BME137 INTRODUCTION TO BIOMEDICAL IMAGING

(Elective)

Catalog Data:	**BME137 Introduction to Biomedical Imaging (Credit Units: 4)** Introduction to imaging modalities widely used in medicine and biology, including x-ray, computed tomography (CT), nuclear medicine (PET and SPET), ultrasonic imaging, magnetic resonance imaging (MRI), optical tomography, imaging contrast, imaging processing, and complementary nature of the imaging modalities. Prerequisite: BME130. (Design Units: 1)
Textbook:	Webb, A., *Introduction to Biomedical Imaging*, John Wiley & Sons, 2003.
References:	Cho, Z., *Foundations of Medical Imaging*, John Wiley & Sons, 1993. Handouts
Coordinator:	Zhongping Chen
Course Outcomes:	Students will: Identify and describe in qualitative terms of the x-ray generation, x-ray-tissue interaction, x-ray detections, and x-ray imaging formation. Describe the principle of the CT and the imaging reconstruction methods involved. Describe in qualitative terms, the principle of ultrasound imaging. Describe the principle of the PET and SPECT. Describe the principle of the magnetic resonance imaging. Identify and describe the imaging contrast, imaging resolution, and signal to noise ratio involved in biomedical imaging. Identify and describe the Complementary nature of various imaging.
Prerequisites by Topic:	Introductory physics, linear algebra, and ordinary differential equations
Lecture Topics:	Introduction to imaging X-ray and computed tomography (CT) Nuclear medicine (PET and SPET) Magnetic resonance imaging (MRI) Ultrasonic imaging Optical tomography Imaging contrast and imaging processing
Class Schedule:	Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.
Computer Usage:	MATLAB may be required to perform imaging reconstruction problems in homework.
Laboratory Projects:	
Professional Component:	Contributes toward the Biomedical Engineering Topics and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes (a), (b), (g), (i), (j), and (k) as stated at:
http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission

Design Content Description:

Approach: Students will be given a set of pathological conditions and asked to identify the appropriate imaging modality that has the best chance to diagnose the pathological condition. Factors to be considered include spatial resolution, contrast, signal to noise ratio, contrast to noise ratio, and costs. (20%) Lectures will cover the fundamental principles of various imaging modalities, including imaging contrast, resolution, and signal to noise level. (80%)

Lectures: 100%

Laboratory Portion: 0%

Grading Criteria:

Homework:	30%
Midterm:	30%
Final:	40%
	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: Zhongping Chen **Date:** July 2007

CEP Approved: Spring 2004