


May 23, 2011

To: Enrique J. Lavernia, Dean
College of Engineering


Robert Powell, Chair
Academic Senate

Fr: Matthew Farrens, Chair 
Engineering Executive Committee

Re: Approval of New Minors in Engineering

The Engineering Executive Committee met and discussed two new proposed minors in Engineering at their meeting scheduled May 19, 2011. The proposed new minors are for Biomedical Engineering to be administered by the Department of Biomedical Engineering and Computational Biology and Bioinformatics administered by the Department of Computer Science. Executive Committee members approved the proposed minors.

APPROVAL RECOMMENDED:



Enrique J. Lavernia, Dean
College of Engineering



COLLEGE OF ENGINEERING
DEPARTMENT OF
BIOMEDICAL ENGINEERING

ONE SHIELDS AVENUE
DAVIS, CALIFORNIA 95616-5294

To: College of Engineering Committee on Undergraduate Education and Policy
From Angelique Louie, Vice Chair, Biomedical Engineering

Re: Proposed Minor in Biomedical Engineering

The Department of Biomedical Engineering proposes to offer a **minor in Biomedical Engineering** for all students within the College of Engineering. The new minor would allow students from any engineering discipline to build upon their existing core strengths and add expertise in biomedical applications. This additional training would help to make students more attractive to employers in the medical device industry, and also position the students for graduate training in health related applications of engineering. The proposed minor requires two life sciences courses, not typically required for engineering, at the cellular (BIM102) and physiological (NPB101 or BIM116) levels. The remaining units are to be selected in consultation with an **academic** advisor from the upper division BIM courses for a total of 21 units for the minor. Students will be advised to select additional courses to complement their existing curricula; examples of relevant coursework for different majors are provided as a reference. These listings classify the upper division BIM courses into categories and provide a suggested subset of coursework for the majors most likely to have students interested in health-related applications.

Sincerely,

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BME Minor

Courses for the minor are listed below. **No more than one course may be counted toward both the major and the minor.** Successful completion of the minor requires the following:

1. Minimum GPA of 2.0 for coursework completed in the minor
2. No grade lower than a C- for any course counted toward the minor

Transcript notation requires successful completion of the minor. Notation will appear as minor in "Biomedical Engineering".

Total units for the minor = 21 units. All courses must be taken for a letter grade. No grade lower than a C- will be accepted.

Required Courses

NPB 101 or BIM 116 Physiology	5
BIM 102	4

Plus 12 units from upper division BME courses, chosen in consultation with an academic advisor

The information below will be provided as advising materials and it not part of the catalog listing for the minor. These are suggested only, not required.

EE/CS-Related Electives

- BIM 108 Biomedical Signals and Control
- BIM 109 Biomaterials
- BIM 111 Biomedical Instrumentation
- BIM 117 Analysis of Molecular and Cellular Networks
- BIM 118 Microelectromechanical Systems
- BIM 142 Biomedical Imaging
- BIMxxx Bioelectricity

ME-Related Electives

- BIM 111 Biomedical Instrumentation
- BIM 118 Microelectromechanical Systems

BIM 126 Tissue Mechanics

BIM 141 Cell and Tissue Mechanics

BIM 151 Mechanics of DNA

BIM 167 Biomedical Fluid Mechanics

ChE/MS-Related Electives

BIM 109 Biomaterials

BIM 140 Protein Engineering

BIM 151 Mechanics of DNA

BIM 161A Biomolecular Engineering

BIM 161L Biomolecular Engineering Laboratory

BIM 162 Quantitative Concepts in Biomolecular Engineering

BIM 173 Cell and Tissue Engineering

Computational Electives

BIM 117 Analysis of Molecular and Cellular Networks

BIMxxx Molecular Control of Biosystems

BIMxxx Systems Biology

UC Davis Computational Biology and Bioinformatics Minor Program

Offered by the Department of Computer Science
2063 Kemper Hall
+1 530 752 7004

Overview: Technological advances in the past 15 years have revolutionized biological sciences, as they have allowed large-scale simulations and high-throughput experiments throughout the Tree of Life. Unarguably, there is a need for computational methods that enable us to efficiently store, analyze and visualize the plethora of biological information available. Scientific methods from many areas of computer science such as machine learning, graph theory, scientific computation, visualization and databases, have been employed to address problems in biological sciences, while projections support that biological-related research in those areas will continue to increase in the next decade.

The minor in **Computational Biology and Bioinformatics (CBB)** will provide to students with engineering, physical or biological majors the foundations necessary to build efficient computational models and algorithms, use state-of-the-art techniques for scientific analysis and create scalable infrastructure environments for biological and biotechnological applications.

Comparison to other minors: Despite the significant presence of biological research on campus, we currently lack a minor with a clear emphasis on computational techniques that are biology related. The only minor that has a small overlap, the minor in Quantitative Biology and Bioinformatics, puts its emphasis on the mathematical methods rather than on computational methods and does not focus on any of the biology-relevant computer science areas mentioned.

Requirements: Students must take a total of **20** upper division units, with **two required courses** and **three electives**, as specified below. At most **one** course may be counted toward both the student's minor and major. A **minimum GPA of 2.0** is required for coursework in the minor. Students should note that most of the courses listed below have lower division prerequisites.

- **Required courses (2 courses, 8 units):**
 - ECS 122A Algorithm Design and Analysis
 - ECS 124 Theory and Practice of Bioinformatics

- **Electives (3 courses, 12 units):**

- One biology course from the following:

MCB 121 Molecular Biology of Eukaryotic Cells	EVE 103 Phylogeny and Macroevolution
MCB 124 Macromolecular Structure and Function	EVE 104 Community Ecology
MCB 161 Molecular Genetics	EVE 131 Human Genetic Variation and Evolution
MCB 182 Principles of Genomics	BIS 101 Genes and Gene Expression
EVE 100 Introduction to Evolution	BIS 104 Regulation of Cell Function
EVE 101 Introduction to Ecology	BIS 122 Population Biology and Ecology
EVE 102 Population and Quantitative Genetics	

- One computational or statistics course from the following:

ECS 130 Scientific Computation	ECS 166 Scientific data Management
ECS 132 Probability and Statistical Modeling for CS	ECS 170 Introduction to Artificial Intelligence
ECS 140 Programming Languages	ECS 177 Introduction to Visualization
ECS 145 Scripting Languages and Their Applications	EVE 175 Computational Genetics
ECS 156 Discrete-Event Simulation	STA 141 Statistical Computing
ECS 158 Programming on Parallel Architectures	STA 130A Brief Mathematical Statistics
ECS 160 Introduction to Software Engineering	BIT 150 Applied Bioinformatics
ECS 165A Database Systems	BIS 132 Introduction to Dynamic Models in Biology

- One computational biology and bioinformatics course from the following:

ECS 129 Computational Structural Biology	EVE 175 Computational Genetics
BIS 132 Introduction to Dynamic Models in Biology	BIT 150 Applied Bioinformatics
BIM 117 Analysis of Molecular and Cellular Networks	