

KU4DSCCHE202: ORGANIC CHEMISTRY- II

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
IV	DSC	200	KU4DSCCHE202	4	75

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture/ Tutorial	Practical/ Internship	CE	ESE	Total	
3	2	35	65	100	1.5

Course Description: The course comprises of modules on carbonyl compounds, carbohydrates, carboxylic acids, their derivatives, nitrogen compounds, dyes and a module on organic chemistry practicals.

Course Prerequisite: Basic knowledge about functional groups and homologous series. Awareness of IUPAC and common names of first five members of different classes of compounds such as carbonyl compounds, carbohydrates, carboxylic acids and nitrogen containing compounds.

Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the preparative methods and properties of carboxylic acids, carbonyl compounds and nitrogen containing compounds.	U
2	Describe the classification, structure and properties of carbohydrates.	U
3	Explain the configuration of glucose and fructose	U

4	Examine the carbohydrate content of biological samples	An
5	Analyse the characteristics of different functional groups	An
6	Classify different dyeing agents	U

***Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)**

Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	0	0	0	0	0	0
CO 2	3	0	2	0	0	0	0
CO 3	3	0	0	0	0	0	0
CO 4	3	0	0	0	0	0	0
CO 5	3	0	2	0	0	0	0
CO 6	3	0	0	0	0	0	0

Course Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	HOUR S
1	CARBONYL COMPOUNDS		15
	1	Aldehydes and ketones: Preparation of aldehydes and ketones: Rosenmund’s reduction, Stephen’s reduction, Etard’s reaction, Oppenauer oxidation, Houben-Hoesch synthesis.	
	2	Reactions of aldehydes and ketones: Meerwein-Ponndorf-Verley reduction, Clemmensen reduction, Wolff-Kishner reduction, Reduction using LiAlH ₄ and NaBH ₄ and reduction to pinacols.	
	3	Oxidation using mild and strong oxidizing agents- SeO ₂ oxidation. Reaction with alcohols, KCN, sodium bisulphite and derivatives of ammonia. Distinction between acetaldehyde and benzaldehyde and acetaldehyde and acetone.	
	4	Mechanisms of Aldol and Benzoin condensation reactions, Knoevenagel condensation, Claisen-Schmidt, Perkin, Cannizzaro and Wittig reactions, Beckmann and Benzil-Benzilic acid rearrangements- Addition reactions of unsaturated carbonyl compounds: Michael addition	
2	CARBOHYDRATES		9
	1	Occurrence, classification and functions of carbohydrates- Monosaccharide: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation	
	2	Determination of ring size of glucose and fructose, Haworth projections and conformational structures- Interconversion of Monosaccharides: Aldopentose to Aldohexose (Arabinose to D-Glucose, D Mannose) (Kiliani - Fischer method)	

	3	Epimers, Epimerization – Aldohexose to Aldopentose (D glucose to D- Arabinose) by Ruff degradation.	
	4	Aldohexose to Ketohexose [Glucose to Fructose] and Ketohexose to Aldohexose (Fructose to Glucose)- Structure of disaccharides- sucrose, maltose and lactose. Structure of polysaccharides - starch and cellulose (excluding structure elucidation). Colour tests for carbohydrates	
	CARBOXYLIC ACIDS & DERIVATIVES		8
3	1	Carboxylic acids - Preparation and reactions of acrylic and crotonic acids. Preparation and reactions of Hydroxy acids - lactic acid, tartaric acid and citric acid	
	2	Dicarboxylic acids - Preparation and reactions of malonic, succinic, maleic and fumaric acids - Blanc's rule	
	3	Preparation and reactions Aromatic acids - Benzoic acid, Phthalic acids, anthranilic acid, salicylic acid and cinnamic acid.	
	4	Acid derivatives –Preparation of - Acyl chlorides, anhydrides, esters and amides	
	NITROGEN CONTAINING COMPOUNDS AND DYES		13
4	1	Nitro compounds –General methods of preparation- (From alkanes, alkyl halides and halogeno carboxylic acids).	
	2	Nitro benzene: Preparation and reactions - Reduction, Electrophilic substitution and Nucleophilic substitution Cyanides and isocyanides: - General methods of preparation	
	3	Amines: Preparation – From Alkyl halide, Nitro Compounds, Nitriles, Hoffman Bromamide reaction, Curtius reaction, Schmidh reaction, reduction of Alkyl isocyanide, Preparation of tertiary amine	

4	Amines: Chemical reactions- Acylation, Benzoylation, Diazotisation, Reactions of diazonium salt, Carbylamine reaction, Hofmann's exhaustive methylation, Hofmann's elimination, Mannich reaction, Ring substitution, Separation of mixture by Hinsberg method, Hoffman's tests for amine.	
5	Synthetic Dyes: Colour and constitution- Chromophores and auxochrome. Classification of dyes, Synthesis of Methyl orange, Malachite green, and Alizarin. Edible Dyes with examples	

5	TEACHER SPECIFIC MODULE		
	PRACTICALS		
	ORGANIC QUALITATIVE ANALYSIS*		30
	<i>A minimum of ten compounds should be analysed and recorded. Microscale analytical technique is preferred for carrying out the reactions. Out of the ten experiments one is to be open-ended and is subjected to teacher's choice.</i>		
	1	Reactions of Organic Compounds- Detection of elements- Preparation of derivatives of organic compounds containing single functional group only.	
	2	Identification and confirmation of functional groups (single functional group only) in the given organic compound	
	3	Suggestion and Preparation of derivative of the given organic compound	
	5	ORGANIC COMPOUNDS FOR ANALYSIS Analyse the following organic compounds with a view to characterize functional group/groups in them. Carbohydrates (glucose, sucrose) Aliphatic saturated amide (Urea)	

	Carboxylic acid (benzoic acid, cinnamic acid, succinic acid, salicylic acid and phthalic acid)	
9	Carbonyl compounds (benzaldehyde, acetophenone and benzophenone)	
10	Phenols (phenol, cresol, naphthol and resorcinol)	
11	Aromatic hydrocarbons (naphthalene and anthracene)	
12	Halo compound (chlorobenzene, bromobenzene and benzyl chloride)	
13	Ester (ethyl benzoate and methyl salicylate)	
14	Aromatic compounds containing nitrogen (nitrobenzene, aniline, p-toluidine, N, N-dimethyl aniline, benzamide and o-nitrotoluene)	
15	Suggestions for open- ended experiments. a) Determination of melting point of an organic compound. b) Determination of boiling point of an organic compound	

Essential Readings:

1. M. K. Jain and S. C. Sharma '*Modern Organic Chemistry*' 3rd Edition, Visal Publishing Company Co.
2. K. S. Tewari and N. K. Vishnoi '*Organic Chemistry*', 3rd Edition, Vikas Publishing House
3. B. S. Bahl '*Advanced organic Chemistry*', S. Chand.
4. R. T. Morrison and R. N. Boyd, '*Organic Chemistry*', 6th Edition - Prentice Hall of India.
5. I. L. Finar '*Organic Chemistry*', Vol.- 1, Pearson Education
6. P. S. Kalsi '*Organic Reactions and their Mechanisms*' New Age International Publishers.
7. Graham Solomons, T.W., Fryhle, C.B. & Snyder, S.A. *Organic Chemistry*, JohnWiley& Sons (2014).
8. McMurry, J.E. *Fundamentals of Organic Chemistry*, 7th Ed. Cengage Learning Indian Edition, 2013
9. B. S. Furniss, A. J. Hannaford, P. W. G. Smith, A. R. Tatchell, *Vogel's Textbook of Practical Organic Chemistry*, 5thEdn., Pearson Education, Noida, 2014.

10. F. G. Mann, B. C. Saunders, *Practical Organic Chemistry*, 4thEdn., Pearson Education, Noida, 2011.
11. Arthur I. Vogel, *Elementary Practical Organic Chemistry- Small Scale Preparations*, 2ndEdn., Pearson Education, Noida, 2013

Suggested Readings:

1. 1.P. Y. Bruise, '*Organic Chemistry*', Pearson Education.
2. 2.J. March, '*Advanced Organic Chemistry*', John Wiley & Sons, NY
3. 3.S. H. Pine '*Organic Chemistry*', McGraw Hill
4. 4.J. Clayden, N. Greeves, S. Warren and P. Wothers, '*Organic Chemistry*', Oxford University

Assessment Rubrics:

Evaluation Type		Marks
End Semester Evaluation (ESE)		65 (50T+15P)
Continuous Evaluation (CCA)		35 (25T+10P)
Theory		25
a)	Test Paper*	10
b)	Assignment	5
c)	Viva-Voce	5
d)	Seminar	5
Practical		10
a)	Skill	4
b)	Record	4
c)	Punctuality	2
Total		100

*Average mark of the best two written tests may be considered for internal mark.