

<b>Name of Faculty</b>	:	Faculty of Engineering & Technology
<b>Name of Program</b>	:	Diploma Engineering
<b>Course Code</b>	:	2DCH01
<b>Course Title</b>	:	Organic Chemistry
<b>Type of Course</b>	:	Basic Science (BS)
<b>Year of Introduction</b>	:	2023-24

<b>Prerequisite</b>	:	Understanding of basic science
<b>Course Objective</b>	:	To provide students with a comprehensive understanding of organic chemistry, including its methods of purification, qualitative and quantitative analysis, nomenclature, chemical bonding, and reactions of organic compounds such as Haloalkanes and Haloarenes, Alcohol, Phenols, and Ethers, Aldehydes, Ketones, and Carboxylic Acids, and Amines and Biomolecules.
<b>Course Outcomes</b>	:	At the end of this course, students will be able to:
	CO1	Understand the basic concepts of organic chemistry, its methods of purification, qualitative and quantitative analysis, classification, and IUPAC nomenclature of organic compounds.
	CO2	Understand the homolytic and heterolytic fission of a covalent bond, free radicals, carbocations, carbanions, electrophiles, and nucleophiles, and types of organic reactions.
	CO3	Understand Haloalkanes and Haloarenes, including their nomenclature, nature of C-X bond, physical and chemical properties, optical rotation, and mechanism of substitution reactions.
	CO4	Understand Alcohol, Phenols, and Ethers, including their nomenclature, methods of preparation, physical and chemical properties, identification of primary and secondary and tertiary alcohols, and uses.
	CO5	Understand Aldehydes, Ketones, and Carboxylic Acids, including their nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, and uses.
	CO6	Understand Amines and Biomolecules, including their nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines, carbohydrates, vitamins, nucleic acids, and proteins.

**Teaching and Examination Scheme**

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		C	Theory Marks		Practical Marks	
SEE	CIA	SEE	CIA					
3	0	2	4	70	30	30	20	150

Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P - Practical, C - Credit, SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

**Course Content**

Unit No.	Topics	Teaching Hours	Weightage	Mapping with COs
1	<b>Introduction of Organic Chemistry</b> General introduction, methods of purification, qualitative and quantitative analysis, classification, and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance, and hyper conjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.	8	20%	CO1
2	<b>Haloalkanes and Haloarenes</b> Haloalkanes: Nomenclature, nature of C-X bond, physical and chemical properties, optical rotation mechanism of substitution reactions. Haloarenes: Nature of C-X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only). Uses and environmental effects of dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT	8	20%	CO2
3	<b>Alcohol, Phenols and Ethers</b> Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only) , identification of primary and , secondary and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol. Phenols: Nomenclature, method of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols. Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.	8	20%	CO3

4	<b>Aldehydes, ketones, and Carboxylic Acids</b> Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses. Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties, uses.	8	20%	CO4 CO5
5	<b>Amines and Biomolecules</b> Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines. Carbohydrates- Classification, monosaccharides D-L configuration oligosaccharides, polysaccharides; Importance of carbohydrates. Vitamins- Classification and functions. Nucleic Acids: DNA and RNA Proteins- structure of proteins: primary, secondary, tertiary structures and quaternary structures.	8	20%	CO6

**Suggested Distribution of Theory Marks Using Bloom's Taxonomy**

Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	25	25	20	15	10	5

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Suggested List of Experiments/Tutorials**

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Quantitative analysis of organic compounds using titration techniques	2
2	Purification of organic compounds through distillation and recrystallization	2
3	Study of the structure of vitamins and their functions	2
4	Isolation and identification of nucleic acids from natural sources	2
5	Study of the primary, secondary, tertiary, and quaternary structure of proteins using spectroscopic techniques.	2
6	Preparation of carboxylic acids and their identification through chemical tests	2
7	Acid-base titration of carboxylic acids and identification of products using spectroscopic techniques	2
8	Preparation of amines and their identification through chemical tests	2

9	Identification of primary, secondary, and tertiary amines using spectroscopic techniques	2
10	Preparation of different types of alcohols and study of their physical and chemical properties	2
11	Identification of primary, secondary, and tertiary alcohols using different reagents	2
12	Study of dehydration mechanism of alcohols	2

#### Major Equipment/ Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	Burette, Pipette, Conical flask, Analytical balance, pH meter
2	Distillation apparatus (including a round-bottomed flask, Liebig condenser, and receiving flask), Boiling chips, Melting point apparatus, Hot plate
3	UV-Vis spectrophotometer, HPLC (High-performance liquid chromatography)
4	Centrifuge, Electrophoresis apparatus
5	Circular dichroism spectrophotometer, Fourier transform infrared (FTIR) spectrophotometer, UV-Vis spectrophotometer, Fluorescence spectrophotometer
6	Round-bottomed flask, Reflux condenser, Separatory funnel, pH pape
7	Separatory funnel
8	Lucas reagent (concentrated hydrochloric acid and zinc chloride), Chromic acid reagent, Tollens' reagent
9	Infrared (IR) spectrophotometer, Nuclear magnetic resonance (NMR) spectrophotometer

#### Suggested Learning Websites

Sr. No.	Name of Website
1	<a href="https://www.khanacademy.org/science/organic-chemistry">https://www.khanacademy.org/science/organic-chemistry</a>
2	<a href="https://www.organic-chemistry.org/">https://www.organic-chemistry.org/</a>
3	<a href="https://www.chemguide.co.uk/organicprops/">https://www.chemguide.co.uk/organicprops/</a>
4	<a href="https://www.masterorganicchemistry.com/">https://www.masterorganicchemistry.com/</a>
5	<a href="https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/">https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/</a>
6	<a href="https://www.chem.wisc.edu/areas/reich/Links.html">https://www.chem.wisc.edu/areas/reich/Links.html</a>
7	<a href="https://chem.libretexts.org/Courses">https://chem.libretexts.org/Courses</a>
8	<a href="https://www.organicchemistryexplained.com/">https://www.organicchemistryexplained.com/</a>
9	<a href="https://www.youtube.com/user/TheOrganicChemistryTutor">https://www.youtube.com/user/TheOrganicChemistryTutor</a>
10	<a href="http://www.organicchemistryhelp.com/">http://www.organicchemistryhelp.com/</a>

#### Reference Books

Sr. No.	Name of Reference Books
1	11 <sup>th</sup> and 12 <sup>th</sup> Standard NCERT books
2	Organic Chemistry by Leroy G. Wade Jr.
3	Organic Chemistry by Paula Yurkanis Bruice
4	Advanced Organic Chemistry: Part B: Reaction and Synthesis by Francis A. Carey and Richard J. Sundberg

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5	Stereochemistry of Organic Compounds by Ernest L. Eliel, Samuel H. Wilen, and Leland J. M. Allen
6	March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure by Michael B. Smith and Jerry March
7	Organic Chemistry: An Intermediate Text by Robert V. Hoffman