IV CHE354 Separation Processes-I

Course Outlines

- **Title:** Separation Processes - I
- **Code Number:** CHE354
- **Semester:** 5th
- **Credit hours:** 3
- **Pre-requisites course requirements/ skills:** CHE232
- **Learning Outcomes:**

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

  1. Understand different separation processes and their characteristics with regards to applications
  2. Perform economic and sensitivity analyses during the selection of equipment design
  3. Interpret problems by presenting a flowchart of the system indicating information and solution to the problems
  4. Select the processes to accomplish a desired separation and purification

- **Contents**

  Unit I: Evaporation

  1.1 Introduction
  1.2 Heat transfer in evaporators
  1.3 Single-effect evaporators
  1.4 Multiple-effect evaporators
  1.5 Effect of feed system on economic evaporator operation
  1.6 Vapour compression evaporators
  1.7 Heat pump cycle
  1.8 Selecting evaporators for process application
  1.9 Critical operation and product characteristics
  1.10 Types of evaporators

  Unit II: Humidification and Water Cooling

  2.1 Introduction
  2.2 Humidification terms
  2.3 Wet bulb and adiabatic saturation temperature

2.4 Humidity data for the air-water system
2.5 Determination of humidity
2.6 Methods of increasing humidity
2.7 Dehumidification
2.8 Water cooling towers
2.9 Types of natural draught and mechanical draft cooling towers
2.10 Direct contact and indirect contact cooling towers

Unit III: Drying

3.1 Introduction
3.2 General principles
3.3 Drying periods
3.4 Time for drying
3.5 Classification and selection of dryers
3.6 Drying of gases

Unit IV: Crystallization

4.1 Introduction
4.2 Characteristics of crystals
4.3 Crystallization processes
4.4 Mechanism of crystallization
4.5 Factors effecting crystallization
4.6 Equipment for crystallization
4.7 Importance and application of crystallization

- **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 aids.
  Lectures: 3 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. Seader, J.D., Henley, E.J. Roper, D.K., (2016), “Separation Process Principles with Applications using Process Simulators”, 4th Edition, Wiley.
2. King, C.J., (2013), “Separation Processes”, 2nd Editions, Dover Publications.
3. Treybal, R.E., (1980), “Mass Transfer Operations”, 3rd Edition McGraw Hill.
4. Ray, A.K., (2023), “Coulson and Richardson's Chemical Engineering: Volume 2b: Separation Processes”. 6th Edition, Butterworth-Heinemann.
5. Chhabra, R., Shankar, V., (2018) “Coulson and Richardson's Chemical Engineering: Volume 1b: Heat and Mass Transfer: Fundamentals and Applications”, 7th Edition, Butterworth-Heinemann.
6. McCabe, W.L., Smith, J.C., Harriott, P., (2005), “Unit operations of Chemical Engineering”. 7th Edition McGraw Hill
7. Baker, R., (2012), “Membrane Technology and Applications”, 3rd Edition, Wiley.
8. Wankat, P.C., (2021), “Separation Process Engineering: Includes Mass Transfer Analysis”, 4th Edition, Prentice Hall.
9. De Haan, André B. , Bosch, H., (2013), “Industrial Separation Processes Fundamentals”, De Gruyter.