

Sri Venkateswara University, Tirupati

**Syllabus for Chemistry (Major) in consonance with Curriculum frame work
(W.E.F. AY-2026-27)**

COURSE STRUCTURE (for Semesters III)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
II	III	5	Organic Chemistry – II (Halogenated Hydrocarbons and Oxygen Containing Functional Groups)	3	3
			Organic Qualitative Analysis	2	1
		6	Physical Chemistry – II (Solutions and Electrochemistry)	3	3
			Physical Chemistry – II Practical	2	1
		7	Coordination Chemistry	3	3
			Preparation of Coordination Compounds	2	1


(BOS Chairman)
Dr. V. PRABHAKAR RAO
M.Sc., M.Phil, Ph.D.
LECTURER IN CHEMISTRY
Dr. YSR GOVT. DEGREE COLLEGE
VEDURUKUPPAM - 517 560
CHITTOOR (DIST), A.P.

SEMESTER-III

COURSE 5: ORGANIC CHEMISTRY-II

Theory

Credits: 3

3 hrs/week

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I. LEARNING OBJECTIVES:

1. To understand the structure, reactivity, and mechanisms of halogenated organic compounds, alcohols and phenols.
2. To analyze the mechanisms of key reactions involving aldehydes and ketones.
3. To discuss the properties and synthetic applications of carboxylic acids.
4. To explore the importance and utility of active methylene compounds in organic synthesis.

II. COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Describe and compare SN1 and SN2 mechanisms in halogen compounds
2. Illustrate the methods of preparation and reactions of alcohols and phenols including rearrangements.
3. Predict products and explain mechanisms of carbonyl compound reactions.
4. Demonstrate the preparation and properties of carboxylic acid with mechanisms.
5. Apply synthetic strategies using acetoacetic and malonic esters for target molecule synthesis

III. SYLLABUS:

UNIT-1: HALOGENATED HYDROCARBONS

(9 h)

Alkyl halides: Nucleophilic substitution reactions – SN1 and SN2 mechanisms with energy profile diagrams, Comparison of SN1 and SN2 reactions.

Aryl halides: Nucleophilic aromatic substitution, relative reactivity of alkyl, allyl, vinyl, benzyl and aryl halides towards nucleophilic substitution reactions.

UNIT-2: ALCOHOLS AND PHENOLS

(9 h)

Alcohols: Preparation of 1°, 2°, 3°-alcohols from Grignard's reagent, Chemical properties: substitution of –OH by using PCl₅, PCl₃, SOCl₂ and HX / ZnCl₂, Oxidation of alcohols with PCC and PDC, Pinacol-Pinacolone rearrangement with mechanism.

Phenols: Preparation from diazonium salt, Reimer-Tiemann and Kolbe–Schmidt reaction with mechanism.

UNIT-3: CARBONYL COMPOUNDS

(9 h)

Preparation from acid chlorides, Nucleophilic addition reactions with HCN, and alcohols, addition-elimination reactions with hydroxylamine, hydrazine, phenyl hydrazine, 2,4-DNP, Oxidation with KMnO₄, Clemmensen reduction, Wolf–Kishner reduction.

Reaction & Mechanism- Aldol condensation, Cannizzaro reaction, Benzoin condensation.

UNIT-4: CARBOXYLIC ACIDS

(9 h)

Preparation of carboxylic acids from Grignard reagent, Reactions of carboxylic acids involving -H, -OH and -COOH groups: formation of esters, amides and anhydrides. Hunsdiecker reaction, Arndt-Eistert synthesis, Hell-Volhard-Zelinsky reaction, Mechanism of acidic hydrolysis of esters.

UNIT- 5: ACTIVE METHYLENE COMPOUNDS

(9 h)

Acetoacetic ester (AAE): Keto-enol tautomerism, preparation of Acetoacetic ester by Claisen condensation with mechanism, synthetic applications of AAE in the preparation of mono carboxylic acids, dicarboxylic acids, α , β -unsaturated acids

Malonic ester: Preparation and synthetic applications of Malonic ester- mono carboxylic acids, dicarboxylic acids, α , β -unsaturated acids.

IV. REFERENCES:

1. R.N. Morrison, R.N. Boyd, Organic Chemistry, Pearson Education, 7th edition, 2010.
2. Peter Sykes, Guidebook to Mechanism in Organic Chemistry, 6th edition, 1985.
3. S.P. Singh, O. Prakash, Reaction mechanism in organic chemistry, Laxmi Publications, 2017.
4. P.Y. Bruice, Organic Chemistry, 8th Edition, Pearson, 2017.
5. V.K. Ahluwalia, P. Bhagat, R. Aggarwal, R. Chandra, Intermediate for Organic Synthesis, I.K. International. 2005.
6. T.W.G. Solomons, C.B. Fryhle, S.A. Snyder, Organic Chemistry, 12th Edition, Wiley, 2016.

V. PROPOSED ACTIVITIES:

1. Concept Mapping- Compare SN1 & SN2 mechanisms with energy diagrams.
2. Lab-based Demonstration-Tests for alcohols and phenols.
3. Problem Solving / Reaction Mapping- Interconversion exercises between carboxylic acid derivatives.
4. Group Discussion: How esters are used in perfumes, solvents, and food industries.

VI. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Continuous Internal Evaluation (CIA): Monitoring the progress of student's learning.
2. Class Tests, Worksheets, Quizzes, Industrial/Field visits, Student seminars, Poster and PPT presentations, Peer learning, Project-based learning, Assignments, Debates, Group Discussions: Enhances critical thinking skills.
3. Semester End Examination (SEE): Critical indicator of student's learning and teaching methods adopted by teachers throughout the semester.

SEMESTER-III

COURSE 5: ORGANIC QUALITATIVE ANALYSIS

Practical

Credits: 1

2 hrs/week

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I. LEARNING OBJECTIVES:

1. To identify functional groups in unknown organic compounds using systematic analysis.
2. To determine the physical constants of organic compounds accurately.
3. To prepare suitable solid derivatives to confirm the presence of functional groups.
4. To apply laboratory safety protocols and precise techniques during analysis.

II. COURSE OUTCOMES:

At the end of the course, the student will be able to

1. Proper use of glassware, equipment and chemicals in the laboratory.
2. Systematically analyze unknown organic compounds to identify functional groups.
3. Determine melting point or boiling point of organic compounds to assess purity.
4. Prepare derivatives for confirmation of functional groups.

III. SYLLABUS:

Systematic Qualitative Analysis of an organic compounds for functional group identification including the determination of melting point and boiling point with suitable derivatives: Alcohols, Phenols, Aldehydes, Ketones, Carboxylic acids, Aromatic primary amines, amides and simple sugars.

IV. REFERENCES:

1. F.G. Mann, B.C. Saunders, Practical Organic Chemistry, Pearson Education, 2009.
2. B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, Vogel's Textbook of Practical Organic Chemistry, Pearson, 2012.
3. V.K. Ahluwalia, R. Aggarwal, (2004), Comprehensive Practical Organic Chemistry: Preparation and Quantitative Analysis, University Press, 2004
4. V.K. Ahluwalia, S. Dhingra, (2004), Comprehensive Practical Organic Chemistry: Qualitative Analysis, University Press, 2004.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

1. Internal Practical Assessment
2. Lab Record Evaluation
3. Final Practical Examination
4. Oral/Viva Voce

4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-III

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V