CBEMS104 QUANTITATIVE PHYSIOLOGY: ORGAN TRANSPORT SYSTEMS

Catalog Data: **CBEMS104 Quantitative Physiology: Organ Transport Systems (Credit Units: 4) S.** A quantitative and systems approach to understanding physiological systems. Systems covered include the cardiopulmonary, circulatory, and renal systems. Prerequisite: Mathematics 3D or equivalent, or consent of instructor. Same as BME121. Concurrent with CBEMS204 and BME221. (Design units: 1)

Textbook: Seeley, Stephens, and Tate, *Anatomy & Physiology,* 6th Edition, McGraw-Hill, 2002.

References:

Coordinator: Steven C. George

Course Objectives: There are three broadly defined goals for the course: 1) describe the relevant anatomical features of the cardiopulmonary, circulatory systems, 2) describe quantitatively the physiological function of the cardiopulmonary, and circulatory systems, and 3) work in small groups using problem-based learning techniques to solve complex engineering design problems.

Course Outcomes: Students will be able to:
Describe and identify basic anatomical features of the pulmonary and cardiovascular systems.
Describe both qualitatively and quantitatively the fundamental physiological functions of the pulmonary and cardiovascular systems.
Perform fundamental mass balances as applied to physiological systems, and solve the resulting first order differential equations.
Apply knowledge of anatomy and physiology of the pulmonary and cardiovascular systems together with basic engineering principles to design solutions to current medical problems.

Prerequisites By Topic: Differential Equations.

Lecture Topics: Cardiac anatomy
Mechanical analysis of heart Chambers, pressure flow relations.
Electrophysiological analysis of conduction in heart.
Circulatory anatomy.
Pressure flow relationships in arterial and venous trees.
Blood and blood substitutes.
Anatomy of the lungs.
Gas exchange properties of the lungs, quantitative description.
Mechanical properties of the lungs.
Respiratory Control.
Midterm and Final.

Class Schedule: Each class meets 4 hours per week for 10 weeks.

Computer Usage: Word processing of written solutions to design problems, and basic spreadsheet calculations.

Laboratory Projects:

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

Relationship to Program Outcomes: This course relates to Program Outcomes 4, 5, 6, 7, 8, 9, and 10 as stated at: http://www.eng.uci.edu/dept/objective_chemical

Design Content Description

Approach: Small group discussion of open ended biomedical design problems (problem based learning). Written reports of design solution. (50%) Description of mathematical models which describe physiologic function and can be used in the design of solutions of pulmonary or cardiovascular problems. (50%)

Lectures:

Laboratory Portion:

Grading Criteria:

Weekly homework problems:	20%
Midterm exam:	30%
Final exam:	50%
	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: Steven C. George **Date:** July 2005

CEP Approved: Fall 2002