1. Course Number and Name - BMED 2110 Conservation Principles in Biomedical Engineering
2. Credits and Contact Hours: (1-4-0-3)
3. Prepared by: Joe LeDoux
4. Textbook: Basic Principles and Calculations in Chemical Engineering, Himmelblau and Riggs, Prentice-Hall (2012)
5. Specific Course Information:
    a. Catalog description: study of material and energy balances applied to problems in biomedical engineering.
    b. Prerequisites or co-requisites: CHEM 1211K and MATH 1552
    c. Required
6. Specific goals for the course
    a. Know the basics of conducting engineering calculations (Student Outcome 1)
        i. Convert quantities from one set of units to another quickly and accurately
        ii. Define, calculate, and estimate system and material properties such as fluid density, flow rate, chemical composition, fluid pressure, temperature, enthalpy, work, and heat capacity
        iii. From verbal descriptions of problems, draw and label process diagrams, and use the diagrams as problem-solving tools
    b. Comprehend concepts and principles of mass and energy conservation (Student Outcome 1)
        i. Identify principles in restated form
        ii. Describe examples of principles and state hypothesis that are in harmony with the principles
        iii. Distinguish between correct and incorrect interpretations of the principles
    c. Apply these concepts and principles to the analysis of biological systems (Student Outcome 1)
        i. 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
        ii. 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
    d. Communicate solutions of problems (Student Outcome 5)
        i. Generate effective written reports
        ii. Construct and present effective oral presentations
    e. One year after having taken the course, students should be able to explain, through the lens of a theoretical framework from the social sciences, the

different kinds of group dynamics that can take place within teams, the impact that various kinds of diversity can have on those dynamics (including personality, prior experiences, and content knowledge), and be able to use this information to analyze and influence their own team's interactions"

7. Brief list of topics to be covered:
    a. Basics of engineering calculations, including units and dimensions
    b. Conservation equations
    c. Mass balances
    d. Degree-of-freedom analysis
    e. Equilibrium systems of gases, vapors, liquids and solids
    f. Energy balances
    g. Solving simultaneous mass and energy balances
    h. Theoretical framework of group dynamics