

## CH 251 PROCESS CALCULATIONS

CREDITS = 5 (L = 4, T=1, P = 0)

1. **Introduction to process calculations:** Review of units and dimensions. 4 Hours
2. **Properties of gases, liquids and solids:** Ideal and real gases; Vapour pressure; Properties of mixtures and solutions; Phase Equilibria. 8 Hours
3. **Material balances:** Chemical Equation and stoichiometry- concept of limiting and excess reactant, conversion, yield and selectivity, tie-component; Material balances without and with chemical reactions – including recycle, bypass and purge streams. Concept of humidity, saturation and crystallization. 10 Hours
4. **Energy Balances:** Concept of heat, work, energy and enthalpy; Heats of formation, combustion, solution, dilution; Energy balances for the systems without and with chemical reactions, Effect of temperature and pressure on heat of reaction. 9 Hours
5. Unsteady state material and energy balances, Combined material and energy balance for single stage industrial processes. 3 Hours
6. **Application of computers in Process calculations:** Introduction to MATLAB and Excel and their applications to process calculations. 4 Hours
7. **Fuels and combustion:** Solids, liquids and gaseous fuels, calorific value of fuels, theoretical and excess air requirement; combustion calculations. 4 Hours

### REFERENCE BOOKS:

Title: Basic Principles and Calculations in Chemical Engineering  
Author: David H Himmelblau  
Publisher: Prentice Hall of India

Title: Chemical Process Principles Part-I  
Author: O A Hougen and K M Watson  
Publisher: John Wiley and Asia Publishing

Title: Stoichiometry (3<sup>rd</sup> edition)  
Author: B I Bhatt and S M Vora  
Publisher: Tata McGraw Hill

### TUTORIAL

1. Total 10 tutorials for problem solving covering course contents of material balance, energy balance, properties of gases, liquids & solids and combustion calculations.
2. Home Assignment