BME145 MEMS AND NANOTECHNOLOGY FOR BIOMEDICINE AND BIOTECHNOLOGY

(Elective for BME)

Catalog Data: **BME145 MEMS and Nanotechnology for Biomedicine and Biotechnology (Credit Units: 4).** Basic concepts of MEMS and nanotechnology, its application to biotechnology/biomedicine. Introduction to scaling laws as applied toward living systems and artificial devices; micro- and nanofabrication; sensor and actuator principles; drug delivery, implantable systems, minimally invasive surgery, total analysis systems. (Design units: 1)

Textbook: TBA

References: Class notes

Coordinator: Abraham Lee

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

Course Outcomes / Performance Criteria: Students will:

Understand the physical scaling principles of both living and synthetic systems in the micro and nano length scales. (BME a)

Understand how micro/nano devices are fabricated for interfacing to the biological world. (BME a)

Analyize the operation princeiples for miniaturized (micro and nano) devices and instrumentation for treatment and diagnosis of human diseases. (BME b)

Apply the essential techniques in MEMS and nanotechnology to biomedicine including device design, fabrication, testing, and characterization. (BME e)

Prerequisites By Topic: Freshman level chemistry and physics

Lecture Topics:

Introduction to micro/nanofabrication.
Introduction to scaling laws and principles.
Introduction to transduction (sensors and actuators) principles.
Introduction to MEMS and nanotechnology devices (sensors, actuators, biomaterials).
System and integration aspects of MEMS/nanotechnology.
Cells and biomolecules as biotransducers.
Microfluidics.
Biosensors.
In vivo MEMS and nanotechnology (surgical tools, drug delivery, implantable systems).
In vitro MEMS and nanotechnology (point of care diagnostics).
MEMS and nanotechnology for understanding biology.
Challenges and limitations of MEMS and nanotechnology in biomedicine.

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: 50%

Grading Criteria:

Homework assignments:	30%
Midterm exam:	30%
Final exam:	40%
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: Abraham Lee **Date:** July 2008

CEP Approved: Winter 2006