE Courses in Categories A-E Environmental Health, GE-B2, D, UDID (3) (36 BIOL 433* Ecology and the Environment, GEunits) B2, UDID (4) Category A (9) Category C (12) **REQUIRED SUPPORTING AND OTHER** Category D (12) GE COURSES (72 units): Category E (3) 5. American Institutions Requirement (6 units) 1. Chemistry (minimum 15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1)AND select either CHEM 318 Biological Chemistry (3) or CHEM 314 Organic Chemistry II (3) CHEM 315 Organic Chemistry II Laboratory (1)

| (Note: Students completing the following | |
|--|--|
| courses to satisfy this category will obtain a | |
| Minor in Chamistry in addition to a Major in | |
| Pielegy | |
| $\frac{\text{DIOIOgy.}}{\text{OHEM}} = \frac{1}{21} $ | |
| CHEM 121* General Chemistry I, GE-BI (4) | |
| CHEM 122 General Chemistry II (4) | |
| <u>CHEM 311 Organic Chemistry I (3)</u> | |
| CHEM 312 Organic Chemistry I Laboratory | |
| <u>(1)</u> | |
| CHEM 314 Organic Chemistry II (3) | |
| CHEM 315 Organic Chemistry II Laboratory | |
| <u>(1)</u> | |
| CHEM 400 Biochemistry (4) | |
| (A year-long organic chemistry sequence with | |
| laboratory taken at a community college may be | FOR EMPHASIS IN MEDICAL IMAGING |
| accepted for the Biology major in lieu of | |
| CHEM 311, 312, 314, 315.) | |
| 2. Physics (8 units) | ADDITIONAL LOWER DIVISION |
| select either | REQUIREMENTS IN THE MAJOR (8 |
| PHYS 100 Introduction to Physics I (4) | units): |
| PHYS 101 Introduction to Physics II (4) | BIOL 210 Human Anatomy and Physiology I |
| or | (4) |
| PHYS 200 General Physics I (4) | BIOL 211 Human Anatomy and Physiology II |
| PHYS 201 General Physics II (4) | (4) |
| 3 Statistics and Mathematics (7 units) | |
| BIOL 202 Biostatistics (3) | UPPER DIVISION REQUIREMENTS IN |
| MATH 150* Calculus I GE-B3 (4) | THE MAJOR (38 units): |
| 4 Required General Education Courses (6 | 1. Required Biology and Physics Courses (30 |
| LINITS) | units) |
| $\underline{\text{ENGL}}_{330}$ Writing in the Disciplines $\underline{\text{GE}}_{41}$ | BIOL 300 Cell Biology (4) |
| A2 UDID (3) | BIOL 301 Microbiology (4) |
| AND select one of the following: | BIOL 302 Genetics (4) |
| BIOL 326* Scientific and Professional Ethics | BIOL 400 Molecular Biology (4) |
| CE D (3) | BIOL/PHYS 416 Radiobiology and |
| DUVS/ENCL 228* Science and Conscience | Radionuclides (3) |
| CE P1 C2 UDID (2) | BIOL/PHYS 434* Introduction to Biomedical |
| $\frac{\text{OE-BI, C2, ODID (5)}}{5 \text{ Other GE Courses in Categories A E (30)}}$ | Imaging GE-B1 E UDID (4) |
| $\underline{5}$. Other OE Courses in Categories A-E ($\underline{50}$ | BIOL/PHYS 464 Biomedical Instrumentation |
| $C_{\text{stagenty}} \Lambda (6) \text{ three write several hy s}$ | (4) |
| required CE course for the degree program | BIOL 499 Senior Capstone (3) |
| Catagory D accounted by required accurace for | bioli ()) benior cupstone (5) |
| Category B- covered by required courses for | 2 Electives in Biology and Physics (8 units): |
| the degree program $C(0)$ there exists a second has a | Select from the following list of courses: |
| Category $C(9)$ three units covered by a | Dice from the jouowing hist of courses. |
| | BIOL PHYS 315 Introduction to Riophysics (4) |
| required GE course for the degree program | BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Pacambinant |
| Category D (12) | BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant |
| Category D (12) Category E (3) | BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Collular and Molecular Immunology |

| FOR EMPHASIS IN MEDICAL IMAGING: | BIOL 421 Virology (3) | | | |
|--|---|--|--|--|
| | BIOL 423 Cellular And Molecular Neurobiology | | | |
| ADDITIONAL LOWED DIVISION | (3) | | | |
| DECLIDEMENTS IN THE MAIOD (8 | BIOL 424 Human Physiology (3) | | | |
| MEQUINEMENTS IN THE MAJOR (8 | BIOL 425 Human Genetics (3) | | | |
| BIOL 210 Hymon Anotomy and Physiology I | BIOL 427 Developmental Biology (4) | | | |
| | BIOL 428 Biology of Cancer (3) | | | |
| (4) PIOL 211 Human Anatomy and Physiology II | BIOL 431* Bioinformatics, GE-B2, B4, UDID | | | |
| A) | (4) | | | |
| (4) | BIOL 432* Principles of Epidemiology and | | | |
| | Environmental Health, GE-B2, D, UDID (3) | | | |
| THE MAJOD (29 miles): | BIOL 433* Ecology and the Environment, GE- | | | |
| 1 Deguined Dielegy and Dhysics Courses (20 | B2, UDID (4) | | | |
| 1. Required biology and Physics Courses (50 | PHYS 445* Image Analysis and Pattern | | | |
| ullits) BIOL 200 Call Biology (4) | Recognition, GE-B1, B4, UDID (3) | | | |
| BIOL 300 Cell Biology (4) BIOL 201 Microbiology (4) | NO MORE THAN 2 units taken from the | | | |
| BIOL 301 Microbiology (4) BIOL 202 Canadias (4) | following: | | | |
| DIOL 502 Genetics (4) DIOL 400 Molecular Diology (4) | PHYS 492 PHYSICS INTERNSHIP (3) | | | |
| BIOL 400 Molecular Biology (4) BIOL /DHVS 416 Radiobiology and | BIOL OR PHYS 494 INDEPENDENT | | | |
| BioL/FILLS 410 Radiobiology and Bediopuelides (2) | RESEARCH (1-3) | | | |
| DIOL /DHVS 424* Introduction to Diomodical | BIOL OR PHYS 497 DIRECTED STUDY (1- | | | |
| Imaging GE B1 E IIDID (4) | | | | |
| BIOL /PHVS 464 Biomedical Instrumentation | n -/ | | | |
| (Λ) | ^{on} REQUIRED SUPPORTING AND OTHER | | | |
| | GE COURSES (66 units): | | | |
| AND A MINIMIM OF 2 UNITS | GE COURSES (66 units): | | | |
| (+) <u>AND A MINIMUM OF 2 UNITS</u> TAKEN FROM the following: | GE COURSES (66 units): 1. Chemistry (15 units) | | | |
| (+) <u>AND A MINIMUM OF 2 UNITS</u> <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- <u>3)</u> BIOL or PHYS 497 Directed Study (1-3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- <u>3)</u> BIOL or PHYS 497 Directed Study (1-3) AND | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- <u>3)</u> BIOL or PHYS 497 Directed Study (1-3) <u>AND</u> BIOL or PHYS 499 Senior Capstone | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic chemistry I-equivalent course with | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) <u>AND</u> BIOL <u>or PHYS</u> 499 Senior Capstone <u>Colloquium (1)</u> | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic chemistry I-equivalent course with laboratory taken at a community college may be | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) <u>AND</u> BIOL <u>or PHYS</u> 499 Senior Capstone <u>Colloquium</u> (1) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic chemistry I-equivalent course with laboratory taken at a community college may be accepted for the Biology major in lieu of | | | |
| AND A MINIMUM OF 2 UNITS <u>TAKEN FROM the following:</u> PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- <u>3)</u> BIOL or PHYS 497 Directed Study (1-3) <u>AND</u> BIOL <u>or PHYS</u> 499 Senior Capstone <u>Colloquium (1)</u> 2. Electives in Biology and Physics (8 units): | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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.) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) | | | |
| (4) AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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 | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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 (4) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology (4) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) <i>select either</i> PHYS 100 Introduction to Physics I (4) PHYS 101 Introduction to Physics II (4) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology (4) BIOL 421 Virology (3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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 (4) PHYS 101 Introduction to Physics II (4) or | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology (4) BIOL 423 Cellular And Molecular Neurobiology | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) <i>select either</i> PHYS 100 Introduction to Physics I (4) <i>or</i> PHYS 200 General Physics I (4) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology (4) BIOL 421 Virology (3) BIOL 423 Cellular And Molecular Neurobiology (3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) <i>select either</i> PHYS 100 Introduction to Physics I (4) PHYS 101 Introduction to Physics II (4) <i>or</i> PHYS 200 General Physics I (4) PHYS 201 General Physics II (4) | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) AND BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology (4) BIOL 421 Virology (3) BIOL 423 Cellular And Molecular Neurobiology (3) BIOL 424 Human Physiology (3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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) <i>select either</i> PHYS 100 Introduction to Physics I (4) PHYS 101 Introduction to Physics II (4) <i>or</i> PHYS 200 General Physics I (4) PHYS 201 General Physics II (4) 4. Other Required GE Courses in Categories A- | | | |
| AND A MINIMUM OF 2 UNITS TAKEN FROM the following: PHYS 492 Physics Internship (3) BIOL or PHYS 494 Independent Research (1- 3) BIOL or PHYS 497 Directed Study (1-3) <u>AND</u> BIOL or PHYS 499 Senior Capstone Colloquium (1) 2. Electives in Biology and Physics (8 units): Select from the following list of courses: BIOL/PHYS 315 Introduction to Biophysics (4) BIOL 401 Biotechnology and Recombinant DNA Techniques (5) BIOL 420 Cellular and Molecular Immunology (4) BIOL 421 Virology (3) BIOL 423 Cellular And Molecular Neurobiology (3) BIOL 425 Human Genetics (3) | GE COURSES (66 units): 1. Chemistry (15 units) CHEM 121* General Chemistry I, GE-B1 (4) CHEM 122 General Chemistry II (4) CHEM 311 Organic Chemistry I (3) CHEM 312 Organic Chemistry I Laboratory (1) CHEM 318 Biological Chemistry (3) (An organic 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 (4) PHYS 101 Introduction to Physics II (4) or PHYS 200 General Physics I (4) PHYS 201 General Physics II (4) 4. Other Required GE Courses in Categories A- D (33 units) | | | |

| BIOL 428 Biology of Cancer (3) | Category C (12) |
|--|--|
| BIOL 431* Bioinformatics, GE-B2, B4, UDID | Category d (12) |
| (4) | Category E- covered by a required GE course |
| BIOL 432* Principles of Epidemiology and | for the degree program |
| Environmental Health, GE-B2, D, UDID (3) | 6. American Institutions Requirement (6 units) |
| BIOL 433* Ecology and the Environment, GE- | |
| B2. UDID (4) | (Courses with * are double-counted toward GE |
| PHYS 445* Image Analysis and Pattern | credits.) |
| Recognition, GE-B1, B4, UDID (3) | |
| 1000 g $1000 g$ 1 | |
| REQUIRED SUPPORTING AND OTHER | |
| GE COURSES (66 units): | |
| 1 Chamistry (15 units) | |
| CHEM 121* Concred Chemistry L CE D1 (4) | |
| CHEM 121 ⁺ General Chemistry I, GE-DI (4) | |
| CHEM 122 General Chemistry II (4) | |
| CHEM 311 Organic Chemistry I (3) | |
| CHEM 312 Organic Chemistry I Laboratory | |
| (1) | |
| CHEM 318 Biological Chemistry (3) | |
| (An organic chemistry I-equivalent course with | |
| laboratory taken at a community college may be | |
| accepted for the Biology major in lieu of | REOUIREMENTS FOR THE BACHELOR |
| CHEM 311 and 312.) | OF ARTS DEGREE IN BIOLOGY (120 |
| 2. Mathematics (4 units) | units): |
| MATH 150 Calculus I (4) | COMMON LOWER DIVISION |
| 3. PHYSICS (8 units) | REOUIREMENTS FOR ALL EMPHASES |
| select either | (8 units): |
| PHYS 100 Introduction to Physics I (4) | (*******)* |
| PHYS 101 Introduction to Physics II (4) | BIOL 200* Principles of Organismal and |
| or | Population Biology, GE-B2 (4) |
| PHYS 200 General Physics I (4) | BIOL 201 Principles of Cell and Molecular |
| PHYS 201 General Physics II (4) | Biology (4) |
| 4. Required General Education Courses (6 | |
| <u>units)</u> | FOR EMPHASIS IN GENERAL BIOLOGY |
| ENGL 330 Writing in the Disciplines, GE-A1, | UPPER DIVISION REQUIREMENTS IN |
| A2, UDID (3) | THE MAJOR (37 units). |
| AND select one of the following: | 1 Required Biology Courses (25 units) |
| BIOL 326* Scientific and Professional Ethics, | BIOL 300 Cell Biology (4) |
| <u>GE-D (3)</u> | BIOL 302 Genetics (4) |
| PHYS/ENGL 338* Science and Conscience, | BIOL 302 Evolutionary Biology (3) |
| GE-B1, C2, UDID (3) | BIOL 303 Evolutionary Biology (3) BIOL 304 Comparative Animal Physiology |
| 5. Other GE Courses in Categories A-D (27 | (3) |
| units) | (J) BIOL 400 Molecular Biology (4) |
| Category A (6) three units covered by a | BIOL 400 Molecular Biology (4) BIOL 433* Ecology and the Environment (4) |
| required GE course for the degree program | BIOL 400 Senior Constone (3) |
| Category B- covered by required courses for | 2 Electives in Biology (12 units) |
| the degree program | 2. Electives in Diology (12 units) Select at least three courses from the |
| Category C (9) three units covered by a | |
| | jouowing list, one of which must be a lab |

| required GE course for the degree program | со |
|--|-------|
| category d (12) | BI |
| Category E- covered by a required GE course | BI |
| for the degree program | BI |
| 6. American Institutions Requirement (6 units) | BI |
| | BI |
| (Courses with * are double-counted toward GE | BI |
| credits.) | BI |
| | BI |
| REQUIREMENTS FOR THE BACHELOR | Ι |
| OF ARTS DEGREE IN BIOLOGY (120 | BI |
| units): | BI |
| COMMON LOWER DIVISION | I |
| REQUIREMENTS FOR ALL EMPHASES | BI |
| (8 units): | BI |
| | BI |
| BIOL 200* Principles of Organismal and | N |
| Population Biology, GE-B2 (4) | BI |
| BIOL 201 Principles of Cell and Molecular | BI |
| Biology (4) | BI |
| | BI |
| FOR EMPHASIS IN GENERAL BIOLOGY: | BI |
| UPPER DIVISION REQUIREMENTS IN | I |
| THE MAJOR (37 units): | BI |
| 1. Required Biology Courses (25 units) | |
| BIOL 300 Cell Biology (4) | - |
| BIOL 302 Genetics (4) | BI |
| BIOL 303 Evolutionary Biology (3) | (|
| BIOL 304 Comparative Animal Physiology | NON |
| (3) | THE |
| BIOL 400 Molecular Biology (4) | BI |
| BIOL 433* Ecology and the Environment (4) | BI |
| AND | |
| A minimum of 2 units taken from the | BI |
| following: | |
| BIOL 492 Internship (2-3) | REO |
| BIOL 494 Independent Research (1-3) | GEO |
| BIOL 497 Directed Study (1-3) | 1. Ch |
| AND | CF |
| BIOL 499 Senior Capstone Colloquium (1) | CF |
| 2. Electives in Biology (12 units) | 2. Ma |
| Select at least three courses from the | Se |
| following list, one of which must be a lab | BI |
| course. | |
| BIOL 301 Microbiology (4) | M |
| BIOL 310 Animal Biology and Ecology (4) | M |
| BIOL 311 Plant Biology and Ecology (4) | 3. Ot |
| BIOL 312 Marine Biology (4) | 2.00 |
| | • |

urse. OL 301 Microbiology (4) OL 310 Animal Biology and Ecology (4) OL 311 Plant Biology and Ecology (4) OL 312 Marine Biology (4) OL 313 Conservation Biology (4) OL 316 Invertebrate Zoology (4) OL 317 Parasitology (4) OL 401 Biotechnology and Recombinant DNA Techniques (5) OL 402 Toxicology (3) OL 420 Cellular and Molecular mmunology (4) OL 421 Virology (3) OL 422 Molecular Plant Physiology (4) OL 423 Cellular and Molecular Neurobiology (3) OL 424 Human Physiology (3) OL 425 Human Genetics (3) OL 427 Developmental Biology (4) OL 428 Biology of Cancer (3) OL 431* Bioinformatics, GE-B2, B4, JDID(4)OL 432* Principles of Epidemiology and Environmental Health, GE-B2, D, UDID (3)OL 450 Ichthyology: The Biology of Fishes (4) MORE THAN 2 UNITS TAKEN FROM FOLLOWING: OL 492 INTERNSHIP (2-3) OL 494 INDEPENDENT RESEARCH (1-3) OL 497 DIRECTED STUDY (1-3) UIRED SUPPORTING AND OTHER COURSES (53-54 units): emistry (8 units) HEM 121* General Chemistry I, GE-B1 (4) HEM 122 General Chemistry II (4) athematics and Statistics (3-4 units) *lect one of the following:* **OL 203* QUANTITATIVE METHODS**

| DIOL 212 $\mathcal{O}_{\text{constructions}}$ D ¹ $\mathcal{O}_{\text{constructions}}$ (4) | $\mathbf{C}_{\mathbf{a}}$ |
|---|--|
| BIOL 313 Conservation Biology (4) | Category A (9) G_{12} |
| BIOL 316 Invertebrate Zoology (4) | Category C (12) |
| BIOL 31 / Parasitology (4) | Category D (12) |
| BIOL 401 Biotechnology and Recombinant | Category E (3) |
| DNA Techniques (5) | 4. American Institutions Requirements (6) |
| BIOL 402 Toxicology (3) | |
| BIOL 420 Cellular and Molecular | ELECTIVES IN ANY DISCIPLINE (21-22 |
| Immunology (4) | units) |
| 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) | FOR EMPHASIS IN PRE-PROFESSIONAL |
| BIOL 427 Developmental Biology (4) | STUDIES: |
| BIOL 428 Biology of Cancer (3) | UPPER DIVISION REQUIREMENTS IN |
| BIOL 431* Bioinformatics, GE-B2, B4, | THE MAJOR (32 units): |
| UDID (4) | 1. Required Biology Courses (21-22 units) |
| BIOL 432* Principles of Epidemiology and | BIOL 300 Cell Biology (4) |
| Environmental Health, GE-B2, D, UDID | BIOL 302 Genetics (4) |
| (3) | BIOL 304 Comparative Animal Physiology |
| BIOL 450 Ichthyology: The Biology of Fishes | (3) |
| (4) | BIOL 400 Molecular Biology (4) |
| | |
| REQUIRED SUPPORTING AND OTHER | Select one of the following: |
| GE COURSES (53-54 units): | BIOL 303 Evolutionary Biology (3) |
| 1. Chemistry (8 units) | BIOL 433* Ecology and the Environment, |
| CHEM 121* General Chemistry I, GE-B1 (4) | GE-B2, UDID (4) |
| CHEM 122 General Chemistry II (4) | AND DIGL 400 G i G i (2) |
| 2. Mathematics and Statistics (3-4 units) | BIOL 499 Senior Capstone (3) |
| Select one of the following: | 2. Electives in Biology (10-11 units) |
| BIOL 20 <u>2</u> * <u>Biostatistics</u> , GE-B3 (3) | Select at least three courses from the |
| MATH 105 Pre-Calculus (4) | following list, one of which must be a lab |
| MATH 150* Calculus I, GE-B3 (4) | course. |
| 3. Other GE Courses in Categories A-E (36) | BIOL 301 Microbiology (4) |
| Category A (9) | BIOL 310 Animal Biology and Ecology (4) |
| Category B – covered by required courses for | BIOL 311 Plant Biology and Ecology (4) |
| the degree program | BIOL 312 Marine Biology (4) |
| Category C (12) | BIOL 313 Conservation Biology (4) |
| Category D (12) | BIOL 316 Invertebrate Zoology (4) |
| Category E (3) | BIOL 31/ Parasitology (4) |
| 4. American Institutions Requirements (6) | BIOL 401 Biotechnology and Recombinant |
| | DNA Techniques (5) |
| ELECTIVES IN ANY DISCIPLINE (21-22 | BIOL 402 Toxicology (3) |
| units) | BIOL 420 Cellular and Molecular |
| | Immunology (4) |
| | BIOL 421 Virology (3) |
| | BIOL 422 Molecular Plant Physiology (4) |

| FOR EMPHASIS IN PRE-PROFESSIONAL | BIOL 423 Cellular and Molecular | | |
|--|--|--|--|
| STUDIES: | Neurobiology (3) | | |
| UPPER DIVISION REOUIREMENTS IN | BIOL 424 Human Physiology (3) | | |
| THE MAJOR (32 units): | BIOL 425 Human Genetics (3) | | |
| 1 Required Biology Courses (21-22 units) | BIOL 427 Developmental Biology (4) | | |
| BIOL 300 Cell Biology (4) | BIOL 428 Biology of Cancer (3) | | |
| BIOL 302 Genetics (4) | BIOL 420 Biology of Calleer (5) BIOL 431* Bioinformatics CE B2 B4 | | |
| BIOL 302 Comparative Animal Physiology | UDID (4) | | |
| (2) | DIOL (4) DIOL (22* Dringinlag of Enidemiclogy and | | |
| (5) | BIOL 452* Principles of Epidemiology and | | |
| BIOL 400 Molecular Biology (4) | Environmental Health, GE-B2, D, UDID | | |
| | | | |
| Select one of the following: | BIOL 450 Ichthyology: The Biology of Fishes | | |
| BIOL 303 Evolutionary Biology (3) | (4) | | |
| BIOL 433* Ecology and the Environment, | NO MORE THAN 2 UNITS TAKEN FROM | | |
| GE-B2, UDID (4) | THE FOLLOWING: | | |
| AND | BIOL 492 INTERNSHIP (2-3) | | |
| A minimum of 2 units taken from the | BIOL 494 INDEPENDENT RESEARCH (1- | | |
| following: | 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 | | |
| AND | GE COURSES (69-70 units): | | |
| BIOL 499 Senior Capstone Colloquium (1) | 1. Chemistry (16 units) | | |
| 2. Electives in Biology (10-11 units) | CHEM 121* General Chemistry I, GE-B1 (4) | | |
| Select at least three courses from the | CHEM 122 General Chemistry II (4) | | |
| following list one of which must be a lab | CHEM 311 Organic Chemistry I (3) | | |
| course | CHEM 312 Organic Chemistry I Laboratory | | |
| BIOL 201 Microbiology (4) | (1) | | |
| BIOL 301 Microbiology (4) BIOL 310 Animal Biology and Ecology (4) | CHEM 314 Organic Chemistry II (3) | | |
| DIOL 310 Alliniai Diology and Ecology (4) | CHEM 315 Organic Chemistry II Laboratory | | |
| DIOL 311 Plant Diology and Ecology (4) | (1) | | |
| BIOL 312 Marine Biology (4) | (1) 2 Mothematics and Statistics (2.4 units) | | |
| BIOL 313 Conservation Biology (4) | 2. Mathematics and Statistics (5-4 diffs) | | |
| BIOL 316 Invertebrate Zoology (4) | DIOL 202* OLIANTITATIVE METHODS | | |
| BIOL 317 Parasitology (4) | BIOL 203*, QUANITIATIVE METHODS | | |
| BIOL 401 Biotechnology and Recombinant | FOR BIOLOGY, GE-B3 (3) | | |
| DNA Techniques (5) | MATH 150* Calculus I, GE-B3 (4) | | |
| BIOL 402 Toxicology (3) | (check with professional schools or pre- | | |
| BIOL 420 Cellular and Molecular | professional advisor for specific requirements | | |
| Immunology (4) | in this category.) | | |
| BIOL 421 Virology (3) | 3. Physics (8 units) | | |
| BIOL 422 Molecular Plant Physiology (4) | PHYS 100 Introduction to Physics I (4) | | |
| BIOL 423 Cellular and Molecular | PHYS 101 Introduction to Physics II (4) | | |
| Neurobiology (3) | 4. Other Required GE Courses in Categories A-E | | |
| BIOL 424 Human Physiology (3) | (36) | | |
| BIOL 425 Human Genetics (3) | Category A (9) | | |
| BIOL 427 Developmental Biology (4) | Category C (12) | | |
| BIOL 428 Biology of Cancer (3) | Category D (12) | | |
| BIOL 431* Bioinformatics GE-B2 B4 | Category E (3) | | |

UDID (4) BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2, D, UDID (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, GE-B1 (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* Biostatics, GE-B3 (3) MATH 150* Calculus I, GE-B3 (4) (check with professional schools or preprofessional 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) Category A (9) Category B – covered by required courses for the degree program Category C (12) Category D (12) Category E (3) 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)**

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, GE-B2, UDID (3) BIOL 433* Ecology and the Environment, GE-B2, UDID (4) BIOL 499 Senior Capstone (3) 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, GE-B2, B4, UDID (4) BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2, D, UDID

BIOL 304 Comparative Animal Physiology (3) BIOL 335* The Biosphere, GE-B2, UDID (3) BIOL 433* Ecology and the Environment, GE-B2, UDID (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 <u>Colloquium</u> (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, GE-B2, B4, UDID (4) BIOL 432* Principles of Epidemiology and Environmental Health, GE-B2, D, UDID (3)BIOL 450 Ichthyology: The Biology of Fishes (4)**REQUIRED SUPPORTING AND OTHER**

(3)BIOL 450 Ichthyology: The Biology of Fishes (4)NO MORE THAN 2 UNITS TAKEN FROM THE FOLLOWING: **BIOL 492 INTERNSHIP (2-3) BIOL 494 INDEPENDENT RESEARCH (1-**3) **BIOL 497 DIRECTED STUDY (1-3) REQUIRED SUPPORTING AND OTHER** GE COURSES (76 units): 1. Required Education Course (3 units) EDUC 330* Introduction To Secondary Schooling, GE-D, UDID (3) 2. Mathematics and Statistics (7 units) **BIOL 203* QUANTITATIVE METHODS** FOR BIOLOGY, GE-B3 (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 (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 Required GE Courses in Categories A-E (36)Category A (9) Category C (12) Category D (12) Category E (3) 5. American Institutions Requirements (6) (Courses with * are double-counted toward GE credits.) **REOUIREMENTS FOR THE MASTER OF**

SCIENCE DEGREE IN BIOTECHNOLOGY AND BIOINFORMATICS (33-34 units)

(Pending approval from the Chancellor's Office and offered through California State University

GE COURSES (76 units):

- 1. Required Education Course (3 units) EDUC 330* Introduction To Secondary Schooling, GE-D, UDID (3)
- 2. Mathematics and Statistics (7 units) BIOL 20<u>2</u>* <u>Biostatistics</u>, GE-B3 (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 (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) Category A (9) Category B – covered by required courses for the degree program
 - Category C (12)
 - Category D (12)
 - Category E (3)
- 5. American Institutions Requirements (6)
- (Courses with * are double-counted toward GE credits.)

REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOTECHNOLOGY AND BIOINFORMATICS (33-3<u>5</u> units)

(Pending approval from the Chancellor's Office and offered through California State University Channel Islands Extended Education Program)

ADMISSION REQUIREMENTS:

Applicants must have a BS/BA degree in Biology, Computer Science, Chemistry, Biochemistry, or Mathematics. Alternatively, they must have a BA/BS degree in any equivalent work field and experiences in one of the above fields. The prerequisite courses for the graduate level courses should be completed at the undergraduate level or before enrolling in the set required Channel Islands Extended Education Program)

PROGRAM DESCRIPTION:

The Master of Science Degree 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.

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 largescale 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 problemsolving skills using multiple perspectives.

ADMISSION REQUIREMENTS:

1. Applicants must have a BS/BA degree Computer in Biology, Science. Chemistry, Biochemistry, or Mathematics. Alternatively, **APPLICANTS** WITH А **BA/BS** DEGREE IN ANY FIELD AND EQUIVALENT WORK EXPERIENCES IN ONE OF THE ABOVE FIELDS MAY BE GRANTED CONDITIONAL courses after conditional admission.

- <u>Applicants seeking admission to the</u> professional MS in Biotechnology and Bioinformatics program must be officially accepted into the CSUCI academic program.
- Applicants must declare themselves as graduate students in the professional MS degree program in Biotechnology and Bioinformatics.
- Applicants will be evaluated by the admissions program committee which will consider the applicants in the context of the total applicant pool general admission using our standards. No arbitrary grade point or test score will be used in the evaluation process. However, the following materials are required for evaluation and admission our process.
- Applicants must submit to the program 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 а 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 to the program their Test of English as a Foreign Language (TOEFL) scores for evaluation.
- A one page "Statement of Purpose" from the applicant and two letters of recommendations from people who are able to judge the applicant's capacity for both academic and professional success should be submitted to the program for evaluation.
- <u>Applicants will be interviewed by the</u> <u>program admissions committee</u> <u>before admission to the program.</u>

ADMISSION AND THEY MUST FULFILL ALL THE 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.

5. Applicants must submit to the program their transcript from their undergraduate institution, Graduate Record Examinations (GRE) General Test scores or the Medical College Admission Test (MCAT) scores.

6. 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 to the program their Test of English as a Foreign Language (TOEFL) scores for evaluation.

7. A one page "Statement of Purpose" from the applicant and two letters of recommendations from people who are able to judge the applicant's capacity for both academic and professional success should be submitted to the program for evaluation.

DEGREE REQUIREMENTS: COMMON CORE COURSES (16 units): BINF 500 DNA and Protein Sequence Analysis

| - <u>Although a BS/BA in the natural or</u> | (3 |
|---|-------|
| life science, computer science, or | BIC |
| mathematics is likely to provide the | Р |
| most thorough academic preparation | BIC |
| <u>for our program, it is not a</u> | (3 |
| prerequisite for admission. Relevant | MG |
| work experience in fields of | BIC |
| biotechnology, computing, | BIC |
| pharmaceuticals, medical, | В |
| environmental, and agricultural | |
| biotechnology, clinical trials, | For |
| regulatory affairs, intellectual | |
| property law, and management in | RE |
| biotechnology is looked upon | BIC |
| favorably. However, as our program | BIC |
| demands sophisticated technical | |
| training which requires a comparable | ELI |
| level of requisite knowledge and | A m |
| skills, some deficiency in academic | сои |
| preparation among applicants who | the . |
| have relevant work experience may | BIC |
| be offered conditional admission, | BIC |
| contingent upon successful | Р |
| completion of prerequisite academic | BIC |
| work specified by the admissions | BIC |
| committee. | MG |
| - Once admitted, students must remain | |
| in good academic standing | For |
| throughout the duration of their | |
| enrollment in CSUCI. | RE |
| - Students must complete and fulfill | BIN |
| the requirements of the degree | BIN |
| program within a designated period | (3 |
| specified by the university. | BIN |
| | BIN |
| DEGREE REQUIREMENTS: | |
| COMMON CORE COURSES (1 <u>9</u> units): | ELI |
| BINF 500 DNA and Protein Sequence Analysis | A m |
| (3) | folle |
| BINF 501 Biological Informatics (3) | the . |
| BIOL 502 Techniques in Genomics and | cou |
| Proteomics (2) | BIN |
| BIOL 503 Biotechnology Law and Regulation | BIN |
| (3) | B |
| MGT 471 Project Management (3) | PH |
| D(A) = C(A) Team Drain of (4) | ם |

BIOL 600 Team Project (4)BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1) (3)

- BIOL 502 Techniques in Genomics and 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)

For Biotechnology Emphasis (17 units):

REQUIRED COURSES (7 units):

BIOL 504 Molecular Cell Biology (3) BIOL 505 Molecular Structure (4)

ELECTIVES (10 units):

A minimum of 10 units chosen from the following courses and/or from the elective courses under the Bioinformatics Emphasis:

BIOL 506 Molecular Evolution (4)

- BIOL 507 Pharmacogenomics and Pharmacoproteomics (3)
- BIOL 508 Advanced Immunology (4)
- BIOL 509 Plant Biotechnology (4)

MGT 421 Human Resource Management (3)

For Bioinformatics Emphasis (18 units):

REQUIRED COURSES (12 units): BINF 501 BIOLOGICAL INFORMATICS (3) BINF 510 Database Systems for Bioinformatics (3) BINF 511 Computational Genomics (3) BINF 513 Programming for Bioinformatics (3)

ELECTIVES (6 units):

A minimum of two courses chosen from the following and/or from the elective courses under the Biotechnology Emphasis, with at least one course in the BINF category:
BINF 512 Algorithms for Bioinformatics (3)
BINF 514 Statistical Methods in Computational Biology (3)
PHYS 445 Image Analysis and Pattern Recognition (3)
MGT 421 Human Resource Management (3)

For Biotechnology Emphasis (14 units):

REQUIRED COURSES (7 units): BIOL 504 Molecular Cell Biology (3) BIOL 505 Molecular Structure (4)

ELECTIVES (7 units):

A minimum of <u>7</u> units chosen from the following courses and/or from the elective courses under the Bioinformatics Emphasis: BIOL 506 Molecular Evolution (4) BIOL 507 Pharmacogenomics and Pharmacoproteomics (3) BIOL 508 Advanced Immunology (4) BIOL 509 Plant Biotechnology (4) MGT 421 Human Resource Management (3)

For Bioinformatics Emphasis (15-16 units):

REQUIRED COURSES (<u>9</u> units):

BINF 510 Database Systems for Bioinformatics (3)
BINF 511 Computational Genomics (3)
BINF 513 Programming for Bioinformatics (3)

ELECTIVES (6<u>-7</u> units):

A minimum of two courses chosen from the following and/or from the elective courses under the Biotechnology Emphasis, with at least one course in the BINF category: BINF 512 Algorithms for Bioinformatics (3) BINF 514 Statistical Methods in Computational Biology (3) PHYS 445 Image Analysis and Pattern Recognition (3)

MGT 421 Human Resource Management (3)

PROPOSED COURSE OF STUDY:

For Biotechnology Emphasis:

Year 1 (1<u>5</u> units) Semester 1 BINF 500 DNA and Protein Sequence Analysis (3) <u>BIOL 501 Biological Informatics (3)</u> BIOL 502 Techniques in Genomics and

PROPOSED COURSE OF STUDY:

For Biotechnology Emphasis:

(The following are mostly rearrangement of courses)

Year 1 (13 units) Semester 1 BIOL 504 Molecular Cell Biology (3) MGT 471 Project Management (3)

Semester 2
BINF 500 DNA and Protein Sequence Analysis (3)
BIOL 503 Biotechnology Law and Regulation (3)
BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)

Year 2 (20 units)

Semester 1
BIOL 502 Techniques in Genomics and Proteomics (2)
BIOL 505 Molecular Structure (4)
Electives (3)

Semester 2 BIOL 600 Team Project (4) Electives (7)

For Bioinformatics Emphasis:

Year 1 (13 units) Semester 1 BINF 501 Biological Informatics (3) MGT 471 Project Management (3)

Semester 2
BINF 500 DNA and Protein Sequence Analysis (3)
BIOL 503 Biotechnology Law and Regulation (3)
BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)

Year 2 (21 units) Semester 1 BIOL 502 Techniques in Genomics and Proteomics (2) Proteomics (2)

Semester 2
BIOL 503 Biotechnology Law and Regulation (3)
MGT 471 Project Management (3)
BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)

Year 2 (1<u>8</u> units) Semester 1 BIOL 504 Molecular Cell Biology (3) BIOL 505 Molecular Structure (4) Electives (3)

Semester 2 BIOL 600 Team Project (4) Electives (4)

For Bioinformatics Emphasis:

Year 1 (1<u>5</u> units) Semester 1 BINF 500 DNA and Protein Sequence Analysis (3) BINF 501 Biological Informatics (3) BIOL 502 Techniques in Genomics and Proteomics (2)

Semester 2
BIOL 503 Biotechnology Law and Regulation (3)
MGT 471 Project Management (3)
BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)

Year 2 (1<u>6-17</u> units) Semester 1 BINF 510 Database Systems for Bioinformatics (3) Electives (6-7)

Semester 2 BINF 511 Computational Genomics (3) BIOL 600 Team Project (4) BINF 510 Database Systems for Bioinformatics (3)BINF 511 Computational Genomics (3)

Semester 2 BINF 513 Programming for Bioinformatics (3) BIOL 600 Team Project (4) Electives (6)

REQUIREMENTS FOR THE MINOR IN BIOLOGY (21 units) No changes made.

REQUIREMENTS FOR THE CERTIFICATE IN BIOTECHNOLOGY (23-24units) No changes made.

REQUIREMENTS FOR HONORS IN BIOLOGY No changes made.

REQUIREMENTS FOR THE MINOR IN BIOLOGY (21 units) No changes made.

EQUIREMENTS FOR THE CERTIFICATE IN BIOTECHNOLOGY (23-24units) No changes made.

REQUIREMENTS FOR HONORS IN BIOLOGY

No changes made.

SUMMARY OF CHANGES

- 1. Moved BIOL 492, 494 and 497 courses from required to elective courses in biology for the BS and BA programs;
- 2. Made BIOL 499 a 3-unit course for the BS and BA programs;
- Removed ENGL 330, BIOL 326 and PHYS 338 from required GE courses for the following emphases: BS in Biology (ENGL 330), BS in Biology with Emphases in Cell and Molecular Biology and Medical Imaging (ENGL 330 and BIOL 326 or PHYS 338);
- 4. Modified the Admission Requirements for the MS program;
- 5. Streamlined the Admission Requirements for the MS program;
- 6. Deleted BINF 501 course from the MS in Biotechnology and Bioinformatics with an Emphasis in Biotechnology, and
- 7. Rearranged the sequence of Proposed Course of Study for the MS program.

JUSTIFICATION

- 1. In the last four-and-a-half years of offering the biology degree programs, we have observed uneven experiences from the students who completed the BIOL 499 Senior Capstone Colloquium where students were required to present what they had completed in their service learning projects in BIOL 492, 494 or 497. This was mainly due to the sheer numbers of students required to complete either BIOL 492, 494 or 497, and the limited faculty members who could supervise students carrying out these projects. To enrich our students' educational experience and to improve the quality of the Biology Program, we would like to move the BIOL 492, 494 and 497 courses from required to elective courses in biology. All biology undergraduate students are still required to complete the newly designed BIOL 499 course that will provide them with an enriched capstone course. We realize that various other program areas have been using these similar types of service learning courses as electives as well.
- 2. BIOL 499 in its original design was to have students to present in written and oral forms what they have learned from carrying out the BIOL 492, 494 and 497 projects. Since the latter three courses are no longer required but only elective courses, the previous objectives of BIOL 499 as a capstone course for students are no longer there. We redesigned the BIOL 499 course to make it a senior capstone course that will have major scientific writing and bioethics components incorporated into the course and its discussions. Students will also orally present their study of scientific journals and findings in the course.
- 3. Because of the modification of BIOL 499 which will emphasize writing and bioethics as well as oral and written communications, there is no longer a need to require students to take ENGL 330, BIOL 326 or PHYS 338.
- 4. The modification is to align MS program admission requirements with the general CSU admission requirements for graduate students.
- 5. All applicants for the MS program need to go through a dual admission process: the CSUCI university admission process and the MS in Biotechnology and Bioinformatics program admission process. The Catalog lists the CSUCI University Admission Requirements for graduate students under the section of Admissions, Recruitment, Records, and Registration. However, it does not cover specific program admission requirements. For the convenience of the potential graduate student applicants and for the clarity of the dual admission process, the specific Admission Requirements for the MS program need to be listed under the program description. For example, the Education Program listed all the program specific

Admission Requirements under each of their Credential Programs in the Catalog. The Biology Program believes that it is important for us to list all the program admission requirements as well.

- 6. BINF 501, as a bioinformatics course, is not necessary for students in the Biotechnology Emphasis of the MS program, and therefore is deleted from this emphasis. It remains as a required course for the Bioinformatics Emphasis.
- 7. The rearrangement is stemming from our current implementation of the MS program.

____Ching-Hua Wang_____Nov. 22, 2005_____ Proposer of Program Modification Date

Approvals

 Program Chair
 Date

 Curriculum Committee Chair
 Date

Dean

Date

California State University Channel Islands Program Modification Consultation Sheet

1. Course Title: _____

2. Program Area: _____Biology_____

Recommend Approval

| Program Area/Unit | Program/Unit Chair | YES | NO | Date |
|-------------------|--------------------|-----|-------------|------|
| | | | (attach | |
| | | | objections) | |
| Art | | | | |
| Biology | | | | |
| Business & | | | | |
| Economics | | | | |
| Education | | | | |
| English | | | | |
| History | | | | |
| Liberal Studies | | | | |
| Mathematics & CS | | | | |
| Multiple Programs | | | | |
| Psychology | | | | |
| | | | | |
| Library | | | | |
| Information | | | | |
| Technology | | | | |
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