BMED 2210 Conservation Principles in Biomedical Engineering (Required)

Catalog Description: BMED 2210 Conservation Prin in BME (4-0-4)
Prerequisite(s): CHEM 1211K and MATH 1552 (w/ minimum grade of "C" in both prerequisite courses)
A study of material and energy balances applied to problems in biomedical engineering.

Textbook: Basic Principles and Calculations in Chemical Engineering, Himmelblau and Riggs, Prentice-Hall (2012)

Prepared by: Joe Le Doux

Topics Covered:

1. Basics of engineering calculations, including units and dimensions
2. Conservation equations
3. Mass balances
4. Degree-of-freedom analysis
5. Equilibrium systems of gases, vapors, liquids and solids
6. Energy balances
7. Solving simultaneous mass and energy balances

Course outcomes:

Students who complete this course will be able to:

Outcome 1: Know the basics of conducting engineering calculations (Student Outcomes a and e)

- 1.1 Convert quantities from one set of units to another quickly and accurately
- 1.2 Define, calculate, and estimate system and material properties such as fluid density, flow rate, chemical composition, fluid pressure, temperature, enthalpy, work, and heat capacity
- 1.3 From verbal descriptions of problems, draw and label process diagrams, and use the diagrams as problem-solving tools

Outcome 2: Comprehend concepts and principles of mass and energy conservation (Student Outcomes a and e)

- 2.1 Identify principles in restated form
- 2.2 Describe examples of principles and state hypothesis that are in harmony with the principles
- 2.3 Distinguish between correct and incorrect interpretations of the principles

Outcome 3: Apply these concepts and principles to the analysis of biological systems (Student Outcomes a and e)

- 3.1 Write and solve mass and energy balance equations for single-unit and multi-unit systems, systems with multi-component streams, systems with reactive processes, and dynamic systems
- 3.2 Calculate internal energy and enthalpy changes for fluids that undergo specific changes in temperature, pressure, phase, and chemical composition and incorporate the results of these calculations into system mass and energy calculations

Correlation between course outcomes and student outcomes:

BMED 2210											
	Biomedical Engineering Student Outcomes										
Course outcomes	a	b	c	d	e	f	g	h	i	j	k
1.1	X										
1.2	X										
1.3	X				X						
2.1	X				X						
2.2	X				X						
2.3	X				X						
3.1	X				X						
3.2	X				X						

The Wallace H. Coulter Department of Biomedical Engineering Student Outcomes:

a. an ability to apply knowledge of mathematics, science, and engineering;
b. an ability to design and conduct experiments, as well as to analyze and interpret data;
c. an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, societal, political, ethical, health and safety, manufacturability, and sustainability;
d. an ability to function on multidisciplinary teams;
e. an ability to identify, formulate, and solve engineering problems;
f. an understanding of professional and ethical responsibility;
g. an ability to communicate effectively;
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
i. a recognition of the need for, and an ability to engage in lifelong learning;
j. a knowledge of contemporary issues;
k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice;