CEPC2002 CHEMICAL PROCESS CALCULATION (3-0-0)

Module I: **(07 hrs)**

Ideal gas laws, equation of state, Vapor pressure, Clausius-Clapeyron equation, Ideal and non-ideal solutions, humidity-relative saturation & percentage saturation, concept of wet & dry bulbs thermometer, use of Humidity chart.

Module II: **(10 hrs)**

Engineering Calculations: Units and dimensions Conversion of units. Chemical reactions: excess reactant, limiting reactant, conversion, extent of reaction yield and selectivity in multiple reactions. Composition of mixtures and solutions. Flow-sheeting: degrees of freedom and its importance in flow-sheeting.

Module III: **(08 hrs)**

Material balances & unit operations: drying, crystallization dissolution, combustion, etc. Solving material balance (steady and unsteady state processes) without and with chemical reactions, recycle, bypass, & purge calculations.

Module IV: **(10 hrs)**

Energy balance concepts: Heat capacity, Calculation of enthalpy changes without change of phase, Energy balance with chemical reaction, Standard heat of reaction at constant pressure & constant volume, effect of T and P on heat of reaction, Adiabatic reaction of temperature, heat of solution & mixing.

Module V: **(10 hrs)**

Calculations for unit operations like mixing, evaporation, crystallization and distillation Combustion reactions. Law of Dalton and Amagat, Densities of gaseous mixture. Real gases: Critical properties, various equations of state, Law of corresponding states. Vapour pressures: Liquefaction, Vaporization, Cox Chart, Duhring Plot. Psychometric calculations.Use of spreadsheet software (Excel/Origin).

Textbook:

1. Stoichiometry and Process Calculations by B Lakshmikutty and K V Narayanan, PHI.
2. Stoichiometry, 5th ed. by B I Bhatt and S B Thakore, McGraw-Hill.

Reference books:

1. Elementary Principles of Chemical Processes, 3rd ed. by R M Felder and R W Rousseau,John Wiley.
2. Basic Principles and Calculations in Chemical Engineering, 8th ed. by D M Himmelblauand J B Riggs, PHI.
3. Principles of Chemical Engineering Processes by N Ghasem and R Henda, CRC.

Web learning resources:

1. Basic principles and calculations inchemical engineering by Prof. S. K.Majumdar, Department of Chemical Engineering,IIT Guwahati (https://nptel.ac.in/courses/103/103/103103165/)