

BACHELOR OF SCIENCE - Industrial Chemistry – Sardar Patel University - Semester-VI - PAPER NO.: US06CICH51 - TITLE: Synthetic Dyes and Pharmaceuticals - (04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks) - (Effective from June 2023)

COURSE OUTCOMES: This course comprises of detailed study of dyes and pharmaceuticals. The students will understand and learn the basic concepts of coloring agents, their chemistry, synthesis, application and analysis. Additionally, the students will learn the two aspects of pharmaceutical industries that are formulations, their packaging and active pharmaceutical ingredients. Also, they will study various diseases and the drugs used to cure it. This will enhance their knowledge in the field of pharmaceuticals.

UNIT-1 Dyes: Introduction, Theory of colors, Classification of dyes, Chemistry of Azo, Anthraquinone, Reactive and Disperse dyes.

UNIT-2 Application of synthetic dyes of various fabrics and Fastness properties. Analysis of dyes and dye intermediates: Nitrite value, Coupling value, Titanous chloride reduction, Halogen content determination and estimation of Cu, Ni and Cr.

UNIT-3 Drugs: Introduction, Drugs, pro-drugs, biotransformation of drugs, routes of drug administration and dosage forms, drug binding, drug toxicity, drug addiction, some important terms used in chemistry of drugs, biological and medical terms used in the study of drugs, distinctive definition. Classification of drugs, relation of chemical structure and chemical activity. Account of Sulfa drugs, Antipyretics and analgesics drugs.

Unit 4: Vitamins, Hormones, Antibiotics, Antitubercular, Antifungal and Antiinflammatory drugs: Introduction, classification and synthesis and study of selected drugs.

REFERENCE BOOKS:

1. Synthetic Dyes by Gurdeep R. Chatwal (Himalaya PublishingHouse).
2. Synthetic Drugs by Gurdeep R. Chatwal (Himalaya PublishingHouse).
3. Organic Chemistry by M K Jain and S C Sharma., (SHOBANLAL NAGIN CHAND & CO.)
4. Handbook of Synthetic Dyes & Pigments by K. M. Shah, (Multi-tech PublishingCo.)

**BACHELOR OF SCIENCE - Industrial Chemistry – Sardar Patel University -
Semester-VI - PAPER NO.: US06CICH52 - TITLE: Polymer Technology - (04 Credits,
4 Hours; 70 External Marks & 30 Internal Marks) - (Effective from June 2023)**

COURSEOUTCOMES: This paper will inculcate knowledge of polymer industry. The students will study the concepts of polymerization, types of polymers and the chemistry of polymerization process. Also, they will learn about types of polymers, their characteristics and synthesis at laboratory level and industrial level as well. Additionally, students will learn the manufacturing of various synthetic polymers and their application in day to day life.

UNIT-1 A Brief history of polymer, Classification and nomenclature of polymers, chemistry of polymerization and Polymerization methods.

UNIT-2

Molecular weight and molecular weight distribution number, weight and viscosity average molecular weights of polymers. Methods of determining molecular weight, Practical significance of molecular weight distribution. Glassy state, Glass transition temperature (T_g), Factors affecting T_g, Crystallinity in polymers.

UNIT-3 Raw material, manufacture, properties and application of PF, UF, MF, PU, Epoxy resins.

Raw material, manufacture, properties and application of PE, PP, polycarbonates, PTFE, PVC, PS, PVA.

UNIT-4 Fiber – Natural and synthetic fiber, nylon, polyester and Rayon.

Rubber – Natural and synthetic rubbers, Polyisoprene, Butadiene, Neoprene, SBR and Thiokol.

Specialty Polymer – polyimides and related specialty polymers, ionic polymers, polyaryletherketones, Specialty polyolefins, Inorganic Polymers, liquid-crystal polymers, Conductive polymers.

REFERENCE BOOKS

1. Shreve's Chemical Process Industries by Austin (MacGrow- Hill Publication, New Delhi)
2. Riegel's Hand Book of Industrial Chemistry by James A Kent (CBS Publishers & Distributors - NewDelhi)
3. Polymer Science by V. R Gowariker, N. V. Viswanathan, JayadevSreedhar, Wiley Eastern. (New Age International (P) Ltd., NewDelhi)
4. Polymer Science and Technology of Plastics and Rubbers by PremamoyGhosh(Tata McGraw-Hill Publishing Co. Ltd., NewDelhi)
5. Polymer Science and Technology, by Joel R Fried,PHI.

BACHELOR OF SCIENCE - Industrial Chemistry – Sardar Patel University - Semester-VI - PAPER NO.: US06CICH53 - TITLE: Business Organization & Management - (04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks) - (Effective from June 2023)

COURSE OUTCOMES: This paper will help students to understand the concepts of management. They will go through the basic concepts of management like types of ownerships, formation of an organization, entrepreneurship and forms of legal organization. Also, they will study the functions of management, financial management and concepts of marketing management. Also, they will learn the concepts of economics and project development and project cost estimation.

UNIT-1 Forms of legal ownership, Ideal form of an organization, Feature, Advantages and disadvantages of Sole proprietorship, Partnership, Co-operative.

Joint Hindu Family Organization and Joint Stock Company. Entrepreneurship decision, Launching of a new enterprise, Principle of management.

UNIT-2 Function of management I. Planning, Directing and Decision making.

Function of management II. Staffing, control, organization.

UNIT-3 Financial management (source of finance, working and fixed capital). Interest and Depreciation, Taxes and Insurance.

Marketing management (core concepts of marketing), Pricing policy, Break Even Analysis, Profitability criteria and selection of alternatives.

UNIT-4 Project cost estimation, Plant location, Inventory management (methods for calculating economic order quantity), Welfare and Safety.

Development of the project, evaluation of a process, choice of process, plant design factors, selection of process equipment and materials, reactors, plant layout.

REFERENCE BOOKS

1. Fundamentals of Business Organisation and Management by Y. K. Bhusan (Sultan Chand & Sons – New Delhi)
2. Business Administration and Management by S. C. Saksena (Sahitya Bhawan – Agra).
3. Business Organisation and Management by Shukla M C, (S. Chand & Co.).
4. Principle and Practice of Management by V S P Rao and P S Narayana. (Konark Publishers PVT LTD)
5. Organisation and Management by R D Agrawal. (Tata McGraw Hill New Delhi)
6. Principle and Practice of Management by L M Prasad. (S. Chand & Co.).
7. Finance Management by I. M. Pandey (Vikas Publishing House Pvt. Ltd. – New Delhi)
8. Marketing Management by Philip Kotler. (Prentice Hall of India Pvt. Ltd. – New Delhi)
9. Plant Design Economics for Chemical Engineers by Peter and Timmerhouse. (McGraw-Hill, Inc. – New Delhi)
10. Chemical Engineering Plant Designing By Vilbrandt & Dryden (McGraw-Hill Co.).

BACHELOR OF SCIENCE - Industrial Chemistry – Sardar Patel University - Semester-VI - PAPER NO.: US06CICH54 - TITLE: Process control for Heat & Mass Transfer Operations - (04 Credits, 4 Hours; 70 External Marks & 30 Internal Marks) - (Effective from June 2023)

COURSE OUTCOMES: This paper will help students understand the engineering concepts related to heat transfer and mass transfer. The students will learn the concepts of units and dimensions as well as basics of thermo dynamics which are used routinely in the industries. The students will also get exposed to various mechanical operations employed in chemical industries and will gain knowledge about the use and application of such mechanical concepts at various levels of chemical processes.

UNIT-1 Concept of measurement and accuracy, Principle, construction and working of temperature measuring instruments, Expansion thermometer, Thermo-electric temperature measurement, Resistances thermometers, Pyrometers. Pressure Terms, Bourden pressure gauge, Bellow type and Diaphragm type pressure gauge, Vacuum measurement, Calibration of pressure gage, Direct and indirect method of level measurement, Sp. Gravity scales, Density and sp. Gravity measurement, Viscosity measurement.

UNIT-2 Flow measurement – classification of instruments, Differential pressure and differential area meters, Open channel flow measurement. Control system, Terminology, Manual and automatic control, Open and closed loop control, Process time lags, Modes of control actions, Final Control Element. Indicators, Recorders, Control panels and Control center, instrumentation diagram, Pneumatic and electrical transmission system.

UNIT-3 Modes of heat transfer, Fourier's law, Thermal conductivity, Thermal insulators, Resistance in series and parallel, Heat flow through Sphere and Cylinder, Natural and forced convections. Natural and forced convections, Heat Transfer equipment, Types of Heat Exchanger, Shell and Tube Heat Exchanger, Double Pipe heat Exchanger, Extended surface and plate type heat exchanger.

Unit 4: Distillation- volatility and relative volatility, Boiling point diagram and equilibrium diagram, Types of distillation, Mass and enthalpy balance calculations, Calculation of number of theoretical plates, Mc-Cabe Thiel method, Importance of reflux ratio, Steam distillation, Equipment's of Distillation. Drying, Classification of dryers, Compartment dryer, Tunnel dryer, Rotary dryer, Drum dryer, Spray dryer etc., Types of moisture, Theory of drying. Evaporation- batch and continuous type evaporators, Multiple effect evaporator, Capacity of evaporator, Accessories of evaporator.

REFERENCE BOOKS:

Industrial Instrumentation by Donald P Eckman (Wiley Estern Ltd.) Mechanical & Industrial Measurement by R. K. Jain (Khanna Publishers) Industrial Instrumentation & Process Control by Kulkarni (NiraliPrakashan – Pune) Process Instrumentation & Control Handbook – Douglass M Considine. (McGraw-Hill, Inc., New Delhi) Instrumentation Technology (volume iii) E.B. John Unit Operations: Volume I & II, by K. A. Gavhane(NiraliPrakashan-Pune) Introduction to Chemical Engineering by Walter L Badger and Juline T Banchemo (McGraw-Hill Book Co.) Unit Operation of Chemical Engineering by Warreh L Mc Cabe&Jullian C Smith (McGraw-Hill Book Co.) Chemical Engineering (volume I & II) byJ. M. Coulson & K. F. Richardson (Asian Books Pvt. Ltd., New Delhi).

BACHELOR OF SCIENCE - Industrial Chemistry – Sardar Patel University - Semester-VI - SUBJECT CODE: US06CICH55 - TITLE: Practical (All Core Courses) - (08 Credits, 16 Hours; External Marks-140, Internal Marks-60) - (Effective from June 2023)

COURSE OUTCOMES: This paper of practical will provide hands on exposure to students towards preparation and estimation of dye intermediates and various dyes. Also, it will help students to learn synthesis and analysis of various types of polymers and its monomers. Also, it will help students to learn various types of heat transfer method, distillation and purification of chemical compounds by crystallization and its yield.

Part: I (02 Credits, 04 Hours, 35 External 15 Internal marks)

Preparation of intermediates and dyes from different groups., Analysis and estimation of dyes., TLC of intermediates, Paper Chromatography of Dyes., Dyeing: Dyeing of the following dyes on cotton – Direct, Azoics, Acid, on wool and silk Demonstration of various pharmaceutical packaging materials quality control tests of some materials. Aluminium strips, cartons, glass bottles., Limits tests for chlorine, heavy metals, arsenic etc. of two representative bulk drugs., Demonstration of various pharmaceutical products.

Identification of raw drugs (TLC method).

Part: II (02 Credits, 04 Hours, 35 External 15 Internal marks)

Synthesis of polymers and resins like Novalak Phenol formaldehyde, Resol Phenol formaldehyde, Urea formaldehyde, Melamine formaldehyde, Glyptalresin, Saturated and Unsaturated polyester. Cellulose Acetate, Cellulose Nitrate, Polysulfonerubber.% purity determination of formalin, Benzoyl peroxide & Hydrogen peroxide. Determination of acid value, Saponification value and Hydroxyl value.

Part: III (02 Credits, 04 Hours, 35 External 15 Internal marks)

Book review report writing and its submission and presentation. A case study on selected management area of chemical industry visited. Project on various subjects of curriculum like Forms of legal ownership, Financial management, Marketing management, Project cost estimation, Plant location, Inventory management...etc

Part: IV (02 Credits, 04 Hours, 35 External 15 Internal marks)

Study of types of distillation-Simple distillation, Rectification, Steam distillation, 2. Study of yield of crystallization with seeding and without seeding, 3. To generate Mier's super saturation curve, 4. Study on evaporation with respect to temperature and surface area, 5. Study of boiling point depression, 6. Study of adsorption behavior, 7. Study of humidity parameter using DBT-WBT method and dew point method, 8. Calibration of industrial instruments.