Module title: Mass and Energy Balances

Module Code: 24-18-201-01

Module Credit: 4

Term: Second Term 1397-98

Lecturer: Prof. A. Samimi
  a.samimi@eng.usb.ac.ir

Lecturing time: Sat. (7:30-9:30) and Mon. (7:30-9:30)

Assessments: 20% mid-term 1 exam
  25% mid-term 2 exam
  40% final exam
  10% Quiz
  5% home works

Class attendance: REGULAR ATTENDING IS IMPORTANT AND EACH SESSION YOUR ATTENDANCE WILL BE CHECKED

References: Basic Principles and Calculations in Chemical Engineering (7th Edition)
  David M. Himmelblau
  ISBN: 0-13-305798-4
  ©2004

Elementary Principles of Chemical Processes (3rd Edition)
  Richard M. Felder
  Ronald W. Rousseau
  ISBN 0-471-53478-1
  © 2000
Module Subjects:

**Introduction to chemical Engineering:**
1st. week: Introduction to Chemical Engineering and Mass and Energy Balances
2nd. week: Unit and Dimensions, Unit Conversion and conversion factors, Dimensional Analysis and Dimensional Consistency
3rd. week: Mole Unit, Density and Specific Gravity, Concentration, mass and mole fractions, Basis, Temperature and Pressure, and their units.
4th. week: Stoichiometry, Reaction Equation, Limiting and Excess Reactants

**Material Balances:**
5th. week: The Concept of Material Balance, Open and Closed Systems, Steady-state and Unsteady-state systems. Program of Analysis of Material Balance Problems and strategy for solving them,
6th. week: Solving Material Balances with and without Chemical Reactions for single units, *First Mid-Term Exam*,
7th. week: Solving Material Balances with and without Chemical Reactions for multiple units
8th. week: Recycle, Bypass and Purge Calculations

**Gases, Vapors, Liquids and Solids:**
9th. week: Ideal Gas Relationship, Define the Law of Corresponding State, Critical State
10th. week: Real Gas Relationships, Reduced temperature and pressure, the compressibility factor
11th. week: Phase Diagrams, Vapor Pressure, Saturation, Vapor-Liquid Equilibrium, Partial Saturation and Humidity, *Second Mid-term Exam*,

**Energy Balances:**
12th. week: The concept of Conversion Energy, Enthalpy Change, Work and Other Types of Energy
13th. week: Energy Balances With and Without Reactions for open and closed system, Steady and Unsteady States Energy Balances.
14th. week: Mechanical Energy Balances, Ideal Reversible Processes
15th. week: Humidity Charts and Their Uses (Psychrometric Charts).
16th. week: Solving complicated Problems of Mass and Energy Balances, Preparation for *Final Term Exam*