

Sri Venkateswara University, Tirupati

**Syllabus for Chemistry (Major) in consonance with Curriculum frame work
w.e.f. AY 2025-26**

COURSE STRUCTURE (for Semesters I to VI)

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
I	I	1	General Chemistry	3	3
			Qualitative Analysis of Simple Salt	2	1
		2	Inorganic Chemistry	3	3
			Inorganic Preparations	2	1
	II	3	Organic Chemistry – I (Structural Theory & Hydrocarbons)	3	3
			Organic Preparations	2	1
		4	Physical Chemistry – I (States of Matter, Phase rule & Surface Chemistry)	3	3
			Physical Chemistry – I Practical	2	1
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
	IV	8	Organic Chemistry-III (Nitrogen Containing Organic Compounds & Biomolecules)	3	3
			Organic Chemistry-III Practical	2	1
		9	Physical Chemistry – III (Ionic equilibrium and Thermodynamics)	3	3

Year	Semester	Course	Title of the Course	No. of Hrs /Week	No. of Credits
			Qualitative Analysis of Inorganic Mixture	2	1

III		10	Applied and Physical Chemistry	3	3
			Applied and Physical Chemistry Practical	2	1
	V	11	Organic Spectroscopy	3	3
			Organic Spectral Problems	2	1
		12 A	Analytical Methods in Chemistry	3	3
			Analytical Methods in Chemistry Practical	2	1
		13 A	Separation techniques and Chromatography	3	3
			Separation techniques and Chromatographic Techniques	2	1
	VI	14 A	Green Chemistry and Nanotechnology	3	3
			Green Chemistry and Nanotechnology - Practical	2	1
		15 A	Environment and Industrial Chemicals	3	3
			Environment and Industrial Chemicals Practical	2	1

Note: In the III Year (during the V and VI Semesters), students are required to select a pair of electives from one of the **Two** specified domains. **For example: if set 'A' is chosen, courses 12 to 15 to be chosen as 12 A, 13 A, 14 A and 15 A.** To ensure in-depth understanding and skill development in the chosen domain, students must continue with the same domain electives in both the V and VI Semesters.


(BOS chairman)
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SEMESTER-II

COURSE 3: ORGANIC CHEMISTRY-I

Theory

Credits: 3

3 hrs/week

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I. LEARNING OBJECTIVES:

1. To understand the structural theory behind reactivity in organic chemistry.
2. To identify and classify hydrocarbons, their reactions, and stability.
3. To explain organic reaction mechanisms and orientation in aromatic substitution.
4. To apply concepts like resonance, inductive effects, hyperconjugation, and aromaticity.
5. To analyze stereochemistry through molecular representations and optical activity.

II. COURSE OUTCOMES:

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

1. Study Inductive effect, Mesomeric effect, Hyperconjugation and its applications.
2. Explain the preparation and chemical properties of alkanes, alkenes, alkynes and benzene.
3. Analyze and apply Huckel's rule to benzenoid and non-benzenoid aromatic compounds.
4. Differentiate between Markownikoff and Anti-markownikoff addition, Ring activating and deactivating groups.
5. Interpret stereochemical representations and identify chiral molecules.

III. SYLLABUS:

UNIT-1: STRUCTURAL THEORY IN ORGANIC CHEMISTRY

(9 h)

Functional groups in organic chemistry, Types of bond fission; Electrophiles, Nucleophiles- (only definition and examples), Reactive intermediates-carbocations, carbanions & free radicals- (only definition, structure and examples). Inductive effect and its application: (a) Basicity of amines and (b) Acidity of carboxylic acids, Resonance or Mesomeric effect and its application: (a) Acidity of phenol, and (b) Acidity of carboxylic acids. Hyper conjugation and its application to the stability of carbonium ions.

UNIT-2: SATURATED HYDROCARBONS (ALKANES & CYCLOALKANES) (9 h)

Types of organic reactions: Addition, Elimination, Substitution and Rearrangement reactions.

Alkanes: Preparation of alkanes by Corey House synthesis, Substitution reactions of alkanes.

Cycloalkanes: Cycloalkanes and their relative stability, Baeyer strain theory, Cyclohexane conformations with energy diagram.

UNIT-3: UNSATURATED HYDROCARBONS (ALKENES & ALKYNES)

(9 h)

Alkenes: Preparation of alkenes by dehydration of alcohols, Saytzeff and Hofmann eliminations, Electrophilic Additions of H₂O, HX to alkene, Markownikoff and Anti-markownikoff addition, Ozonolysis, Diels-Alder reaction, 1,2- and 1,4-addition reactions in conjugated dienes.

Alkynes: Preparation of alkynes by double dehydrohalogenation of dihalides, Kolbe electrolysis of dicarboxylic acid salts, Additions of H₂O, HX to alkynes, acidity .

UNIT- 4: AROMATICITY, BENZENE AND ITS REACTIVITY (9 h)

Aromaticity: Concept of aromaticity, Huckel's rule - application to Benzenoid (Benzene, Naphthalene) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation). Electrophilic aromatic substitution of benzene- Nitration, Friedel- Craft's alkylation and Friedel- Craft's acylation with mechanisms.

Orientation of aromatic substitution: Ortho, para and meta directing groups with examples, Ring activating and deactivating groups with examples.

UNIT- 5: STEREOCHEMISTRY OF CARBON COMPOUNDS (9 h)

Molecular representations - Wedge, Fischer, Newman and Saw-Horse formulae.

Optical isomerism: Optical activity, optical rotation and specific rotation. Chiral molecules- Symmetry elements-enantiomers and diastereomers, Explanation of optical isomerism with examples- Glyceraldehyde, Lactic acid, and Tartaric acid. Relative configuration (D, L-notation), CIP rules, Absolute configuration (R, S-Configuration)

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.
7. P.S. Kalsi, Stereochemistry, New Age International, 2015.
8. D. Nasipuri, Stereochemistry of organic compounds, New Age International, 2020.

V. PROPOSED ACTIVITIES:

1. Mechanism writing exercises- Electrophilic aromatic substitution, electrophilic additions.
2. Group quiz on directive effects and reactive intermediates.
3. Concept mapping-Properties of alkane, alkene, alkyne, benzene.

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-II

COURSE 3: ORGANIC PREPARATIONS

Practical

Credits: 1

2 hrs/week

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I. LEARNING OBJECTIVES:

1. Understand mechanisms and conditions for common organic synthesis reactions (nitration, bromination, esterification, acetylation).
2. Perform organic synthesis using appropriate techniques such as heating, reflux, crystallization, and filtration.
3. Develop safe laboratory practices and chemical handling procedures.

II. COURSE OUTCOMES:

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

1. Describe the theoretical background and reaction mechanisms of organic preparations.
2. Synthesize organic compounds using standard laboratory procedures.
3. Analyze reaction steps and evaluate the melting point, and yield of synthesized products.
4. Relate synthesis methods to pharmaceutical and industrial applications.

III. SYLLABUS:

1. Preparation of tribromo aniline
2. Preparation of p-nitroacetanilide
3. Preparation of nerolin
4. Preparation of aspirin (Acetylsalicylic acid)
5. Preparation of paracetamol (Acetaminophen)

IV. REFERENCES:

1. B.S. Furniss, A.J. Hannaford, P.W.G. Smith, A.R. Tatchell, Vogel's Textbook of Practical Organic Chemistry, Pearson, 2012.
2. V.K. Ahluwalia, R. Agarwal, Comprehensive Practical Organic Chemistry, University Press, 2010.

V. CO-CURRICULAR ACTIVITIES AND ASSESSMENT METHODS:

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

Model question paper- Semester: II
Subject: Chemistry Major
Single major program wef: 2025- 26

COURSE 3: ORGANIC CHEMISTRY – I
(STRUCTURAL THEORY & HYDROCARBONS)

Max. time: 3 hrs

Max. marks: 75

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Section: A

Answer any 5 of the following 10 questions. Each question carries 3 marks (2 questions should be given from each unit)

5 QX 3 M = 15 M

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

Section: B

Answer 5 of the following 10 questions following internal choice. Each question carries 12 marks (2 questions should be given from each unit)

5 QX 12 M = 60 M

11. Questions 11 & 12 from unit 1. One should be answered.
- 12.
13. Question 13 & 14 from unit 2. One should be answered
- 14.
15. Question 15 & 16 from unit 3. One should be answered
- 16.
17. Question 17 & 18 from unit 4. One should be answered
- 18.
19. Question 19 & 20 from unit 5. One should be answered
- 20.