AMSF-22 PRINCIPLES OF CHEMICAL ENGINEERING

UNIT-1 MATERIAL BALANCE

1.1 Introduction to chemical engineering,

1.2 Basic chemical calculations-mole concept,

1.3 Methods of expressing composition-mole fraction, weight fraction, volume fraction,

1.4 Concentration of liquid solutions- morality, molality, normality, ppm.

1.5 Ideal gases and gas mixtures- ideal gas law, Amagat'slaw,

1.6 Dalton's law, Henry's law, average molecular weight, and density of gases, partial pressure and partial volume calculations.

1.7 Material balance involving chemical reactions and not involving chemical reactions,

1.8 Simple calculations involving recycle, bypass and purge streams.

UNIT-2 ENERGY BALANCE

2.1 Energy balance- heat capacity, specific heat and enthalpy,

2.2 Heat capacity of gases at constant pressure,

2.3 Heat capacity of gaseous mixtures, latent heats,

2.4 Enthalpy changes accompanying chemical reactions-

2.5 Standard heat of formation and standard heat of combustion, standard heat of reaction.

UNIT-3 CHEMICAL ENGINEERING THERMODYNAMICS

3.1 Chemical thermodynamics,

3.2 Fundamental concepts and definitions

3.3 Types of thermodynamic systems and properties-closed, open and isolated system-

3.4 Intensive and extensive properties path and state functions,

3.5 First law of thermodynamics, second law of thermodynamics,

3.6 Entropy, change in entropy,

3.7 Maxwell relations, heat capacity in terms of entropy,

3.8 Equation of state of gases, the principle of corresponding states,

3.9 Compression and expansion of fluids

3.10   Joule Thomson expansion.

3.11   Gibbs free energy change, equilibrium constant,

3.12   Effect of temperature on equilibrium constant.

UNIT-4 MECHANICAL OPERATIONS, SOILDS

4.1 Properties of solids,

4.2 Methods of size analysis-differential and cumulative,

4.3 Screening, screening equipment, effectiveness of screens.

4.4 Size reduction of solids, types of equipment - jaw crushers,.

4.5 Gyratory crushers, hammer mills, ball mill,

4.6 Power requirement, laws of crushing.

4.7 Handling of solids

4.8 Principle of operation of belt conveyers,

4.9 Bucket elevators and pneumatic conveyers.
4.10   Fluids: Flow of solids through fluids
4.11   Maximum settling velocity.
4.12   Sedimentation- Laboratory batch sedimentation,
4.13   Calculation of area and depth for continuous thickeners.
4.14   Principle of centrifugal separation.
4.15   Filtration: equipment's for filtration
4.16   Plate and frame filter press, rotary drum filter,
4.17   Constant pressure and constant rate filtration, filter media, filter aids.

References Books:
1. W.L. McCabe, J.C. Smith & Peter Harriott, Unit Operations of Chemical Engineering, McGraw-Hill
2. K.V. Narayanan, Stoichiometry and Process Calculations, Prentice-Hall of India Pvt.Ltd.
3. K.V. Narayanan, A Text Book of Chemical Engineering Thermodynamics, Prentice Hall of India Pvt Ltd.
4. W.L.Badger & J.T. Banchero, Introduction to Chemical Engineering, Tata McGraw-Hill
5. Christe J. Geankoplis, Transport Process and Unit Operations, Prentice Hall India Pvt Ltd.