

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. (Design units: 1)

Textbook: Seeley, Stephens, and Tate. *Anatomy & Physiology*, 8th edition, McGraw-Hill, 2007.

References:

Coordinator: Steven C. George

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

Course Outcomes / Performance Criteria: Students will:
Describe and identify basic anatomical features of the pulmonary and cardiovascular systems. (BME a)
Describe both qualitatively and quantitatively the fundamental physiological functions of the pulmonary and cardiovascular systems. (BME a)
Perform fundamental mass balances as applied to physiological systems, and solve the resulting first and second order differential equations. (BME a, k)
Apply knowledge of anatomy and physiology of the pulmonary and cardiovascular systems together with basic engineering principles to design solutions to current medical problems. (BME a, c, e, f, g, h, i, j, k)

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 Biomedical Engineering Topics and Major Design experience.

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 exam: 25%

Final exam: 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: Steven C. George

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CEP Approved: Winter 2002