Programme	B.Sc. (Engg.) Energy Engineering	Course Code	EE 214	Credit Hours	3 + 0 = 3
Course Title	**Energy Engineering Principles and Calculations-II**				

Course Introduction

This major based core breadth engineering course enables students to comprehend the energy balance knowledge, allowing them to calculate the amount of energy generated or required during a process using engineering principles.

Mapped SDGs	SDG-7: Affordable and Clean Energy

Learning Outcomes

1. **Demonstrate** the concepts related to energy balance. (C3)
2. **Solve** energy and mass balance problems by incorporating different approaches. (C3)

Course Content		Assignments/Readings
Week 1	**Unit-I Energy properties** 1.1 Enthalpy, heat content, heat capacity	The teacher may assign home assignments/problem-based learning/reading materials/learning activity etc.
Week 2	1.1 Heat of formation/ combustion/ reaction/ solution	
Week 3	1.2 Steam tables (saturated and super saturated steam properties)	
Week 4	1.3 Temperature and Enthalpy	
Week 5	1.3 Humidity correlations	
Week 6	1.3 Psychometric properties	
Week 7	1.4 Adiabatic flame temperature	
Week 8	1.4 Combustion efficiency 1.4 Plant efficiency (energy losses)	
Week 9	**Unit-II Energy balance calculations** 2.1 Energy / Exergy basics 2.2 Energy balance on multiple-device systems	
Week 10	2.3 Heat balances involving solutions phases	
Week 11	2.4 Energy balance equation derivation and application (batch and continuous processes)	
Week 12	2.5 Energy balance for reactive systems and non-reactive systems	
Week 13	**Unit-III Combined mass and energy engineering calculations** 3.1 Uncoupled system balances	

Week 14	3.3 System balances using computational tools	
Week 15	3.3.1 Excel based FlowBal-flowsheet simulator for material balances	
Week 16	3.3.1 Excel based FlowBal-flowsheet simulator for heat balances	

Textbooks and Reading Material

1. Himmelblau, D. M., Riggs, J. B. (2022). Basic Principles and Calculations in Chemical Engineering. United Kingdom: Pearson Education.
2. Felder, R. M., Rousseau, R. W., Bullard, L. G. (2020). Elementary principles of chemical processes. John Wiley & Sons.
3. Green, D. W., Perry, R. H. (2019). Perry's Chemical Engineers' Handbook. McGraw-Hill Education.
4. Seyed, A. A. (2019). Mass and Energy Balances: Basic Principles for Calculation, Design, and Optimization of Macro & Nano Systems. Springer.
5. Hipple, J. (2017). Chemical Engineering for Non-Chemical Engineers. John Wiley & Sons.
6. Hicks, T., Chopey, N. (2012). Handbook of Chemical Engineering Calculations. McGraw Hill Professional.
7. Morris, A.E., Geiger, G., & Fine, H.A. (2011). Handbook on Material and Energy Balance Calculations in Material Processing. John Wiley & Sons.
8. Akram, M.S., Usman, M.R. (2021). Simulation and optimization of hydrogen fueled mobile power plant based on methylcyclohexane–toluene–hydrogen cycle. Theoretical Foundations of Chemical Engineering 55, 545-561.

Teaching Learning Strategies

The teaching strategies for the energy balance on a particular system will incorporate a variety of approaches to enhance understanding and engagement of students. Lectures will utilize multimedia and whiteboards, to present core concepts effectively. Group discussions will foster critical thinking. Take home numerical problems or case studies tasks will provide students confidence in solving energy engineering problems.

Assignments: Types and Number with Calendar

Week	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Activity	-		-	Assignment 1	-	-	Quiz 1	-

Week	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Activity	-	-	-	Assignment 2	-	-	Quiz 2	-

The abovementioned schedule of assignments/quizzes/presentations is tentative. The schedule will be provided to the students at the start of semester.

Assessment			
Sr. No.	**Elements**	**Weightage**	**Details**
1.	Midterm Assessment	35%	Written assessment at the mid-point of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work, report writing, and viva-voce examination, etc.
2.	Sessional Assessment	25%	This assessment may include classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written assessment at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work, report writing, and viva-voce examination, etc.