

**Module title: Mass and Energy Balances**

**Module Code: 24-18-201-02**

**Module Credit: 4**

**Term:** Second Term 99-00

**Lecturer:** Dr. B. Bidar  
b.bidar@eng.usb.ac.ir

**Lecturing time:** Sunday (18:00-20:00), Wednesday (09:30-11:30)

**Assessments:** 10% exam 1  
20% exam 2  
15% exam 3  
20% exam 4 (final exam)  
15% Quiz  
20% home works

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

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

**Basic Principles and Calculations in Chemical Engineering (8<sup>th</sup> Edition)**  
David M. Himmelblau ISBN: 0-13-234660-5  
©2012

**Elementary Principles of Chemical Processes (3<sup>rd</sup> Edition)**  
Richard M. Felder  
Ronald W. Rousseau  
ISBN 0-471-53478-1  
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## 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, *Exam 1*

### 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, *Exam 2*

### 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, *Exam 3*

### 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, *Exam 4*