

CHE-231: Chemical Engineering Thermodynamics-I

Credit Hours: 3-0

Pre-requisites: None

Course Objectives

- To learn the scope and basic definitions of thermodynamics
- To learn the relationship between heat and work by understanding the significance of the first law of thermodynamics
- To learn the application of first and second law of thermodynamics.

Course Contents

- i. Chemical engineering thermodynamics: Scope and definitions; Units and Dimensions
- ii. Temperature and zeroth law of thermodynamics, pressure and pressure measuring devices
- iii. Isolated, closed and open systems; Intensive and extensive properties, State and functions of state
- iv. Thermodynamic Equilibrium; Phase equilibria, Phase rule
- v. Enthalpies of formation and reaction, Equilibrium (reversible) and spontaneous (irreversible) change.
- vi. Internal energy U; Enthalpy H; Reversibility; Dependence of U and H on temperature, Reversible processes
- vii. Energy balance in closed system, Mass and Energy Balances for Open Systems.
- viii. First law as applied to ideal gases
- ix. The Phase Rule, P-V-T relationships for non-ideal gases.
- x. Isothermal; Isometric; isobaric; polytropic and adiabatic processes involving an ideal gas
- xi. Heat Effects; Sensible Heat Effects. Latent Heats of Pure Substances, Heat of Formation, Heat of Reaction & Combustion.
- xii. Second Law of Thermodynamics: Entropy; Equilibrium and observable change; Changes in entropy with changes in P, V, and T.
- xiii. Change in entropy in ideal gas; Entropy balance in open system, Measurement of entropy.

Course Outcomes

To apply the knowledge of law of thermodynamics in chemical engineering to develop processes and products.

Recommended Books

- Smith J.M., Van Ness H.C., Abbott M.M. (2018). Introduction to Chemical Engineering Thermodynamics. 8th Ed. McGraw Hill International Edition.
- Çengel, Y. A., & Boles, M. A. (2015). Thermodynamics: An Engineering Approach. 8th Ed.
- Daubert T.E. (1985). Chemical Engineering Thermodynamics. 1st Ed. McGraw Hill Book Company.
- Sandler, S.I. (2006). Chemical and Engineering Thermodynamics. 3rd Ed. John Wiley and Sons, Inc.
- Eastop, T.D. & McConkey A. (1993). Applied Thermodynamics. 5th Ed. Pearson Education Limited.