



Faculty of: **Sciences and Life Sciences**

Course: **Bachelor of Science (Chemistry)**

Semester: **II**

Subject Code: **CHM204-1C**

Subject Name: **Organic and Analytical Chemistry II**

Sr. No	Category	Subject Code	Subject Name	Teaching hours/Week			Credit hours	Credit Points	Evaluation Scheme/ Semester								
				Th	Tu	Pr			Theory				Tutorial / Practical				Total
									Continuous and Comprehensive Evaluation		End Semester Exams		Internal Assessment		End Semester Exams		
									Marks	Marks	Marks	Duration	Marks	Duration	Marks	Duration	
2	MAJOR	CHM204-1C	Organic and Analytical Chemistry II	3	-	2	5	4	10	Assignment	50	2	25	1	-	-	100

AIM

- Aware students of the fundamentals of organic chemistry.
- Acquaint the basic concepts and techniques of water analysis
- Teach concepts related to alkanes, alkenes, and alkynes
- Learn laboratory skills for volumetric analysis

COURSE CONTENTS

Course Outline for Theory

UNIT	COURSE CONTENT	TEACHING HOURS
I	<p>Fundamental Aspects in Organic Chemistry Hybridization, sigma and pi-bonds, hydrogen bond, inductive effect, resonance effect, hyper-conjugation, steric effect, acids and bases, structure and stability of carbocation, carbanions, and free radicals, aromaticity: Benzenoids and Huckel's rule.</p> <p>Electrophilic aromatic substitution Introduction, effect of substituent group, classification of substituent group, electrophilic substitution reactions like Nitration, Sulphonation, Friedal-crafts alkylation and acylation.</p>	15
II	<p>Alkane: Nomenclature, Classification, Preparations (with reference to Wurtz, Colbe, and Corey house reaction), Physical and Chemical properties</p> <p>Alkenes: Nomenclature, Classification, Preparations (with reference to E1 and E2 reactions including kinetics and orders), Physical and Chemical properties</p> <p>Alkyl Halide: Nomenclature, Classification, Preparations and Chemical Properties, SN₁ and SN₂ reactions - kinetics, order of reactivity of alkyl halide stereochemistry and rearrangement of carbocations. SN₁ versus SN₂ reactions, Factors affecting SN₁ and SN₂ reactions.</p>	15
III	Water Analysis	15

	<p>Analysis of hardness of the water in terms of Total solid and volatile solid, Non-filterable solid and non-filterable volatile solid, Filterable solid, Total solid, Total Suspended Solid, Acidity, Basicity or Alkalinity Turbidity. Various methods for determining the hardness of water</p> <p>Basic Principles of Qualitative Analysis Introduction, Factors affecting qualitative analysis: common ion effect, solubility product (k_{sp}), Use of NH_4Cl and NH_4OH in Qualitative analysis, Use of HCl and H_2S in Qualitative analysis, Numerical on common ion effect and k_{sp}</p>	
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Course Outline for Practical

SR. NO	COURSE CONTENT	
1	<p>Volumetric Analysis</p> <ol style="list-style-type: none"> To prepare a solution of acids and bases with a definite concentration To prepare a solution by dissolving 'x' g NaHCO_3 / Na_2CO_3 in 100 ml solution and determine its concentration in terms of normality and molarity using the given 0.1 M HCl solution To determine the normality, molarity, and g/litre of NaOH and HCl using 0.05M Na_2CO_3 solution To determine the molarity, g/litre, and normality of each component in a mixture of $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ and H_2SO_4 using 0.02 M KMnO_4 and 0.1 M NaOH solution To determine the normality, molarity and g/lit of KMnO_4 and $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ solution using 0.1 N $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ solution. To determine the normality, molarity and g/lit of FeSO_4 (NH_4)$_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ and $\text{K}_2\text{Cr}_2\text{O}_7$ solutions using 0.1 N KMnO_4 solution. 	
2	<p>Electrophilic substitution reactions Nitration, Sulphonation, Acylation, Alkylation, and Bromination etc. of organic compounds with recrystallization</p>	
Total Hours = 30		

TEACHING METHODOLOGY

- Conventional method (classroom blackboard teaching)
- ICT Techniques
- Teaching through the classroom, laboratory work
- variety of learning styles and tools (PowerPoint presentations, audio-visual resources, e-resources, seminars, workshops, models)
- Teaching through laboratory work

LEARNING OUTCOME

- Expand the basic knowledge of electrophilic substitution in organic reactions
- To learn the basics of the analysis of water
- Acquire knowledge about basic principles of quantitative analysis

ARRANGEMENT OF LECTURE DURATION AND PRACTICAL SESSION AS PER DEFINED CREDIT NUMBERS

Units	Lecture Duration (In Hrs.)		Calculation of Credits (In Numbers)		Total Lecture Duration	Credit Calculation
	Theory	Practical	Theory	Practical	Theory+	Theory+

					Practical	Practical
Unit – 1	15	30	3	1	45+30	4
Unit – 2	15					
Unit – 3	15					
TOTAL	45	30	3	1	75	4

EVALUATION

Theory Marks	Practical Marks	Total Marks
75	25	100

REFERENCE BOOKS

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|---|--|---|
| 1 | A Textbook of Organic Chemistry | K.S. Tewari, N. K. Vishnoi, and S.N. Mehrotra |
| 2 | Organic Chemistry | Morrison Boyd |
| 3 | 'Instrumental Method & Chemical Analysis | B.K. Sharma. |
| 4 | Fundamental of analytical chemistry | Skoog & West |
| 5 | Vogel's Qualitative Organic Analysis | G. Svehla, B. Sivasankar |
| 6 | Practical Chemistry | Pandey, O. P., Bajpai, D. N., Giri, S. |