



(Bachelor of Science) (Undergraduate) (Industrial Chemistry Vocational)
B. Sc. (UG) Semester – VI(Effective from JUNE 2025)

Course Code (Major)	US06MAICV01	Title of the Course	Synthetic Dyes and Drugs
Total Credits of the Course	4	Hours per Week	4

Course Objectives	To make students familiar with: The basic concepts of coloring agents, their chemistry, synthesis, application and analysis with Detailed study of dyes. The aspects of pharmaceutical industries that are formulations, their packaging and active pharmaceutical ingredients. Various diseases and the drugs used to cure it. This will enhance their knowledge in the field of pharmaceuticals.
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Course Content		
Unit	Description	Weightage*(%)
1.	Dyes: Introduction, Theory of colors, Classification of dyes, Chemistry of Azo, Anthraquinone, Reactive and Disperse dyes.	25%
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.	25%
3.	Historical background and development of pharmaceutical industry in India in brief. Pharmacopeias- I.P., B.P., U.S.P., Brief idea of Pharmaceutical Legislation, Drugs & Cosmetics Act-1940. Introduction to various types of formulation and Routes of Administration. Pharmaceutical Packaging: Introduction, package selection, packaging materials, packaging machinery, quality control of packaging materials. Brief study of sterilizations. Pharmaceutical quality control: Aseptic condition, sterility testing, pyrogenic testing, glasstesting.	25%
4.	Drugs, pro-drugs, biotransformation of drugs, routes of drugs 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. The study of life saving drugs: Introduction, classification, properties and uses of followings. Sulpha drugs, Antipyretics and analgesics, and Anti-inflammatory drugs.	25%



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Vallabh Vidyanagar, Gujarat
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Syllabus with effect from the Academic Year 2025-2026

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry Vocational programs are delivered through classroom, and laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio-visual resources, e-resources, seminars, workshops, and models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per NEP – 2020)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per NEP – 2020)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Get detailed knowledge of dyes and pharmaceuticals.
2.	Learn the basic concepts of colouring agents, their chemistry, synthesis, application and analysis.
3.	Learn the aspects of pharmaceutical industries that are formulations, their packaging and active pharmaceutical ingredients.
4.	Study various diseases and the drugs used to cure it. This will enhance their knowledge in the field of pharmaceuticals.

Suggested References:	
Sr. No.	References
1.	Synthetic Dyes by Gurdeep R. Chatwal (Himalaya Publishing House).
2.	Organic Chemistry by M K Jain and S C Sharma., (SHOBANLAL NAGIN CHAND & CO.)
3.	Handbook of Synthetic Dyes & Pigments by K. M. Shah, (Multi-tech Publishing Co.)

On-line resources to be used if available as reference material
Online Resources: Google Books, INFLIBNET, Google Web



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B. Sc. (UG) Semester – VI (Effective from JUNE 2025)

Course Code (Major)	US06MAICV02	Title of the Course	Separation Techniques & Mass Transfer Operations
Total Credits of the Course	4	Hours per Week	4

Course Objectives	To make students familiar with: 1. Fundamental and advanced mass transfer operations. 2. Modern separation techniques and process control systems applied in industrial chemistry.
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Course Content		
Unit	Description	Weightage*(%)
1.	Advanced Separation Techniques & Process Control Systems: Introduction to ion exchange resins and associated equipment, membrane separation processes, ultrafiltration, reverse osmosis, and electrodialysis, Terminology in automatic control systems, comparison of manual and automatic control, feedforward and feedback control systems, process time lags, control actions and their classifications, and final control elements.	25%
2.	Distillation: Introduction to Distillation: Fundamental principles and types of distillation, Volatility & Relative Volatility: Concepts and their significance, Phase Equilibria: Boiling point and equilibrium diagrams, Mass & Enthalpy Balance Calculations: Application in distillation processes, McCabe-Thiele Method: Calculation of the number of theoretical stages, Reflux Ratio: Importance and optimization, Distillation Equipment: Types of trays and their applications in distillation columns.	25%
3.	Liquid-Liquid Extraction & Gas Absorption: Introduction, comparison with distillation, industrial applications, essential terminologies, distribution coefficient, triangular diagrams, and solvent selection criteria, Gas Absorption: Fundamentals, differences between absorption and distillation, criteria for selecting absorption solvents, gas absorption equipment, and types of packings.	25%
4.	Crystallization & Evaporation: Principles and methods, batch and continuous crystallization, crystallization mechanisms, mass and enthalpy balance calculations, supersaturation methods, Miers' supersaturation theory, and classification of crystallizers. Evaporation: Fundamentals, boiling point elevation, types of evaporators, multiple effect evaporation, vapor recompression, evaporator capacity calculations, and essential evaporator accessories.	25%



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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per NEP – 2020)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per NEP – 2020)	25%
3.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Select appropriate separation techniques and mass transfer operations for industrial applications.
2.	Operate and troubleshoot industrial filtration equipment, including sand filters, plate & frame filters, leaf filters, rotary filters, and centrifugal filters.
3.	Apply theoretical knowledge to practical problems in size reduction, separation, filtration, and process control in industrial operations.

Suggested References:	
Sr. No.	References
1.	Jain, R. K. – <i>Mechanical & Industrial Measurement</i> (Khanna Publishers)
2.	Kulkarni, V. M. – <i>Industrial Instrumentation & Process Control</i> (Nirali Prakashan – Pune)
3.	Considine, D. M. – <i>Process Instrumentation & Control Handbook</i> (McGraw-Hill, New Delhi)
4.	Gavhane, K. A. – <i>Unit Operations: Volumes I & II</i> (Nirali Prakashan – Pune)
5.	Coulson, M., & Richardson, K. F. – <i>Chemical Engineering</i> (Asian Books Pvt. Ltd., New Delhi)
6.	McCabe, W. L., & Smith, J. C. – <i>Unit Operations of Chemical Engineering</i> (McGraw-Hill Book Co.)

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Course Code (Major Practical)	US06MAICV03	Title of the Course	Industrial Chemistry Vocational – Practical
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	This course will Develop the skill of learner towards synthesis of intermediates and dyes, Analysis and estimation process and techniques of dyes, Limit tests of various chemicals on dyes. Moreover, develop skills in the scientific operation which are used in chemical industry such as distillation, crystallization, evaporation, Boiling point, Evaporation, Humidity and calibration of industrial instruments.
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Course Content
<p>Part – I: 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, Azoic, Acid, on wool and silk Demonstration of various pharmaceutical packaging materials quality control tests of some materials. Aluminum strips, cartons, glass bottles., Limit tests for chlorine, heavy metals, arsenic etc., of two representative bulk drugs., demonstration of various pharmaceutical products.</p> <p>Part – II: Study of types of distillation-simple distillation, Rectification, Steam distillation, Study of yield of crystallization with seeding and without seeding, to generate Mier's super saturation curve, Study on evaporation with respect to temperature and surface area, Study on boiling point depression, Study of adsorption behavior, Study of liquid-liquid extraction, Calibration of industrial instruments.</p>

Teaching-Learning Methodology	Courses for B. Sc. Industrial Chemistry program is delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern		
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1.	Internal (Practical Examination, Viva – Voice) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: This paper of practical will provides hands on exposure to students towards preparation and estimation of dye intermediates and various dyes. Moreover, it will help to students to learn various types of heat transfer method, distillation and purification of chemical compounds by crystallization and its yield.



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Course Code (Minor)	US06MIICV01	Title of the Course	Industrial Management
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	To make students familiar with: 1. A comprehensive understanding of business ownership structures, entrepreneurship skills, and financial acumen. 2. Insight into marketing strategies, decision-making processes, and practical applications in a business environment
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Course Content		
Unit	Description	Weightage*(%)
1.	Functions of Management: Planning: Concept, importance, types, and steps in planning, Decision-Making: Process, techniques, and importance in managerial functions, Directing: Meaning, nature, principles, and techniques of effective direction, Staffing: Recruitment, selection, training, and development of employees, Control: Concept, significance, types, and process of control in management, Organization: Concept, principles, and different forms of organizational structure.	50%
2.	Project Planning and Management: Project Cost Estimation: Methods for budgeting and financial planning, cost-benefit analysis, Plant Location: Factors influencing industrial site selection, location strategies, Inventory Management: Economic Order Quantity (EOQ), Just-in-Time (JIT), ABC analysis, and stock control techniques, Employee Welfare and Safety: Importance, regulatory compliance, health and safety measures, Project Development & Evaluation: Steps in project development, feasibility study, risk assessment, Process Selection & Plant Design: Criteria for selecting processes, plant layout, factors influencing plant design, equipment selection, and material choice.	50%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry programs are delivered through classroom, and laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio-visual resources, e-resources, seminars, workshops, and models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal (Written Examination, Practical Examination, Continuous Evaluation, Quizzes, Seminars, Assignments, Attendance) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Understand key managerial functions and their application in business decision-making.
2.	Analyze and evaluate entrepreneurship principles to develop and manage new business ventures.
3.	Gain practical knowledge of financial management, including sources of finance, working capital, interest, depreciation, taxes, and insurance.
4.	Effectively manage industrial projects, including plant setup, equipment selection, and production planning

Suggested References:	
Sr. No.	References
1.	Gupta, C.B. "Business Organization and Management" – Sultan Chand & Sons
2.	Shukla, M.C. "Business Organization and Management" – S. Chand Publishing
3.	Kuratko, Donald F. "Entrepreneurship: Theory, Process, and Practice" – Cengage Learning
4.	Charantimath, Poornima M. "Entrepreneurship Development and Small Business Enterprises" – Pearson Education
5.	Ramasamy, T. "Principles of Management" – Himalaya Publishing House
6.	Chandra, Prasanna "Financial Management: Theory and Practice" – McGraw-Hill Education
7.	Kotler, Philip & Keller, Kevin Lane "Marketing Management" – Pearson Education
8.	Horngren, Charles T., Datar, Srikant M., & Rajan, Madhav V. "Cost Accounting: A Managerial Emphasis" – Pearson

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Course Code (Minor)	US06MIICV02	Title of the Course	Industrial Management – Project Work
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	This course aims to develop students' leadership and management skills in industrial settings by equipping them with practical knowledge of business organization and management. The objective is to enhance their decision-making abilities, strategic thinking, and problem-solving skills relevant to the chemical industry.
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Course Content
<ul style="list-style-type: none">➤ Book Review Report Writing: Selection and critical analysis of books related to business and management, Structured report writing and submission, Presentation and discussion of key insights.➤ Case Study Analysis: Identification of key management issues in the chemical industry, conducting an in-depth case study based on an industrial visit, Preparing a comprehensive report with findings and recommendations.➤ Project Work: Research and documentation on various business topics, including: Forms of legal ownership and their implications. Financial management: budgeting, financial planning, and cost control. Marketing management: market analysis, pricing strategies, and sales forecasting. Project cost estimation techniques and financial feasibility analysis. Plant location and design: factors affecting site selection and layout planning. Inventory management: stock control, supply chain strategies, and optimization.

Teaching-Learning Methodology	Courses for B. Sc. Industrial Chemistry program is delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (PowerPoint presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern		
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1.	Internal (Practical Examination, Viva – Voce) (As per NEP – 2020)	50%
2.	University Examination	50%



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Course Outcomes: Upon successful completion of this course, students will:

1. Develop analytical and critical thinking skills through book reviews and case study evaluations.
2. Gain hands-on experience in business management through practical project work.
3. Acquire fundamental knowledge of financial, marketing, and project management concepts applicable to the chemical industry.
4. Understand the application of inventory management, plant location selection, and project cost estimation techniques in industrial settings.
5. Enhance their leadership, teamwork, and decision-making abilities essential for industrial roles.

Suggested References:

Sr. No.	References
1.	C.B. Gupta, "Business Organization and Management" – Sultan Chand & Sons.
2.	M.C. Shukla, "Business Organization and Management" – S. Chand Publishing.
3.	Donald F. Kuratko, "Entrepreneurship: Theory, Process, and Practice" – Cengage Learning.
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