

# **CHEMICAL ENGINEERING**

## **PAPER -I**

### **A. CHEMICAL TECHNOLOGY (ORGANIC) :**

Pulp and paper, sugar, fermentation product— industrial alcohol, rectified spirit, beers, wines and liquors, Oils and fats processing and hydrogenation, Soap and detergent, plastics polymerization, types and methods, polythylene, polypropylene, polystyrene. Polyvinyl esters, p-f, u-f and m-f, synthetic fibersnyl, lyester, acrylic and cellulose.

Petroleum refining and petrochemical– refining of petroleum, cracking and reforming, sources of raw materials and their preparation for petrochemicals from natural gas and petroleum, fractions, conversion of raw materials to olefins synthesis gas and BTX, separation processes of hydrocarbons for petrochemical synthesis.

### **B. CHEMICAL ENGINEERING (THERMODYNAMICS) :**

First and second laws of the thermodynamics— internal energy enthalpy, absolute temperature entropy, work function and free energy.

Heat capacity and specific heat, reversible and irreversible processes, Ideal and non-ideal gases, equations of state, Heat effects accompanying phase change, standard heats of formation, reaction and combustion, Physical equilibrium, Rule equilibrium state, criteria of equilibria, fugacity, Gibbs— Duhem equation, Van-darwal's equation.

Chemical equilibria-criteria, equilibrium conversion, equilibrium constant.

Refrigeration

### **C. CHEMICAL REACTION ENGINEERING :**

Kinetic, classification of reaction, rate of reaction, effect of temperature, energy of activation, order and modularity of reactions.

Batch reactors—integral and differential methods of analysis of data for constant volume and variable volume batch reactors, Xero, first and second order and catalytic reactions, reversible and irreversible reactions, half life period, series and parallel reactions, Reactor design— principles, mass and energy balances, design expressions for batch, tubular and constant stirred tank reactors, multireactor system.

Catalysts-properties, selection and preparation of solid catalysts, mechanism heterogenous catalysis.

### **D. MECHANICAL OPERATIONS :**

Size reduction of solids — equipments, laws of communiton, poorer requirement.

Mechanical separation processed, Screening, Settling, Floatation, Classification, Filtration, Sedimentation and thickening, Electrostatic, Magnetic and Centrifugal Separations.

Mixing and agitation, fundamentals, equipments, power requirements.

Storage and conveying, mechanical and pneumatic conveyors elevators, principles of storage of solids.

## **PAPER -II**

### **A. INSTRUMENTATION AND PROCESS CONTROL :**

Elements and types of instruments static and dynamic characteristics, Time constant, Order of instruments, Response of instruments.

Instruments of measurement for temperature, pressure flow, liquid level and composition analysis.

Process control—simple system analysis, block diagram linearization, first and higher order systems, frequency response, distributed parameter systems, dead time, feedback control and regulator control, closed loop response optimization of control system response, stability test.

Simple instrumentation diagrams for process equipments.

### **B. MASS TRANSFER OPERATIONS :**

Molecular diffusion —laws of diffusion, analogy between momentum, heat and mass transfer.

Interphase mass, transfer mass, transfer coefficients, gas-liquid and liquid— equilibria.

Principles, equipments and design methods for various mass transfer operation viz, gas absorption & stripping, liquid extraction, leaching, distillation, crystallization, humidification & dehumidification.

### **C. HEAT TRANSFER OPERATIONS**

Conduction—steady and unsteady state conduction one dimensional system.

Convection—film concept individual film coefficients, overall heat transfer coefficients, heat transfer in boiling liquids, condensation.

Radiation— black body concept, Kirchoff's Law, emissivity, absorptivity, view factor.

Furnaces—classification, combustion, calculation.

Heat transfer equipments— double pipe and shell and tube heat exchangers, coolers, condensers, evaporators—their construction, operation and design principles.