1. Course number and name: **MME 2305 Material and Energy Balance**

2. Credits and contact hours. **3 Credit Hours, 3 Lecture**

3. Instructor's or course coordinator's name: *Associate Prof. David A. Roberson*

4. Text book, title, author, and year.
   No textbook used

5. Specific course information
   a. Introduction to process variables, stoichiometry, materials balance, first law of thermodynamics, and energy balance applied to materials system.
   b. Prerequisites or co-requisites: CHEM 1305 or 1306, and MATH 2313, with grades of "C" or better or department approval.
   c. Required

6. Specific goals for the course
   a. Learning Outcomes
   - Describe the concepts of the conservation of mass (Exam I, II)
   - Describe the concepts of the first law of thermodynamics (Exam III, IV)
   - Apply algebraic principles to balance chemical equations (Exam II, IV)
   - Apply principles of chemistry to analyze material processes (Exam II, IV)
   - Review and apply unit analysis to solve material and energy balance problems (Exam I-IV)
   - Analyze conservation of energy for single and multi-phase systems (Exam IV)

   b. Student Outcomes

	Outcome	**Level***	**Relevant Activities**
1.	(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science and mathematics	**H**	Mathematical calculations of mass and energy balances in cases where chemical reactions do and do not occur.
2.	(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare as well as global, cultural, social environmental, and economic factors.	**L**	The course provides the students with an ability to evaluate the use of different material combinations in the synthesis or refining of materials. .
3.	(3) an ability to communicate effectively with a range of audiences	**L**	Students encouraged to participate in the lectures to enable 2-way communication.

4.	(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.	**L**	Students had to complete homework assignments to a specified format.
5.	(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.	**M**	Students encouraged to perform homework assignments in groups.
6.	(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgement to draw conclusions	**L**	Homework assignments and lectures designed towards the application of conservation of mass and energy.
7.	(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.	**M**	Introduction to materials synthesis problems pertaining to the emerging technology of additive manufacturing.

7. Brief list of topics to be covered
    - Units and unit analysis
    - Stoichiometry
    - Conservation of mass and mass balances
    - First law of thermodynamics and energy balances combined mass and energy balances.