

## F.Y.B.Sc.: Industrial Chemistry (Vocational) Semester – I

**US01CICV01**

**Industrial Aspects of Chemistry**

**(2 Credit, 2 hrs)**

**UNIT – I :** Raw materials for organic compounds – Petroleum, natural gas, Fractionation of crude oil, Cracking, Reforming, Hydroforming, Isomerisation petrochemicals.

**UNIT – II :** Coal – Structure and properties, Analysis of coal, Carbonization process, Manufacture of coke and coal gas, Distillation of coal tar, Chemicals derived there from.

**UNIT – III :** Renewable natural resources, cellulose and starch – their properties and uses, Important chemicals derived from cellulose and starch, Alcohol and alcohol based chemicals.

**UNIT – IV :** Inorganic materials of Industrial aspects – Importance, their availability, forms, structure and modification, Alumina, Silica, Clay, Mica, Carbon and Zeolites.

### **BOOKS:**

1. Introduction to Petroleum Chemicals, H.Steiner.
2. Cotton – Cellulose: Its chemistry & technology, Hall A.G.
3. Cellulose, Whistler R.L.
4. Chemistry of cellulose, Henser. B.
5. Chemistry and Industry of starch, Kerr R.M.
6. Modified Starches - Properties and uses. Wurzburg O.B.
7. Clays. P. Rier (John Wiley & sons)
8. Chemistry in engineering and technology, Volume I & II, J.C. Kuricose & J. Rajaram. (Tata McGraw Hill)
9. Shreve's Chemical Process Industries, George A. Austin (McGraw Hill Co).
10. A Textbook of chemical technology, Volume I & II, G.N. Pandey. (Vikas Publishing House)
11. Chemistry of Engineering materials, Jain & Jain.
12. Chemistry of Engineering materials, C.V. Agarwal.

**US01CICV02****Process Calculations****(2 Credit, 2 hrs)**

**UNIT – I :** Units and dimensions, Units for composition of systems, Ideal gas equation, behaviour of gaseous mixture, Rault's Law, Henry's Law, vapour pressure of liquids and solutions.

**UNIT – II :** Elementary Concepts of Unit operations and Unit processes, Preparation of flow diagrams, Concepts of material balance, material balance problems, Strategy for material balance calculation for the processes without and with reactions.

**UNIT – III :** Concept of energy balance, forms of energy, energy balance equations for batch and steady state flow processes, Heat capacity and specific heat, Enthalpy change calculations for non reactive and reactive systems.

**UNIT – IV :** Combustion and combustion reactions, Calculation of air requirement and flue gas composition, Flue gas analysis, Calorific value of fuels, Psychrometry, Humidification & Dehumidification operations, Humidity and Saturation, Psychrometric chart

**BOOKS:**

1. Stoichiometry, B.I. Bhatt & S.M. Vora (Tata McGraw Hill Co).
2. Chemical process principles, (Part I). C.A. Haugen, K.M. Wastson, R.A. Ragatz (Asia Publishing House).
3. Process calculations (Stoichiometry) K.A. Ghavane (Nirali Prakashan).
4. Basic Principles & Calculations in Chemical Engineering, David M. Himmelblau (Prentice Hall).
5. Chemical Engineering thermodynamics, J.M. Smith & Vanners (MacGraw Hill).
6. Fuel and Combustion, Samir Sarkar (Orient Longman Ltd).
7. Fuel and Combustion, S.P. Sharma & Chandra Mohan (Tata McGraw Hill Co.).

**US01CICV03****Laboratory****(2 Credit, 4 hrs)**

1. Analysis of petroleum products, Specific gravity, Boiling range, Flash & Fire point, Cloud & Pour point, Viscosity, Carbon residue etc.
2. Determination of specific gravity using specific gravity bottle and hydrometer.
3. Determination of melting point, boiling point, surface tension and refractive index.
4. Preparation of starch from rice, potato, corn. Preparation of chemicals from cellulose and starch.

## **F.Y.B.Sc.: Industrial Chemistry (Vocational) Semester – II**

**US02CICV01**

**Metallurgy & Material Science**

**(2 Credit, 2 hrs)**

**Unit-I:** Basic metallurgical operations-Calcinations, Roastings, Sintering, Refining, Furnace Secondary metals, Alloys

**Unit-II:** Physicochemical principles in extraction of Iron, copper, aluminium, Nickel, Magnesium, Lead and Silver. Heat treatment operations.

**Unit-III:** Engineering materials, their need and classification, Selection of material of construction, Metals and alloys-Important metals and alloys, Iron, copper, aluminium, Lead, Nickel, Titanium and their alloys.

**Unit-IV:** Cement-Its composition and types, manufacturing process, setting of cement. Ceramics-Introduction, types, manufacturing process, applications. Refractories, Glass-types, composition, manufacture, properties and applications

### **BOOKS:**

1. Extractive metallurgy, Joseph & Newton
2. A textbook of material science & metallurgy, O.P.Khanna
3. Chemistry of Engineering materials. C.V.Agarawal
4. Non-ferrous production metallurgy
5. Material Science. Narang.

**US02CICV02****Mechanical Operations****(2 Credit, 2 hrs)**

**Unit-I:** Filtration-Introduction, Rate equation, Filter media & filter aids, Industrial filter, sand filter, Plate and & frame filter, leaf filter, rotary drum filter, sparkler filter, Nautsche filter, Centrifugal filtration, basket centrifuge

**Unit-II:** Sedimentation-Batch & continuous sedimentation, thickeners, Separation of Solids based on specific properties, Clarification and Clarification equipment's, Cyclones, Froth flotation and Jigs.

**Unit-III:** Mixing, Introduction mixing liquids with liquids, mixing solids with solids, Mixing viscous masses. Conveyors & elevators-Introduction Belt conveyor, Screw conveyor, Pneumatic conveyor.

**Unit-IV:** Size reduction and size separation – Introduction, primary and secondary crushers, fine grinders, Methods of operating crushers, laws of crushing, Industrial Screens.

**BOOKS:**

1. Unit operation Volume I. K.A.Gavhane (Nirali Prakashan)
2. Introduction to Chemical Engineering. W.L.Badger & J.I. Banchemo (McGraw Hill)
3. Unit operation in chemical engineering. W.L.McCabe & J.C.Smith
4. Unit operation, Volume H.Coulson & Richardson

**US02CICV03****Laboratory****(2 Credit, 4 hrs)**

1. Volumetric analysis- Preparation of standard solution, calibration of apparatus.
2. Gravimetric analysis
3. Analysis of ores, cement, metals and alloys, brass bronze steel etc
4. Demonstration of crushing, grinding, sedimentation, centrifugation
5. Experiments based on filtration.