

BME121 QUANTITATIVE PHYSIOLOGY: ORGAN TRANSPORT SYSTEMS

(Required for BME and BMEP)

- Catalog Data:** **BME121 Quantitative Physiology: Organ Transport Systems (Credit Units: 4)** 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 CBEMS104. Concurrent with BME221, CBEMS204. Formerly Engineering E110A. (Design units: 1)
- Textbook:** Seeley, Stephens, and Tate, *Anatomy & Physiology*, 6th Edition, McGraw-Hill, 2002.
- References:**
- Coordinator:** Steven C. George
- Course Outcomes:** Students will:
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
- Class Schedule:** Meets for 3 hours of lecture and 1 hour of discussion each 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 Biomedical Engineering Topics and Major Design experience.

Relationship to Program Outcomes: This course relates to Program Outcomes (a), (c), (d), (e), (f), (g), (h), (i), (j), and (k) as stated at:
<http://undergraduate.eng.uci.edu/degreeprograms/biomedical/mission>

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: 100%

Laboratory Portion: 0%

Grading Criteria:

Weekly homework:	10%
Written reports:	25%
Midterm:	25%
Final:	<u>40%</u>
	100%

Estimated ABET Category Content:

Mathematics and Basic Science:	<u>0</u>	Credit units or	<u>0%</u>
Engineering Science:	<u>3</u>	Credit units or	<u>75%</u>
Engineering Design:	<u>1</u>	Credit units or	<u>25%</u>

Prepared by: Steven C. George **Date:** July 2007

CEP Approved: Fall 2002