

1. CHEMICAL ENGINEERING

Fluids Mechanics and Particle Technology: Classification of fluids, flow patterns, manometry, continuity equation, Navier-Stokes' equation, Bernoulli equation, Dimensional analysis, Flow through pipes, Boundary layer concepts, Flow through fixed and fluidized beds, pumps – classification affinity laws, performance curves, flow **measuring devices**. Characteristics of solids, size analysis, screening, storage, Conveyance, Size reduction, Classifier, Centrifuges, Cyclones. Filtration, Mixing and agitation

Process Calculations and Chemical Technology: Gas calculations, Material balance and Energy balance – Steady and unsteady state, Humidity and Saturation, Combustion, Thermo chemistry, **Recycle, Bypass and Purge calculation**.

Role of chemical Engineers in process industry, Cement, glass and ceramic industries, paper industry – oil, soap, detergent industries, petroleum refining and petrochemicals – polymer industry, Fertilizers, Food industry and other important process industries. **Inorganic Chemical Industries (Sulfuric acid, Phosphoric acid and Chlor Alkali Industry)**

Thermodynamics and Reaction Kinetics: Laws of thermodynamics, PVT behaviour of fluids, Thermodynamic formulations, compression of fluids, Phase equilibria – Application of the correlation and prediction. Free energy change and reaction equilibria. Refrigeration- principles, performance. Reaction rate – laws, theories, analysis. Design of **ideal** reactors, Factors affecting design, **Non – isothermal reactors**. ~~Thermal reactors and rates of heat exchanges.~~ Non-ideal reactors, Heterogeneous reactors and solid catalysts, Gas – solid catalytic reactors, Gas-solid non-catalytic reactors, Gas-liquid reactors

Heat and Mass Transfer: Modes of Heat transfer – **Radiation** - Heat conduction- steady and unsteady state, Natural and forced convection, Heat transfer to fluids with phase change, heat transfer coefficients, evaporation, **Types of evaporators** heat exchangers – design and construction.

Diffusion, Mass transfer coefficients, **Theories of Mass Transfer, HTU & NTU concepts**, humidification, drying, absorption, distillation, extraction, leaching, crystallization, adsorption and ion exchange, analogies.

Process control and Computer Applications in Chemical Engineering: Open loop systems, closed loop systems, Frequency response, Advanced control systems, Instrumentation. Application of spread sheet packages in chemical engineering, Process flow sheeting, Development of software for design of equipments. Dynamic programming in Chemical Engineering.

Organic and Surface Chemistry: Carbohydrates, Oils, Fats and Waxes, Heterocyclic compounds, proteins, dyes and dyeing, pharmaceutical chemistry. Adsorption – types, adsorption of gases over solids, isotherms, applications, ion exchange, adsorption chromatography, Catalysis – types, Equations.

Environmental Pollution and Control: Various methods of reduction of pollution, types of pollution, Air pollution- sources and effects – control techniques, water pollution – sources and effects – control techniques, Soil pollution – sources and effects – control techniques and solid waste disposal.