Lesson Plan

MCM DAV College for Women, Sector – 36A, Chandigarh
Monthly Teaching Plans (Odd Semester)
Session – (2025-26)

Name of the Teacher/s: Dr. Shilpa Dogra, Dr. Archana

Department: Chemistry

Class: M.Sc.II **Subject** Applications of Spectroscopy CH-511

S. No.	Date (Monthly)		Topics to be Covered	Academic Activity Undertaken*
	From	To		
1.	24-07-2025	11-08-2025	Mossbauer Spectroscopy: Basic principles, spectral parameters and spectrum display. Application of the technique to the studies of (1) bonding and structures of Fe^{+2} and Fe^{+3} compounds including those of intermediate spin, (2) Sn^{+2} and Sn^{+4} compounds nature of M-L bond, coordination number, structure and (3) detection of oxidation state and inequivalent MB atoms.	Lecture Method, PPT) Case Studies and Online Sources
2.	12-08-2025	30-08-2025	Electron Spin Resonance Spectroscopy: Hyperfine coupling, spin polarization for atoms and transition metal ions, spin orbit coupling and significance of g-tensors, application of transition metal complexes (having one unpaired electron) including biological systems and to inorganic free radicals such as PH_4, F_2 and $[BH_3]$.	Lecture Method, PPT and Group Discussion
3.	01-09-2025	16-09-2025	Nuclear Magnetic Resonance of Paramagnetic: Substances in Solution The contact and pseudo contact shifts, factors affecting nuclear relaxation Some applications including biochemical systems, an overview of NMR of metal nuclides with emphasis on 195 Pt and 119 Sn NMR.	Lecture Method, PPT and Online Sources
4.	17-09-2025	08-10-2025	Vibrational Spectroscopy: Symmetrey and shapes of AB_2, AB_3, AB_4, AB_5 and AB_6 mode of bonding of ambidentate ligands. Ethylenediamine and diketonato complexes, applications of resonance	Lecture Method, PPT and Group Discussion

5.	09-10-2025	Till exam	Raman spectroscopy particularly for the study of active sites of metalloproteins.	Lecture Method, , PPT Case Studies and Online Sources)
6.	24-07-2025	11-08-2025	Infrared Spectroscopy: Instrumentation and sample handling. Characteristics vibrational frequencies of alkanes, alkenes, alkynes, aromatic compounds, alcohols, ethers phenols and amines. Detailed study of vibrational frequencies of carbonyl compounds (ketones, aldehydes, esters amides acids, anhydrides, lactones, lactams and conjugated carbonyl compounds). Effect of hydrogen bonding of solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. FT-IR of gaseous, solid and polymeric materials. Nuclear Magnetic Resonance Spectroscopy: General introduction and definition, chemical shift, spin interaction, shielding mechanism of measurement, chemical shift values and correlation for protons bonded to carbon (aliphatic,olefinic,aldehydic and aromatic) another nuclei (alcoholic, phenols, enols, carboxylic acids, amines, amides & mercaptan),chemical exchange.	Lecture Method, PPT and Group Discussion
7.	12-08-2025	06-09-2025	Effect of deuteration, complex spin-spin interaction between two, three, four, five nuclei (first order spectra) virtual coupling, stereochemistry, hindered rotation, Karplus curve variation of coupling constant with dihedral angle. simplification of complex spectra-nuclear magnetic double resonance, contact shift reagents, solvent effects, Fourier transform technique, nuclear over hauser effect (NOE) resonance of other nuclei –F, P	Lecture Method and Online Sources
8.	07-09-2025	19-09-2025	NMR spectroscopy –COSY, NOESY, DEPT, APT and INADEQUATE technique.	Lecture Method, PPT and Group Discussion
9.	20-09-2025	09-10-2025	Ultraviolet and Visible Spectroscopy: Various electronic transitions (185-800nm), Beer-Lambert law, effect of solvent on electronic transition, ultraviolet bands for carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser- Woodward rules for conjugated dienes and carbonyl, ultraviolet spectra of aromatic and	Lecture Method and Online Sources

			heterocyclic compounds. Steric effect in biphenyls.	
10.	11-10-2025	Till exam	Mass Spectrometry: Introduction, ion production –EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds, common functional group, molecular ion peak, metastable peak, McLafferty rearrangement. nitrogen rule, high resolution mass spectrometry. Example of mass spectral fragmentation of organic compounds with respect to their structure determination.	Lecture Method, PPT and Group Discussion
Departmental Meeting to Coordinate and Review the Monthly completion of Syllabus as per lesson plans				
27th August, 2025	The teachers have completed the scheduled chapters and topics as shown in the lesson plan			
Departmental Meeting to Coordinate and Review the Monthly completion of Syllabus as per lesson plans				
24thSeptember, 2025	The teachers have completed the scheduled chapters and topics as shown in the lesson plan			
Departmental Meeting to Coordinate and Review the Monthly completion of Syllabus as per lesson plans				
29th October, 2025	The teachers have completed the scheduled chapters and topics as shown in the lesson plan			
Departmental Meeting to Coordinate and Review the Monthly completion of Syllabus as per lesson plans				
10th November, 2025	The teachers have completed the scheduled chapters and topics as shown in the lesson plan			

***Any of these** – (i) Lecture Method; (ii) PPT; (iii) Online Sources; (iv) Group Discussion; (v) Case Studies etc.Other Methods adopted by the teacher – Please write the specific teaching method