

UCTFCT'RCVGN'WP >UKI (Bachelor of Science) (Undergraduate)
 (Industrial Chemistry Vocational)
 B. Sc. (UG) Semester – III (Effective from JUNE 2024)

Course Code (Major)	US03MAICV01	Title of the Course	Unit Processes in Organic Synthesis – I
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	To make students familiar with: <ol style="list-style-type: none"> 1. Concepts of processes in organic synthesis. 2. Chemical reaction and mechanism of unit processes. 3. Commercial manufacturing of unit processes.
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Course Content		
Unit	Description	Weightage*(%)
1.	Nitration – Introduction, Nitrating agents, Aromatic nitration, Kinetics and mechanism of aromatic nitration, N-nitro compounds, Thermodynamics of nitration, Process equipment for technical nitration, Mixed acid for nitration, Typical industrial nitration processes, Continuous vs batch nitration, Benzene to nitrobenzene and <i>m</i> -dinitrobenzene, Chlorobenzene to ortho and para nitro chlorobenzene.	25%
2.	Amination by Reduction Introduction and definitions, Methods of reduction, Iron and acid (Be – champ) reduction, other metal and acid reductions, Catalytic hydrogenation, Sulphide reductions, Electrolytic reductions, Metal and alkali reductions, Sulphite reductions, Miscellaneous reductions, Sodium metal, concentrated caustic oxidation, commercial manufacturing of aniline, <i>m</i> -nitroaniline.	25%
3.	Halogenation Introduction, Thermodynamics and kinetics of halogenation reactions, Survey of halogenations, Chlorination in the presence of a catalyst, Photo-halogenation, Design and construction of equipment for halo-genation, technical halogenations, Reagents for halogenation, Commercial production process of Chlorobenzene acetic acid.	25%
4.	Oxidation Introduction, Types of oxidative reactions, Oxidizing agents, Liquid-phase oxidation with oxidizing compounds, Liquid-phase oxidation with oxygen, Vapor-phase oxidation of aliphatic compounds, Vapor-phase oxidation of aromatic hydrocarbons, Kinetics, and thermochemistry, Apparatus for oxidations, Commercial manufacture of benzoic acid, Phthalic anhydride.	25%

Teaching-Learning	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry programs are delivered through classroom, and
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Methodology	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 (As per NEP 2020)	50%

Course Outcomes: Having completed this course, the learner will be able to Learn about a broad range of organic chemistry topics, including various reaction mechanisms, industrial processes, and the synthesis of important compounds. This knowledge can be valuable for understanding chemical reactions, designing synthesis routes, and exploring industrial applications.

Suggested References:	
Sr. No.	References
1.	Unit process in Organic synthesis, P. H. Groggins, Mcgraw- Hill Book Co., New York.
2.	Stoichiometry: B. L. Bhatt & Vora S. M. (Tata McGraw- Hill Publication).
3.	Chemistry in Engineering and Technology, (volume I & II) JC Kuriacose & J .Rajarah (Tata McGraw Hill).
4.	Chemistry of Engineering Materials by Jain & Jain. (Dhanpairai Publishing Co.).
5.	Shreve's Chemical Process Industries by George T. Austin (McGrow-Hill Publication, New Delhi).
6.	Industrial Chemistry by B. K. Sharma

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



(Bachelor of Science) (Undergraduate) (Industrial Chemistry Vocational)
 B. Sc. (UG) Semester – III (Effective from JUNE 2023)

Course Code (Major)	US03MAICV02	Title of the Course	Introduction to Organic Chemistry
Total Credits of the Course	04	Hours per Week	04

Course Objectives:	To make students familiar with: 1. The fundamental concepts of organic chemistry & chemistry of hydrocarbons. 2. Fundamental knowledge of Stereochemistry.
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Course Content		
Unit	Description	Weightage*(%)
1.	Phenols, Alcohols, Ethers and Epoxides Structure, Nomenclature, Preparation, Physical properties, Salts of phenol, Acidity of phenols, Reactions. Alcohols - Structure, Classification, Nomenclature, Preparation, Physical properties, reactions, Alcohols as acids and bases, Synthesis using alcohols, Formation of 1,2-diols, Analysis of 1,2-diols, Oxidation cleavage of poly hydroxy-alcohols. Ethers - Structure, Nomenclature, Preparation, Physical properties, Reactions, Cyclic ethers. Epoxides - Preparation and reactions.	25%
2.	Aldehydes, Ketones, Carboxylic Acids and Their Derivatives Structure, Classification, Nomenclature, Preparation, Physical properties, Nucleophilic addition reactions, Base promoted halogenation of ketones, Acid catalyzed halogenation of ketones. Structure, Nomenclature, Preparation, Physical properties, Salts of carboxylic acids, Acidity of carboxylic acids, Effect of substituents on acidity, Reactions, reactions of acid chloride, Acid anhydrides, Amides and esters. Preparation of malic acid and tartaric acid from maleic acid, preparation of citric acid from glycerol.	25%
3.	Amines and Diazonium Salts Amines- Structure, Nomenclature, Preparation, Hoffman rearrangement, Physical properties, Salts of amines, Basicity of amines, Effect of substituents on basicity, reactions, Hoffman elimination, Analysis of amines, Phase transfer catalyst. Diazonium salts - Synthesis, reaction and characteristics.	25%
4.	Stereochemistry Stereoisomerism, Polarimeter, specific rotation, chirality, enantiomers, diastereomers, meso compound, Racemic modification, optical activity, configuration, specification of configuration: R & S, conformational isomers, reactions involving stereoisomers.	25%



Teaching-Learning Methodology	Conventional method (classroom blackboard teaching), ICT. Courses for B. Sc. Industrial Chemistry Vocational 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 Written / Practical Examination (NEP 2020)	25%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (NEP 2020)	25%
3.	University Examination (NEP 2020)	50%

Course Outcomes: Having completed this course, the learner will be able	
1.	To understand and explain the functional behavior of Phenols, Alcohols, Ethers & Epoxides.
2.	To understand preparation, properties and reactions of Aldehydes, Ketones, Carboxylic Acids & their derivatives.
3.	To acquire basic knowledge of preparation, properties and reactions of Amines and Diazonium Salts.
4.	To understand the basic of stereochemistry, physical properties of isomers, and applications of the organic stereochemistry.

Suggested References:	
Sr. No.	References
1.	Organic Chemistry by M. K. Jain and S. C. Jain (ShobanLAINagin Chand & Co. Educational Publishers, Jalandhar).
2.	Organic Chemistry by Robert T. Morrison and Robert T. Boyd (VIth Edition, Prentice Hall of India Pvt. Ltd. New Delhi).
5.	Stereochemistry of Organic Compounds 2008 Edition by Samuel H. Wilen, Wiley.
6.	Introduction to Stereochemistry, 1 st Edition by Andrew Clark (Author), RSC, 2020.



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



(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
 B. Sc. (UG) Semester – III (Effective from JUNE 2024)

Course Code (Major Practical)	US03MAICV03	Title of the Course	Practical (Major)
Total Credits of the Course	04	Hours per Week	08

Course Objectives:	Develop the skill to analyze and identify the materials, its testing chemicals, Develop skills in the scientific method of calibrating the glass ware. Enhance the skill of preparation and standardization of analytical solutions.
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Course Content
Part: I (02 Credit ; 04 Hours per week) <ul style="list-style-type: none"> ➤ Organic synthesis ➤ Material Balance calculations Part:II (02 Credit ; 04 Hours per week) <ul style="list-style-type: none"> ➤ Organic qualitative analysis of binary mixture ➤ Purification, crystallization and separation technique.

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.	University Examination (As per NEP 2020)	100%

Course Outcomes: Having completed this course, the learner will be able to
Acquire practical knowledge of basic chemical laboratory tools and analytical concept for the subject of industrial chemistry.



Suggested References:

1. Brian S. Furniss (1989, 5th edition) *Vogel's Textbook of Practical Organic Chemistry*. Hoboken: John Willey & Sons (ISBN: 0-582-462363).
2. Hassner, A. (2012, 3rd edition) *Organic Syntheses Based on Name Reactions*. Philadelphia: Elsevier Publishing company (ISBN: 978-0-08-096630-4).
3. Jeffery, G. H.; Bassett, J.; Mendham, J.; Denny, R. C. (1989, 5th edition) *Vogel's Textbook of Quantitative Chemical Analysis*. Hoboken: John Willey & Sons (ISBN: 0-582-44693-7).

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(Bachelor of Science) (Undergraduate) (Industrial Chemistry Vocational)
B. Sc. (UG) Semester – III (Effective from JUNE 2024)

Course Code (Inter Disciplinary)	US03IDICV01	Title of the Course	Unit Processes
Total Credits of the Course	02	Hours per Week	02

Course Objectives:	To make students familiar with: 1. Concepts of processes in organic synthesis. 2. Chemical reaction and mechanism of unit processes. 3. Commercial manufacturing of unit processes.
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Course Content		
Unit	Description	Weightage*(%)
1.	Nitration – Introduction, Nitrating agents, Aromatic nitration, Kinetics and mechanism of aromatic nitration, N-nitro compounds, Thermodynamics of nitration, Process equipment for technical nitration, Mixed acid for nitration, Typical industrial nitration processes, Continuous vs batch nitration, Benzene to nitrobenzene and <i>m</i> -dinitrobenzene, Chlorobenzene to ortho and para nitro chlorobenzene.	25%
3.	Halogenation Introduction, Thermodynamics and kinetics of halogenation reactions, Survey of halogenations, Chlorination in the presence of a catalyst, Photo-halogenation, Design and construction of equipment for halo-genation, technical halogenations, Reagents for halogenation, Commercial production process of Chlorobenzene acetic acid.	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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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 Learn about a broad range of organic chemistry topics, including various reaction mechanisms, industrial processes, and the synthesis of important compounds and This knowledge can be valuable for understanding chemical reactions, designing synthesis routes, and exploring industrial applications.

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1.	Unit process in Organic synthesis, P. H. Groggins, Mcgraw- Hill Book Co., New York.
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(Bachelor of Science) (Undergraduate) (Industrial Chemistry)
B. Sc. (UG) Semester – III (Effective from JUNE 2024)

Course Code (Inter Disciplinary)	US03IDICV02	Title of the Course	Practical
Total Credits of the Course	02	Hours per Week	04

Course Objectives:	Develop the skill to analyze raw materials and organic synthesis.
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Course Content
(02 Credit ; 04 Hours per week) <ul style="list-style-type: none">➤ Calibration and standarzation of laboratory tools➤ Organic synthesis based on unit processes & Analysis of raw materials.

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.	University Examination (As per NEP 2020)	100%

Course Outcomes: Having completed this course, the learner will be able to Acquire practical knowledge of basic chemical laboratory tools and analytical concept Ceramic industries Refractory for the subject of industrial chemistry.

Suggested References:

1. Brian S. Furniss (1989, 5thedition) *Vogel's Textbook of Practical Organic Chemistry*. Hoboken: John Willey & Sons (ISBN: 0-582-462363).
2. Jeffery, G. H.; Bassett, J.; Mendham, J.; Denny, R. C. (1989, 5th edition) *Vogel's Textbook of Quantitative Chemical Analysis*. Hoboken: John Willey & Sons (ISBN: 0-582-44693-7).

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