

BME146 MINIATURIZATION IN BIOTECHNOLOGY AND BIOLOGICAL SCIENCE
(Elective)

Catalog Data: **BME146 Miniaturization in Biotechnology and Biological Science**
(**Credit Units: 4**) Introduction of BIOMEMS to engineering and science students. Study of various sensing technique fundamentals. Introduction to various biosensors. Introduction to biological sprinciples using examples; nonomachining and biomimetics. (Design units: 1)

Textbook: Madou, Marc. *Fundamentals of Microfabrication. The Science of Miniaturization*, 2nd edition, CRC Press, 2002

References: Class notes

Coordinator: William Tang

Relationship to Program Outcomes: This course relates to the Program Outcomes for **BME: a, and k** as stated at:
<http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission>

Course Outcomes / Performance Criteria: Students will:
Understand the principles of operation of essential instruments in biotechnology that can be miniaturized. (BME k)
Develop the techniques for designing, fabricating, and evaluating miniaturized biotechnology instruments. (BME k)
Apply the fundamental principles of molecular based sensing, gene chips, microfluidics, and self assembly of biological sensors. (BME k)

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: Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.

Computer Usage: Students will use word processors and spreadsheets to do homework assignments.

Laboratory Projects:

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

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: 0%

Grading Criteria:

Homework assignments:	30%
Midterm exam:	30%
<u>Final exam:</u>	<u>40%</u>
Total	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 C. Tang

Date: July 2008

CEP Approved: Winter 2006