

CE – CHEMICAL ENGINEERING

Laws of thermodynamics - reversible and irreversible process - concept of ideal gas and real gas - equations of states - Maxwell relations - adiabatic and isothermal compression - phase equilibrium - Gibbs phase rule - system of variable composition - van Hoff's equation - applications of Gibbs - Duhem equation.

Law of conservation of mass and energy - material balance energy balance and their applications - unit operation and unit process - psychrometry - combustion calculations.

Classification of fluids - fluid statics - basic equations of fluid flow - Bernoulli's equation - laminar flow - friction in flow through beds of solids - packed beds - fluid moving machinery - classification of pumps and its characteristics.

Introduction to particulate solids - particle separation - size reduction - motion of a particle through fluid - classification of particulate solids - centrifugal classifier - sedimentation techniques - flotation - filtration equipments - agitation and mixing of liquids.

Fourier's law of heat conduction - concept of thermal conductivity - heat transfer through fins - convective heat transfer - transfer of heat in flowing fluids - laminar and turbulent flow - heat transfer with and without phase change - types of evaporators - multiple effect evaporators.

Differential and integral method of analysis of rate data - ideal reactor design - Residence time distribution - C, E and F curves.

Basic principles of unit operation and unit process - schematic representations of unit operations - manufacture of sulfur, hydrochloric acid, cement, glass, products used in photography, ceramics and refractory, industrial gases, paints, pigments, fertilizers - fermentation process for the production of ethanol - manufacture of citric acid, antibiotics, penicillin, soaps, detergents - petroleum refining process - process for the production of petrochemical precursors - production of resins, natural and synthetic rubber.

Diffusion in liquids - development of rate equation for mass transfer - contracting devices for improving mass transfer characteristics - humidification, drying and crystallization - distillation, continuous rectification operation, absorption, liquid-liquid extraction and leaching - fundamental principles and design of the pressure, reaction vessels and related equipments in the above process.

Overview of industrial biochemical processes - industrially important microbial strains - enzymes used in industry, medicine and food - industrial production, purification and immobilization of enzymes - reactors types, characteristics and design - growth characteristics of microbial cells - free cell and immobilized cell reactors - downstream processing and effluent treatment.