



**GAYATRI VIDYA PARISHAD**  
**COLLEGE FOR DEGREE AND PG COURSES (AUTONOMOUS)**

*Affiliated to Andhra University || Accredited by NAAC and NBA*  
**VISAKHAPATNAM**

**DEPARTMENT OF ORGANIC CHEMISTRY**

**M.Sc. (Final) CHEMISTRY SYLLABUS**

**SEMESTER-III**

**PAPER-II- ORGANIC SPECTROSCOPY**

**(Effective from the admitted batch of 2022-2023)**

<b>Credits: 4</b>		<b>Theory: 4 Hours</b>
<b>Max Marks: 100</b>	<b>External: 80</b>	<b>Internal: 20</b>

**Course Outcomes (COs)/Course Specific Outcomes (CSOs):**

- CO 1: Acquire the in-depth knowledge on UV Spectroscopic technique.  
CO 2: Acquire the in-depth knowledge on IR Spectroscopic technique.  
CO 3: Acquire the in-depth knowledge on NMR Spectroscopic technique.  
Understand the concepts like Chemical shifts, spin-spin splitting  
CO 4: Acquire the in-depth knowledge on Mass Spectroscopic technique.  
Understand the concepts of fragmentation process  
CO 5: Develop and apply interest in the areas of UV, Infrared, NMR and Mass Spectroscopic techniques and structural elucidation of organic compounds using the data obtained

**Course learning outcome (LOs):**

Upon completion of the course the students should be able to:

- LO 1: Explain the concept of UV spectroscopic techniques and interpret the values of dienes, dienophiles and aromatic compounds.  
LO 2: Analyze the spectral data using IR spectroscopy  
LO 3: Interpret the structure of different organic molecules using NMR spectroscopy  
LO 4: Apply the concept of spin-spin splitting, coupling constants for different organic compounds for data interpretation.  
LO 5: Identify the organic molecules using Mass spectroscopy  
LO 6: Elucidate structure of Organic compounds by a combined application of the UV, IR, NMR and MASS spectral data.

**UNIT-I: UV SPECTROSCOPY:**

**[12 Hours]**

UV spectra of aromatic and heterocyclic compounds,  $\alpha$ -diketones,  $\beta$ -diketones, enediones and quinines. Applications of UV Spectroscopy-study of isomerism, determination of strength of hydrogen bonding.

**UNIT-II: Infrared Spectroscopy:**

**[12 Hours]**

Characteristic vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers, phenols, amines, carbonyl compounds, esters, amides, carboxylic acids, anhydrides, lactones, lactams, nitriles and conjugated carbonyl compounds. Effect of hydrogen bonding and solvent on vibrational frequencies.

**UNIT-III: Nuclear Magnetic Resonance Spectroscopy ( $^1\text{H}$  NMR):[12 Hours]**

Nuclear spin, resonance, saturation, shielding of magnetic nuclei, chemical shifts and its measurements, factors affecting chemical shift, chemical and magnetic equivalence of spins, spin-spin coupling, integration, the coupling constant, types of spin-spin couplings, factors influencing coupling constants,



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first-order and non-first order spectra, spin system notations (ABX, AMX, ABC, A<sub>2</sub>B<sub>2</sub> etc.). Simplification of non-first order spectra- use of higher magnetic fields, Deuterium exchange, Nuclear Overhauser Effect difference spectra,

**UNIT-IV: Mass spectroscopy:**

**[12 Hours]**

McLafferty rearrangement, ortho effect. *retro*-Diels-Alder reaction, Fragmentation processes- fragmentation associated with various functional groups (alkanes, cycloalkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, ethers, aldehydes, ketones, esters, carboxylic acids, amides, amines, alkyl chlorides and alkyl bromides).

**UNIT-V: Application of UV, IR, NMR and MASS**

**[12 Hours]**

Structural elucidation of Organic compounds by a combined application of the UV, IR, NMR and MASS spectral data.

**Textbooks:**

1. Spectroscopic identification of organic compounds by RM Silverstein, G C Bassler and T B Morrill
2. Organic Spectroscopy by William Kemp
3. Spectroscopic methods in Organic chemistry by DH Williams and I Fleming
4. Modern NMR techniques for chemistry research by Andrew B Derome
5. NMR in chemistry - A multinuclear introduction by William Kemp
6. Spectroscopic identification of organic compounds by P S Kalsi
7. Introduction to organic spectroscopy by Pavia
8. Carbon-13 NMR for organic chemists by GC Levy and O L Nelson
9. Nuclear Magnetic Resonance Basic principles by Atta-Ur-Rahman

*Purna den*  
Head of the Department  
Department of Organic Chemistry,  
G.V.P. College for Degree &  
PG Courses (A)  
Visakhapatnam-530 045