

CALIFORNIA STATE UNIVERSITY CHANNEL ISLANDS

PROGRAM MODIFICATION

DATE: 12.06.06

PROGRAM AREA: BIOLOGY AND BUSINESS AND ECONOMICS

SEMESTER /YEAR FIRST EFFECTED: FALL 2007

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 Master of Science in Biotechnology Master of Business Administration	Name of Degree Program Master of Science in Biotechnology and Master of Business Administration
Catalog Description of the Program <u>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. 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 micro-arrays 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</u>	Catalog Description of the Program THE MASTER OF SCIENCE DEGREE 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, ALONG WITH 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 TO PROMOTE INTERPERSONAL SKILLS AND PROBLEM-SOLVING SKILLS FROM MULTIPLE PERSPECTIVES.

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

Requirements for the Degree Program

ADMISSION REQUIREMENTS

1. Applicants must have a BS/BA degree in Biology, Computer Science, Chemistry, Biochemistry, or Mathematics. Alternatively, applicants with a BNBS 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.

Requirements for the Degree Program

ADMISSION REQUIREMENTS

1. Applicants must have a BS/BA degree in Biology, Chemistry, Biochemistry, or BUSINESS AND 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

<p>3. Applicants must declare themselves as graduate students in the <u>professional MS degree program in Biotechnology and Bioinformatics</u>.</p> <p>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:</p> <ul style="list-style-type: none"> . 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 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. <p>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.</p> <p>Requirements for the Degree Program</p>	<p>graduate students in the DUAL DEGREE program.</p> <p>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.</p> <ul style="list-style-type: none"> • Applicants must submit to the program their transcript from their undergraduate institution, Graduate Record Examinations (GRE) General Test scores 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 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. <p>Requirements for the Degree Program REQUIREMENTS FOR THE MASTER OF SCIENCE DEGREE IN BIOTECHNOLOGY AND MASTER OF BUSINESS ADMINISTRATION(72 units*) DEGREE REQUIREMENTS * Assumes that at least one set of the Foundation Courses listed below has been completed in a business or science undergraduate degree program.</p> <p>REQUIRED FOUNDATION COURSES: 1. Required Foundation Courses in Biology</p>
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<p>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) <u>BIOL 600 Team Project (4)</u></p>	<p>and Chemistry for students without a BS in Biology or Chemistry (16 units):</p> <p>CHEM 110 Chemistry of Life (4) BIOL 201 Principles of Cell And Molecular Biology (4) BIOL 300 Cell Biology (4) BIOL 400 Molecular Biology (4)</p> <p>2. Required Foundation Courses in Business and Economics for students without a BS/BA in Business or Economics or a related discipline (16 units)</p> <p>BUS 500 Economics for Managers (3) BUS 502 Quantitative Methods for Decision-Making (3) BUS 504 Introduction to Accounting and Finance (4) BUS 506 Principles of Management and Marketing (3) BUS 508 Business Ethics and Law (3)</p> <p>CORE COURSES</p> <p>COMMON REQUIRED COURSES IN THE DUAL DEGREE PROGRAM (9 units):</p> <p>MGT 471 Project Management (3) BIOL/BUS 600 CAPSTONE PROJECT (6)</p> <p>REQUIRED COURSES IN MASTER OF SCIENCE IN BIOTECHNOLOGY (22 units):</p> <p>1. Required Core Courses (15 units) BINF 500 DNA and Protein Sequence Analysis (3) BIOL 502 Techniques in Genomics and Proteomics (2) BIOL 503 Biotechnology Law and Regulation (3) BIOL 504 Molecular Cell Biology (3) BIOL 510 TISSUE CULTURE TECHNIQUES AND STEM CELL TECHNOLOGY (3) BIOL 601 Seminar in Biotechnology and Bioinformatics (1)</p>
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<p>BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)</p> <p>FOR BIOTECHNOLOGY EMPHASIS (17 UNITS)</p> <p><u>Required Courses (7 units)</u></p> <p>BIOL 504 Molecular Cell Biology (3)</p> <p>BIOL 505 Molecular Structure (4)</p> <p><u>Electives (10 units)</u></p> <p><i>A minimum of 10 units chosen from the following courses and/or from the elective courses under the Bioinformatics Emphasis:</i></p> <p>BIOL 506 Molecular Evolution (4)</p> <p>BIOL 507 Pharmacogenomics and Pharmacoproteomics (3)</p> <p>BIOL 508 Advanced Immunology (4)</p> <p>BIOL 509 Plant Biotechnology (4)</p> <p>MGT 421 Human Resource Management (3)</p> <p><u>PROPOSED COURSE OF STUDY</u></p> <p><u>For Biotechnology Emphasis</u></p> <p><u>FIRST YEAR (13 UNITS)</u></p> <p><u>First Semester</u></p> <p>MGT 471 Project Management (3)</p> <p>BIOL 504 Molecular Cell Biology (3)</p> <p><u>Second Semester</u></p> <p>BINF 500 DNA and Protein Sequence Analysis (3)</p> <p>BIOL 503 Biotechnology Law and Regulation (3)</p> <p>BIOL 601 Seminar Series in Biotechnology and Bioinformatics (1)</p> <p><u>SECOND YEAR (21 UNITS)</u></p> <p><u>First Semester</u></p> <p>BIOL 502 Techniques in Genomics and Proteomics (2)</p> <p>BINF 510 Database Systems for Bioinformatics (3)</p> <p>BINF 511 Computational Genomics (3)</p> <p><u>Second Semester</u></p> <p>BINF 513 Programming for Bioinformatics (3)</p> <p>BIOL 600 Team Project (4)</p> <p><u>Electives (6)</u></p>	<p>2. Elective Courses (7 units)</p> <p><i>A minimum of 7 units from the following courses:</i></p> <p>BIOL 505 Molecular Structure (4)</p> <p>BIOL 507 Pharmacogenomics and Pharmacoproteomics (3)</p> <p>BIOL 508 Advanced Immunology (4)</p> <p>BIOL 509 Plant Biotechnology (4)</p> <p>REQUIRED COURSES IN MASTER OF BUSINESS ADMINISTRATION (24 units):</p>
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MASTER OF BUSINESS ADMINISTRATION (MBA)

CSUCI's MBA Program is designed to develop business leaders capable of working in an increasingly multicultural and global environment. Key elements include:

- . Learning Community/Cohort Experience
- . Evening Classes
- . Online Foundations of Business courses
 - Focus on International Business and Entrepreneurial Innovation
 - Study Abroad Option
- . Real-World Orientation

THE MBA CURRICULUM

The curriculum is comprised of three parts: Foundations of Business (0-16 semester units), Required Core (24 semester units), and Electives (9 semester units) for a total of 33-49 semester units.

FOUNDATIONS OF BUSINESS

The Foundations of Business courses provide the theoretical concepts and quantitative tools that form the basis for making business decisions. These courses are designed to provide students with a general understanding of accounting, economics, finance, ethics and law, statistics, management, and marketing. Some or all of these courses may be waived depending upon the applicant's undergraduate degree and coursework. Students with a bachelor's degree in business from CSUCI or from other accredited institutions within the last 10 years will have met the Foundations of Business requirements. Individual business courses taken as an undergraduate student at CSUCI or another institution may also meet specific Foundations requirements. Upon acceptance to the program, a student's transcripts will be reviewed for completion of the necessary coursework for mastery of the Foundations of Business. A grade of "C" or better is required to meet the criteria.

<p><u>Foundations of Business (0-16 units)</u></p> <p><u>BUS 500 Economics for Managers (3)</u></p> <p><u>BUS 502 Quantitative Methods for Decision Making (3)</u></p> <p><u>BUS 504 Introduction to Accounting and Finance (4)</u></p> <p><u>BUS 506 Principles of Management and Marketing (3)</u></p> <p><u>BUS 508 Business Ethics and Law (3)</u></p> <p>Required Core (24 units)</p> <p>BUS 510 High Performance Management (3)</p> <p>BUS 520 Strategy and Leadership (3)</p> <p>BUS 530 Managing Business Operations (3)</p> <p>BUS 540 Financial Reporting & Analysis (3)</p> <p>BUS 550 The Contemporary Firm (3)</p> <p>BUS 560 The Entrepreneurial Manager (3)</p> <p><u>BUS 570 Competing in a Global Environment (6)</u></p> <p>Electives</p> <p><u>With advisor approval, 9 units of upper-division or graduate-level courses.</u></p>	<p>1. Required Core Courses (18 units)</p> <p>BUS 510 High Performance Management (3)</p> <p>BUS 520 Strategy and Leadership (3)</p> <p>BUS 530 Managing Business Operation (3)</p> <p>BUS 540 Financial Reporting and Analysis (3)</p> <p>BUS 550 The Contemporary Firm (3)</p> <p>BUS 560 The Entrepreneurial Manager (3)</p> <p>2. Elective Courses (6 units)</p> <p><i>DOUBLE COUNTED:</i></p> <p>BINF 500 DNA AND PROTEIN SEQUENCE ANALYSIS (3)</p> <p>BIOL 503 BIOTECHNOLOGY LAW AND REGULATION (3)</p>
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SUMMARY OF CHANGES

1. Require GRE score for admission to join program. MBA Program had previously required GMAT score.
2. Require two common courses: MGT 471 (3) which is currently required in the MS program and BIOL/BUS 600 (6) which is a new Capstone course for the joint program. BIOL/BUS 600 replaces BUS 570 (in the current MBA program) and BIOL 600 (in the current MS program).
3. Double count 6 units: current MBA program has 9 units of electives. Three units are used for the common course MGT 471 and six units for these doubled counted: BIOL 500 and BIOL 503.

4. Total units for both earning degrees:

For “business” student:

Foundation courses in science	16
Core science courses	22
Core business courses	18
Common courses	9
Electives in science	7
(Double counted courses	<u>6</u>)
Total units	72

For “science” student:

Foundation courses in business	16
Core science courses	22
Core business courses	18
Common courses	9
Electives in science	7
(Double counted courses	<u>6</u>)
Total units	72

JUSTIFICATION

The Master of Science in Biotechnology and Master of Business Administration is a dual degree program offered through the Division of Extended Education to meet the regional and national needs of a well-educated workforce in the biotechnology industry.

In Spring 2006, the Biology and Business/Economics programs received a grant of \$50,000 from the CSU Commission on Extended Education to develop this program. In Fall 2006, an extensive biotech industry survey was conducted using a survey instrument designed by the Biology program, Business/Economics program and Extended Education. The survey was based on similar industry surveys of educational needs. Respondents identified themselves as working in the biotechnology or pharmaceutical industries. We received 237 detailed responses: 89% responded positively regarding the need for a dual graduate degree in biotechnology and business. Respondents also provided specific curricular suggestions. They indicated that such a dual degree program would lead to both employment and promotion within their industry. 92% of the respondents also indicated that a dual degree program would serve the needs of the biotechnology industry. A survey of 60 students currently enrolled in our MS in Biotechnology and Bioinformatics program and of the Advisory Board for the MS in Biotechnology and Bioinformatics program also indicates strong interest in and need for this dual degree program.

Recently, the Employment Development Department of the State of California published a document detailing growth rates and training requirements for 36 types of biotechnology jobs in California. The highly technical nature of these jobs often requires a graduate degree in biological science/science. Many jobs also require graduates to have advanced business skills.

The federal government has established High-Growth Job Training Initiative Grants to address the labor shortage in biotechnology industry. In Ventura County, the world’s largest biotechnology company, Amgen, employs 10,000 people. Ceres and Seminis in Thousand Oaks and Oxnard are affiliated with the world’s largest agricultural biotechnology company,

Monsanto. Other international biotechnology firms within our county include Baxter and Invitrogen. There are also many middle and small-sized biotech companies in the region. All of these companies need a workforce well educated at the graduate level in biotechnology and business. An opportunity for continuing education in this dual degree program will allow these biotechnology companies to attract and retain their workforces - translating into economic benefits for the local community and for California.

Currently, similar programs are offered only by a limited number of US universities (Johns Hopkins University, University of Pennsylvania, University of Florida and Rutgers University) all located in the east. California has more than 400 biotechnology companies making it the leading state for biotechnology with about twice the number of firms as any other state. Today, California's biotech firms employ about 100,000 workers. By 2015, the industry may employ about 250,000 workers. We anticipate that a significant number of these employees in the biotechnology industry will need graduate level education in science and business to advance in their careers. Since California has the most biotechnology companies in the country, CSUCI can address a need in the region by offering this dual degree program.

We have developed an innovative and interdisciplinary curriculum that blends key components of biological sciences and business at the graduate level. Most courses are currently offered through the existing MS and MBA programs. Therefore, the dual degree program is a reconfiguration and recombination of our two existing stand-alone masters programs. By recognizing the importance of combining biotechnology and business administration in a dual degree program at graduate level, our biology and business/economics programs represents very forward-looking and progressive programs within the CSU system.

The MS/MBA program will be offered through Extended Education as a self-supported program. It will not contribute to the FTE growth. With our significant relationships with the biotech industry, we will hire experts from the local biotech industry to teach - in addition to our regular faculty members.

Additionally, the program could benefit from the students' participating in tuition reimbursement plans at their biotechnology employers.

William Cordeiro and Ching-Hua Wang

Proposers of Program Modification	Date
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Approvals

Program Chair	Date
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Curriculum Committee Chair	Date
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Dean	Date
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