

CHE-101: Chemical Process Principles-I

Credit Hours: 3-0

Pre-requisites: None

Course Objectives

- Comprehend the basic concepts of material balance and relate them to chemical engineering calculations.
- Extend the concepts of process principles to solve material balance problems for single and multiple units.
- Solve and analyze complex engineering problems pertaining to material balance of unit operations and processes.

Course Contents

- i. Introduction to Chemical engineering: Basic concepts of chemical engineering; Units and dimensions, conversion of units.
- ii. Process variables: Pressure, Temperature, Flow rate, Concentration and composition of mixtures.
- iii. Use of literature to obtain physical, chemical, and thermodynamic properties of substances.
- iv. Stoichiometry, Conversion, yield, and selectivity
- v. Material balances: Fundamentals of material balances, analysis of material balance problems.
- vi. Material balances for single unit and multiple units, recycle, by-pass, and purge calculations.
- vii. Material balance calculations involving gas laws.
- viii. Material balances for reactive systems
- ix. Contemporary examples related to biotech, nanotech, green/environmental engineering, and process safety.
- x. Formulating and solving material balance using excel tools (solver)/MATLAB

Course Outcomes

After completing this course, student will be able to

- Solve unknown variables using fundamental laws, empirical relationships and available data.
- Formulate and solve material and energy balances on chemical process systems.
- Extract data for pure compounds and mixtures from tables, charts, graphs, or phase diagrams and estimate via theoretical or empirical equations

Recommended Books

- Himmelblau, D. M. (2003). Basic Principles and Calculations in Chemical Engineering (7th ed.). Prentice Hall PTR.
- Felder, R. M., & Rousseau, R. W. (2001). Elementary Principles of Chemical Processes (3rd ed.). John Wiley & Sons.
- Reklaitis, G. V., & Schneider, D. R. (1983). Introduction to Material and Energy Balances. John Wiley & Sons.
- Hougen, O. A., & Watson, K. M. (2004). Chemical Process Principles. John Wiley and Sons & CBS Publishers.