CBEMS 124 TRANSPORT PHENOMENA IN LIVING SYSTEMS

Catalog Data:	**CBEMS 124 Transport Phenomena in Living Systems (Credit Units: 3).** An introduction to transport phenomena in cellular and whole organ systems. Application of transport theory including advection and diffusion to the movement of molecules in biological systems, including the cardiovascular system (heart and microcirculation), and the lung. Prerequisite: CBEMS120A or consent of instructor. (Design units: 0)
Textbook:	Handout
References:	General books on Momemtum, Heat, and Mass Transfer
Coordinator:	Steven C. George
Course Objectives:	There are two broadly defined goals for the course: 1) establish a general knowledge base of the different mechanisms and special characteristics of transport phenomena in living systems, and 2) begin to develop the necessary skills (e.g. identifying individual strengths within a group, establishing firm and realistic aims and goals) to approach and solve difficult real-world problems working by yourself and within a group.
Course Outcomes:	
Prerequisites by Topics:	All students are expected to have had an undergraduate series in transport phenomena, and a firm grounding in elementary mathematics. No prior knowledge of biology or physiology is required.
Lecture Topics:	Momentum, Energy, and Mass transfer (Eqs. of Motion, Energy, and Continuity, Newton's, Fourier's, and Fick's Law) Blood Flow in Arteries: Background considerations, biorheology, non-Newtonian characteristics Blood Flow in Capillaries: microcirculation: seepage flow, ultrafiltration Airflow in the Lungs. gas flow in bifurcating airways, steady flow with and without axial diffusion Gas Exchange in the Alveoli, Soluble Gas Uptake in the lungs Diffusion across biological Membranes. free diffusion, facilitated diffusion, diffusion with chemical reaction , diffusion across lipid bilayers Diffusion of Oxygen . With chemical reaction in the red cell; Through arterial wall (model for atherosclerosis)
Class Schedules:	Each class meets 3 hours per week for 10 weeks.
Computer Usage:	Fortran, C+, Mathcad, or basic for solving ordinary and partial differential equations and parameter estimation

Professional Component: This course is designed to contribute to the students' knowledge of engineering topics. The following considerations are included in this course: economic, environmental, ethical, health and safety, manufacturability.

Laboratory Projects:

Relationship to Program Outcomes:

This course relates to Program Outcomes 4, 5, 8, 9, 10, 11 and 12 as stated at: http://www.eng.uci.edu/dept/objective_chemical

Design Content Description:

Approach: N/A
Lectures: N/A
Laboratory Portion: N/A

Grading Criteria: (1) final exam (30%), (2) evaluation by your peers on your involvement in solving the problems (50%), and (3) evaluation by myself in your involvement in the class (20%). The evaluation by your peers will involve each of you distributing "salaries" to everyone else in the group based on your perceived contribution to the solution (I'll handout a salary distribution worksheet).

Estimated ABET Category Contents

Mathematics and Basic Science: 0 credit units or 0%
Engineering science: 3 credit units of 100%
Engineering design: 0 credit unit or 0%

Prepared by: Steven C. George **Date: June 2005**
CEP Approved: Fall 2001