



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

Course Code (Major)	US06MAICH01	Title of the Course	Synthetic Dyes and Pharmaceuticals
Total Credits of the Course	4	Hours per Week	4

Course Objectives	To make students familiar with: 1. Detailed study of dyes and pharmaceuticals. 2. The basic concepts of coloring agents, their chemistry, synthesis and application. 3. Vitamins and Hormones, with 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.	Introduction, Classification of Dyes on the basis of mode of applications to the fibres and chemical constitution of the Dyes. Applications of Dyes to fibres, Colour shades and fastness properties.	25%
2.	Chemistry of the following dyes with respect to general structural features and classification: Azo dyes, Acid dyes, Basic dyes and Mordant dyes, Anthraquinone (VAT) dyes, Indigoid dyes. Disperse dye and Reactive dyes.	25%
3.	Drugs: Introduction, 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. Account of Sulpha drugs, Antipyretics and analgesics drugs.	25%
4.	Vitamins, Hormones, Antibiotics, Antitubercular, Antifungal and Anti-inflammatory drugs: Introduction, classification and synthesis and study of selected drugs.	25%

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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SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus with effect from the Academic Year 2025-2026

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.	Get detailed knowledge of dyes and pharmaceuticals.
2.	Learn the basic concepts of coloring agents, their chemistry, synthesis and applications.
3.	Enhance their knowledge in the field of pharmaceuticals.
4.	Vitamins and Hormones, with various diseases and the drugs used to cure it.

Suggested References:	
Sr. No.	References
1.	Synthetic Dyes by Gurdeep R. Chatwal (Himalaya PublishingHouse).
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 PublishingCo.)

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



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

Course Code (Major)	US06MAICH02	Title of the Course	Process Control And Mass Transfer Operations
Total Credits of the Course	4	Hours per Week	4

Course Objectives	To make students familiar with: 1. Understanding Flow Measurement and Control Systems. 2. Mass Transfer operations and it's principles.
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Course Content		
Unit	Description	Weightage*(%)
1.	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 centre, instrumentation diagram, Pneumatic and electrical transmission system.	25%
2.	Liquid – Liquid Extraction: Introduction, Difference between Distillation and Extraction, Application, Terminology, Distribution Coefficient, Triangular Diagrams, Selection of Solvent, Extraction Equipment's. Leaching: Introduction, Examples of leaching operation, Leaching Equipment: Ballman Extractor, Roto cell Extractor etc. Continuous counter current decantation.	25%
3.	Distillation – Introduction, Type of 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, Equipment's of Distillation. Humidification: Saturated and unsaturated vapour-gas mixture and related terminologies such as absolute humidity, dry bulb temperature, wet bulb temperature, dew point, percentage and relative saturation etc. Psychometric chart	25%
4.	Evaporation- Introduction, Boiling Point elevation, Type evaporators, Multiple effect evaporation, Vapour Re-compression, Accessories of evaporator,	25%



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	Crystallization – Introduction, Methods of crystallization, Batch & Continuous crystallization, Theory of crystallization, Mechanism of crystallization, Equipment's of crystallization.	
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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.	Equip students with skills to select appropriate instruments, design control systems, and optimize heat transfer processes.
2.	Enable students to perform essential calculations in distillation and evaporation, and to choose suitable equipment for drying processes.

Suggested References:	
Sr. No.	References
1.	Industrial Instrumentation by Donald P Eckman (Wiley Estern Ltd.)
2.	R.E.Treybal, Mass Transfer operations, 3 rd edition, Mc-Graw Hill international, New Delhi,1983
3.	"Process Control: Modeling, Design, and Simulation" by B. Wayne Bequette



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4.	W.L.McCabe, J.C.Smith & Hariott, Unit Operations of Chemical Engineering, 7 th edition McGraw Hill international, India, 2014
5.	Instrumentation Technology (volume iii)
6.	Unit Operations: Volume I & II, by K. A. Gavhane (Nirali Prakashan- Pune)
7.	Coughanowr, D.R. LeBlanc, S. "Process Systems Analysis and Control", 3 rd edition, McGraw-Hill (2008)
8.	M. Coulson & K. F. Richardson (Asian Books Pvt. Ltd., New Delhi).
9.	Process Instrumentation And Control by A. P. Kulkarni (Nirali Prakashan)
On-line resources to be used if available as reference material	
Online Resources: Google Books, INFLIBNET, Google Web	



(Bachelor of Science) (Undergraduate) (Industrial Chemistry)

B. Sc. (UG) Semester – VI

Course Code (Major Practical)	US06MAICH03	Title of the Course	Industrial Chemistry – Practical
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	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.
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Part – I: Preparation of Intermediates and dyes of different classes. Analysis and estimation of dyes & intermediates. TLC & Paper chromatography of Dyes and Intermediates. Dyeing of fabrics with different classes of dyes. 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. (50% Weightage)

Part – II: Study of flow measurement using Rotameter, Orifice meter, Venturi meter, 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 humidity parameter using DBT-WBT method and dew point method, Calibration of industrial instruments.(50% Weightage)





(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
B. Sc. (UG) Semester – VI

Course Code (Minor)	US06MIICH01	Title of the Course	Polymer Technology
Total Credits of the Course	2	Hours per Week	2
Course Objectives:	To make students familiar with: 1. Industrial Polymers and Resins. 2. Fibres – natural and synthetic. Rubbers and speciality Polymers.		

Course Content		
Unit	Description	Weightage*(%)
1.	Introduction of polymer, Classification of polymers, chemistry of polymerization and Polymerization methods. Molecular weight and molecular weight distribution number, weight and viscosity average of polymers. Various methods of used for determination molecular weight of Polymer.	50%
2.	Raw material, manufacture, properties and application of PF, UF, MF, PU, Epoxy resins. Fiber – Natural and synthetic Fiber, nylon, polyester and Rayon. Rubber – Natural and synthetic rubbers, Polyisoprene, Butadiene, Neoprene, SBR and Thiokol. Example of Specialty Polymers.	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.	This paper will inculcate knowledge of polymer industry.
2.	The students will study the concepts of polymerization, types of polymers and the chemistry of polymerization process.
3.	Also, they will learn about types of polymers, their characteristics and synthesis at laboratory level and industrial level as well.
4.	Additionally, students will learn the manufacturing of various synthetic polymers and their application in day-to-day life.

Suggested References:	
Sr. No.	References
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.

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





(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
B. Sc. (UG) Semester – VI

Course Code (Minor Practical)	US06MIICH02	Title of the Course	Polymer Technology – Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	This course will develop the skill of learners towards synthesis and analysis of various polymers and monomers.
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Course Content
Synthesis of Polymers and resins like Novalak Phenol Formaldehyde, Resol Phenol formaldehyde, Urea Formaldehyde, Malamine formaldehyde, Glyptal Resin, Saturated and Unsaturated Polyester, Cellulose acetate, Cellulose Nitrate, Polysulfone Rubber, determination of % Purity of formaline, Benzoyl Peroxide and Hydrogen peroxide, Determination of acid value and Hydroxyl value.

Teaching- Learning Methodology	Courses for B. Sc. Industrial Chemistry program are 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		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal(Practical Examination, Viva – Voce) (As per NEP – 2020)	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to Acquire practical knowledge of basic polymer laboratory tools and analytical concept for polymer chemistry for the subject of industrial chemistry.
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(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
B. Sc. (UG) Semester – VI

Course Code (Minor)	US06MIICH03	Title of the Course	Business Organization & Management – II
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.	Hornigren, Charles T., Datar, Srikant M., & Rajan, Madhav V. "Cost Accounting: A Managerial Emphasis" – Pearson

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

Course Code (Minor)	US06MIICH04	Title of the Course	Business Organization & Management – II – 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	
➤ 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		
Sr. No.	Details of the Evaluation	Weightage
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.
4.	Poornima M. Charantimath, "Entrepreneurship Development and Small Business Enterprises" – Pearson Education.
5.	T. Ramasamy, "Principles of Management" – Himalaya Publishing House.
6.	Prasanna Chandra, "Financial Management: Theory and Practice" – McGraw-Hill Education.
7.	Philip Kotler & Kevin Lane Keller, "Marketing Management" – Pearson Education.
8.	Charles T. Horngren, Srikant M. Datar & Madhav V. Rajan, "Cost Accounting: A Managerial Emphasis" – Pearson.

On-line resources to be used if available as reference material

Online Resources: Google Books, INFLIBNET, Google Web



(Bachelor of Science) (Undergraduate)
 B. Sc. (UG) Industrial Chemistry Semester - VI

Course Code	US06MIICH05	Title of the Course	FUNDAMENTALS OF ORGANIC CHEMISTRY
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	To make students familiar with: 1. Organic Chemistry as a subject. 2. Understanding of Amino Acids and Proteins, Purine and Pyrimidines, polynuclear aromatic compounds.
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Course Content		
Unit	Description	Weightage* (%)
1.	(A) Amino Acids and Proteins Proteins, Structure of amino acids, Amino acids as dipolar ions, Isoelectric point of amino acids, Preparation of amino acids, Peptides. Geometry of the peptide linkage, Determination of structure of peptide. Terminal residue analysis. Synthesis of peptides, Structure of proteins, Peptide chain, Side chain. Isoelectric point. Electrophoresis, Secondary structure of protein. (B) Purine and Pyrimidines Purines – Synthesis of Purines, Adenine and Guanine. Pyrimidines – Synthesis of Pyrimidine, Uracil, Thymine and Cytosine.	50%
2.	Polynuclear Aromatic Compounds Fused ring aromatic compounds: Naphthalene Synthesis of naphthalene and its derivatives by ring closure (Haworth method). Nomenclature of naphthalene derivatives, Structure of naphthalene, Reactions of naphthalene: Oxidation and reduction of naphthalene. Nitration and halogenation of naphthalene, Orientation of electrophilic substitution in naphthalene, Friedal–Craft acylation of naphthalene, Sulphonation of naphthalene. Naphthols (α & β), Orientation of electrophilic substitution in naphthalene derivatives, Anthracene and Phenanthrene: Structure and synthesis of anthracene and phenanthrene (Haworth method).	50%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (Power Point presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern

Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Class test/Internal written test 10 Marks (40%), Quiz 05 Marks (20%), Home Assignments 05 Marks (20%), Attendance 05 Marks (20%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50
2.	Semester End Examination [Total 25 Marks (100%)].	50

Course Outcomes: Having completed this course, the learner will be able to

1.	From the study of this paper, student will learn about basic concepts of amino acids, proteins, purins and polynuclear compounds.
2.	This study will helpful them in further HIGHER studies and in industries.

Suggested References:

Sr. No.	References
1.	Organic chemistry of natural products by Gurdeep Chatwal, Vol.II.
2.	Organic chemistry by Morrison and Boyd, 6th ed.
3.	Organic reaction mechanism by R. K. Bansal, 3 rd ed.
4.	Organic chemistry by S. M. Mukherji, S. P. Singh and R. P. Kapoor. Vol. II.
5	Synthetic organic chemistry by Gurdeep R. Chatwal

On-line resources to be used if available as reference material

On-line Resources: Google books, INFLIBNET, Google Web





(Bachelor of Science) (Undergraduate)
B. Sc. (UG) Industrial Chemistry Semester - VI

Course Code	US06MIICH06	Title of the Course	ORGANIC PREPARATION PRACTICAL
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	To make students familiar with: 1. Organic preparation as a subject. 2. To understand synthesis as a tool to prepare new compounds 2 To understand chemical reactions.
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Course Content		
Practical	Description	Weightage* (%)
1	Organic Preparation (a) Preparation of P-Bromo Acetanilide from Acetanilide (Bromination) (b) Preparation of P-Nitro Acetanilide from Acetanilide (Nitration) (c) Preparation of m-dinitrobenzene from m-nitroaniline (Reduction) (d) Preparation of Benzaldehyde from Benzoic acid (Oxidation) (e) Preparation of Iodoform (f) Preparation of Di-benzyl acetone from Benzaldehyde (g) Preparation of Dyes- Modernt Yellow	100%

Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Chemistry programme are delivered through classroom, laboratory work in a challenging, engaging, and inclusive manner that accommodates a variety of learning styles and tools (Power Point presentations, audio visual resources, e-resources, seminars, workshops, models).
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage (%)
1.	Continuous and compression evaluation : Class test/Internal written test 10 Marks (40%), Quiz 05 Marks (20%), Home Assignments 05 Marks (20%), Attendance 05 Marks (20%), (As per SPU Letter No. E-3/2748 dated 02/02/2024) [Total 25 Marks (100%)].	50
2.	Semester End Examination [Total 25 Marks (100%)].	50





Course Outcomes: Having completed this course, the learner will be able to

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|----|---|
| 1. | From the study of this practical student will learn about basic concepts of synthesis of organic substance. |
| 2. | This study will helpful them in further higher studies and in industries. |

Suggested References:

Sr. No.	References
1.	Comprehensive practical organic chemistry Preparation and qualitative analysis by V. K. Ahuwalia and Renu Agarwal.
2.	Organic Preparation by A. I. Vogel

On-line resources to be used if available as reference material

On-line Resources: Google books, INFLIBNET, Google Web

