

**ANDHRA UNIVERSITY**  
**SEMESTER – III SYLLABUS**  
**M.SC., CHEMISTRY (Organic Chemistry Specialization)**  
**( For the batch during the academic year 2020-2021 )**

**Paper II- Organic Spectroscopy**

**UNIT-I**

**UV SPECTROSCOPY:** a) 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 and conformations of  $\alpha$ -substituted cyclohexanones. Steric effect in biphenyls.

**Infrared Spectroscopy:** 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-II**

**Nuclear Magnetic Resonance Spectroscopy ( $^1\text{H}$  NMR):** 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, first-order and non-first order spectra, spin system notations ( ABX, AMX, ABC,  $A_2B_2$  etc.). Simplification of non-first order spectra- use of higher magnetic fields, nuclear magnetic double resonance and contact shift reagents. Deuterium exchange, nuclear overhauser effect difference spectra, Study of dynamic processes by Variable temperature (VT) NMR, restricted rotation DMF, cyclohexane ring inversion.

**UNIT-III**

**Mass spectroscopy:** Basic Principles, instrumentation, isotope abundance, the molecular ion, metastable ions, base peak, fragment ions, even-electron rule and nitrogen rule. 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).

**Reference books:**

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

**Note : The above highlighted unit shall be studied under self study cum assignment mode by the students and considered for mid-II examination**