

Course Title: Chemistry Core-2: Organic Chemistry and Related Techniques of Analysis <i>w.e.f. the session 2022-23 and onwards</i>	
Class: M.Sc. Pt.-I / Semester-II	Course code: MCH-C202
Lectures: 60	Credits : 04
MM: 70	Exam Hours: 03

NOTE: The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questions from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

COURSE CONTENTS:

Unit - I

UV-Vis Spectroscopy: Electromagnetic spectrum, electronic band spectra (UV and Vis region), laws of absorption (Beer's-Lambert law), molar extinction coefficient. Types of electronic transitions, Elementary idea of chromophores, auxochromes, bathochromic and hypsochromic shifts, hyperchromic and hypochromic effects, Instrumentations and technique of UV-VIS Spectroscopy, Woodward-Fieser rules, solvent effects on π - π^* and n- π^* transitions, steric hinderance and coplanarity, Applications of UV-VIS spectroscopy. Problems pertaining to the structure elucidation of organic compounds using UV spectroscopic techniques.

Unit - II

IR spectroscopy: Vibrational rotational spectra- Principle, absorption of infrared radiation & molecular vibration-rotations. Fundamental vibration, overtones and combination tones. finger print region, infrared vibration - active and forbidden (selection rules). Instrumentation, factors affecting vibrational frequencies, spectral study of different functional groups. Idea of rotational spectrum. Problems pertaining to the structure elucidation of organic compounds using IR spectroscopic techniques.

Unit - III

NMR spectroscopy: H¹-NMR; Basic concept, instrumentation, FTNMR, chemical shift, shielding & deshielding, homotopic and diastereotopic protons, spin-spin coupling, coupling constant, AX and AX₂ type spectra, spin decoupling, lanthanide shift reagents. C¹³-NMR spectroscopy, off-resonance decoupling. Applications Problems pertaining to the structure elucidation of organic compounds using NMR spectroscopic techniques.

Unit - IV

Mass spectrometry: Basic principle, fragmentation pattern of major functional groups, instrumentation, McLafferty rearrangement, metastable ions, retro Diels-Alder reaction, general applications. Problems pertaining to the structure elucidation of organic compounds using Mass spectroscopic techniques.

Unit - V

XRD, SEM and TEM:

Principle, Technique and applications of X-ray diffraction spectroscopy. Principle, technique and applications of Scanning Electron Microscopy and Transmission Electron Microscopy.

Suggested Readings:

1. Spectroscopy by: C. J. Benwell
2. Spectroscopic Identification of Organic Compounds by: Silverstein, Bassler, Morrill
3. Organic Chemistry by: Kapoor, Singh, and Mukherjee

4. Organic Chemistry by: Boyd and Morrison
5. Organic Spectroscopy by: W. Kemp
6. Organic Spectroscopy by: Jagmohan

COURSE OBJECTIVES:

1. UV-VIS Spectroscopy
2. IR spectroscopy
3. NMR spectroscopy
4. Mass spectrometry
5. XRD,
6. SEM
7. TEM

COURSE OUTCOMES:

On completion of this course, student shall be able to:

CO 1: Recognize the basic concept of Electronic and I.R. spectroscopy.

CO 2: To understand the valuable concept of NMR spectroscopy for structure elucidation of molecules

CO 3: To learn the knowledge about Mass spectrometry technique.

CO 4: Explain the application of XRD, SEM and TEM techniques.

Mapping of Course outcomes (Cos) with Programme outcomes (POs)

Course outcomes/ Programme outcomes	1	2	3	4	5	6	7	8
CO 1	X	X	X				X	X
CO 2	X	X	X		X		X	X
CO 3	X	X	X				X	X
CO 4		X	X				X	X

O 5: Predict the structure of unknown molecule by using different spectral data.