

BME146 MINIATURIZATION IN BIOTECHNOLOGY AND BIOLOGICAL SCIENCE

Catalog Data:	BME146 Miniaturization in Biotechnology and Biological Science (Credit Units: 4) W. Introduction to the biotechnology industry and the various instruments (e.g., glow cytometry, PCR, centrifuge, electrophoresis, mass spectrometer) that are being miniaturized by MEMS and nanotechnology; fundamental principles of molecular based sensing, gene chips, microfluidics, and self assembly of biological molecules. (Design units: 1)
Textbook:	Madou, Marc. <i>Fundamentals of Microfabrication. The Science of Miniaturization</i> , 2 nd edition, CRC Press, 2002
References:	Class notes.
Coordinator:	William Tang.
Course Outcomes:	Students will be able to: Understand the principles of operation of essential instruments in biotechnology that can be miniaturized. Develop the techniques for designing, fabricating, and evaluating miniaturized biotechnology instruments. Apply the fundamental principles of molecular based sensing, gene chips, microfluidics, and self assembly of biological.
Prerequisites By Topic:	Freshman level chemistry and physics.
Lecture Topics:	Introduction: From MEMS to BioMEMS. Electrochemistry background (I and II). Optics background and acoustics background. Other sensing principles. Ion selective electrodes. Gas sensors. Enzyme based sensors. Protein based sensors – immunosensors (I and II). DNA probes and arrays (I and II). DNA amplification. Cells and liposomes. Fluidics compared. CD fluidics. Total analysis systems. Nanomachining (I and II). Biomimetics.
Class Schedule:	Each class meets 3 hours per week for 10 weeks and students are assigned to a 1 hour discussion session per week.
Computer Usage:	Students will use word processors and spreadsheets to do homework assignments.
Laboratory Projects:	None.

Professional Component: Contributes toward the Biomedical Engineering Topics and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes 1, 2, and 4 as stated at: http://www.eng.uci.edu/dept/objective_biomedical.

Design Content Description

Approach: Specific discussions on system and device designs. (50%) Students will use learned skills to design systems and devices for biotechnology. (50%)

Lectures: 100%

Laboratory Portion:

Grading Criteria:

Homework assignments:	30%
Midterm exam:	30%
Final exam:	<u>40%</u>
	100%

Estimated ABET Category Content:

Mathematics and Basic Science: 0 credit units or 0%

Engineering Science: 3 credit units or 75%

Engineering Design: 1 credit units or 25%

Prepared by: William Tang **Date:** July 2005

CEP Approved: Winter 2005