I CHE231 Chemical Engineering Principles-II

Course Outlines

- **Title:** Chemical Engineering Principles-II
- **Code Number:** CHE231
- **Semester:** 3rd
- **Credit hours:** 2
- **Pre-requisites course requirements/ skills:** Basic knowledge and understanding of engineering science principles, physical laws, and mathematical tools and solution of linear algebraic equations.
- **Learning Outcomes:**

  Upon successful completion of the course, the students will be able to

  1. Describe the role of physical laws governing mass and energy balance calculations.
  2. Acquire skills through SOPs for mass and energy balance calculations.
  3. Solve technical problems associated with mass and energy balance calculations.

- **Contents**

  Unit I: Recycle, Bypass and Purge Calculations

  1.1 Recycle streams in process industries (concept, applications & calculations)
  1.2 Bypass streams in process industries (concept, applications & calculations)
  1.3 Purge streams in process industries (concept, applications & calculations)
  1.4 Computer aided tools for complex numerical calculations

  Unit II: Gases, Vapours and Liquids (Material Balance with Phase Transition)

  2.1 Why gaseous handling is challenging in industrial processes
  2.2 Governing gas laws and their calculations
  2.3 Real gas relationships and deviation from ideality when operated at elevated temperature and pressure
  2.4 Distinction between vapour and gas
  2.5 Vapour pressure of liquids and its implications in engineering calculations
  2.6 Methods for determining vapour pressure
  2.7 Saturation and partial saturation conditions
  2.8 State of equilibria

2.9 Humidity and molal saturation
2.10 Material balance involving condensation and vaporization

Unit III: Energy Balance in Chemical Engineering

3.1 Role of energy balance in Chemical Engineering and its applications
3.2 Law of conservation of energy
3.3 First law of thermodynamics
3.4 Reversible processes and mechanical energy balance
3.5 Enthalpy calculations
3.6 Derivation of energy balance equation for both batch and continuous process
3.7 Derivation of energy balance equation for both reactive and non-reactive systems

- **Teaching-learning Strategies**

The teaching and learning strategy has been designed on the understanding of concepts and the ability to critically analyze and apply the learned content through lectures, discussion, activities, case studies using computer, multi-media and writing board instructional aides.

Lectures: 2 hours per week

- **Assignments- Types and Number with calendar**

A minimum of two assignments to be submitted before the written exam of final term.

- **Assessment and Examinations**

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written examination at the mid-point of the semester.
2.	Formative Assessment	25%	It includes: classroom participation, attendance and assignments.
3.	Final Assessment	40%	Written examination at the end of semester.

- **Textbooks and reference readings**

1. Himmelblau, D.M., Riggs, J.B. (2012) "Basic Principles and Calculations in Chemical Engineering" 8th Edition, Prentice Hall.
2. Felder R. M., Rousseau R. W., Bullard L. G., Newel J. A. (2016) "Elementary Principles of Chemical Processes" 4th Edition, Wiley.

3. Reklaitis, G.V., Schneider, D.R. (1983) “Introduction to Material and Energy Balances” Wiley.
4. Hicks, T., Chopey, N. (2012) “Handbook of Chemical Engineering Calculations” 4th Edition, McGraw Hill.