BME 120 QUANTITATIVE PHYSIOLOGY: SENSORY MOTOR SYSTEMS

(Required for BME and BMEP; Elective for MSE)

Catalog Data:	**BME 120 Quantitative Physiology: Sensory Motor Systems (Credit Units: 4)** A quantitative and systems approach to understanding physiological systems. Systems covered include the nervous and musculoskeletal systems. Prerequisite: Mathematics 3D or equivalent, or consent of instructor. Concurrent with BME220. Formerly Engineering E110B. (Design units: 2)
Textbook:	Seeley, Stephens, and Tate, *Anatomy & Physiology*, 6th Edition, McGraw-Hill, 2002.
References:	Supplemental readings will be placed at the engineering copy center ET 203 and on the course website at: http://eee.uci.edu/
Coordinator:	Fan-Gang Zeng
Course Outcomes:	Students will: Understand relevant anatomies of the nervous and musculoskeletal systems. Apply engineering models and mathematics to understand human physiology. Design devices for enhancing human function.
Prerequisites by Topic:	Freshman-level differential equations
Lecture Topics:	Muscle Neurons (as cables and computers) Motor systems (emphasis on arm movement control) Sensory systems (emphasis on auditory system) Basic dynamics/mechanical circuits (spring, mass dashpot) First and second order linear differential equations Electrical circuits Nonlinear equations and simulation Ion transport Signal processing – frequency analysis and filters Control theory – feedforward, feedback, impedance control, Black's formula Biomechanical modeling of movement control and surgery Functional electrical stimulation systems Rehabilitation robotics Biomimetic devices (e.g. robotic insects) Neuroprostheses (e.g. cochlear implants) Brain computer interfaces
Class Schedule:	Meets for 3 hours of lecture and 1 hour of discussion each week for 10 weeks.
Computer Usage:	Students will use Microsoft Word and Excel to prepare Problem-Based Learning (PBL) reports and CAD tools to simulate neural circuits.

Laboratory Projects: One Computer laboratory on the modeling of neural circuits.

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

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

Design Content Description:

Approach: Student will use PBL skills to analyze and design systems to simulate neural and musculoskeletal systems. (50%) Specific discussions on neural and musculoskeletal system analyses and designs. (40%) Students will use computer to model and analyze neural circuits. (10%)

Lectures: 90%

Laboratory Portion: 10%

Grading Criteria:

Homework:	20%
PBL reports:	30%
Midterm:	20%
Final:	40%
	100%

Estimated ABET Category Content:

Mathematics and Basic Science:	0	Credit units or	0%
Engineering Science:	2	Credit units or	50%
Engineering Design:	2	Credit units or	50%

Prepared by: Fan-Gang Zeng **Date:** July 2007

CEP Approved: Fall 2002