



ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : B.Sc. (Industrial Chemistry)						
Semester	Course Code	Course Title	Lecture (L)	Tutorial (T)	Practical (P)	Credit (C)
IV	INDUSTRIAL CHEMISTRY -SEC-1	Instrumental Methods of Analysis	2			2
Teacher/Instructor(s)		Dr. Nimalini Moirangthem				
Session		2021-22				

Course Objective:

The Objective of this course is to make students aware about the following concepts:

- Spectroscopic methods of analysis
- Principles of UV and Visible spectrophotometry and its applications
- Various components of UV and Visible spectrophotometry
- Single and double beam instruments
- Atomic spectroscopy types and its applications
- ^1H NMR instrumentation and its applications

Course Learning Outcomes:

By the end of this course, students should be able to understand:

- What are the different types of spectroscopic methods of analysis.
- The instrumentation and the applications of the UV- Visible, Atomic, IR, ^1H NMR spectrometry

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
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1.	An introduction to Spectroscopic Methods of Analysis (Lectures: 03)	1	An introduction to Spectroscopic Methods of Analysis
		2	An introduction to Spectroscopic Methods of Analysis
		3	An introduction to Spectroscopic Methods of Analysis
2.	UV-Visible Spectrophotometry: (Lectures: 06)	4	UV- Visible Spectrophotometry: A. Lambert-Beer's law
		5	B. Principles, Instrumentation, Single/double beam instrument
		6	C. Applications: Effect of solvent on λ_{max} , Effect of cis-trans geometrical isomerism (e.g. stilbene),
		7	calculation λ_{max} of different compounds (Woodward-Fieser Rule and Schott's Rule)
		8	calculation λ_{max} of different compounds (Woodward-Fieser Rule and Schott's Rule)
		9	and calculation of stoichiometric ratios of metal-ligand complex (Job's method)
3.	IR Spectrophotometry: (Lectures: 05)	10	IR Spectrophotometry: A. Principle
		11	B. Instrumentation
		12	C. Applications: Identification of the functional groups and simple Organic molecules
		13	C. Applications: Identification of the functional groups and simple Organic molecules
		14	C. Applications: Identification of the functional groups and simple Organic molecules
4.	Atomic Spectroscopy: (Lectures: 08)	15	Atomic Spectroscopy:
		16	A. Types
		17	B. Atomizer
		18	C. Atomic absorption
		19	and emission
		20	D. Applications
		21	D. Applications
		22	D. Applications
5.	1HNMR Spectroscopy: (Lectures: 08)	24	1H NMR Spectroscopy:
		25	A. Principle
		26	B. Instrumentation
		27	C. Factors affecting chemical shift (Electronegativity, Anisotropy, etc.)
		28	D. Spin-spin coupling
		29	E. Coupling constant Applications: Deuterium exchange, effect of restricted rotation (e.g. DMF),
		30	identification of simple organic compounds using 1H NMR spectra along with IR spectral data

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		12

	<ul style="list-style-type: none"> • Quiz • Class Test • Attendance • Assignment 		
2.	End Semester Examination	2.5 hr	38

Details of the Course		
Unit	Contents	Contact Hours
1.	An introduction to Spectroscopic Methods of Analysis	3
2.	UV- Visible Spectrophotometry: A. Lambert-Beer's law B. Principles, Instrumentation, Single/double beam instrument C. Applications: Effect of solvent on λ_{max} , Effect of cis-trans geometrical isomerism (e.g. stillbene), calculation λ_{max} of different compounds (Woodward-Fieser Rule and Schott's Rule) and calculation of stoichiometric ratios of metal-ligand complex (Job's method)	6
3.	IR Spectrophotometry: A. Principle B. Instrumentation C. Applications: Identification of the functional groups and simple Organic molecules	5
4.	Atomic Spectroscopy: A. Types B. Atomizer C. Atomic absorption and emission D. Applications	8
5.	¹ H NMR Spectroscopy: A. Principle B. Instrumentation C. Factors affecting chemical shift (Electronegativity, Anisotropy, etc.) D. Spin-spin coupling E. Coupling constant Applications: Deuterium exchange, effect of restricted rotation (e.g. DMF), identification of simple organic compounds using ¹ H NMR spectra along with IR spectral data.	8
	Total	30
Suggested Books:		
Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1.	Kemp, W. , Organic Spectroscopy, Palgrave Macmillan.	1991
2.	Dyer, J.R. ,Applications of Absorption Spectroscopy of Organic Compounds, Prentice Hall.	1978
3.	Banwell, C.N. ,Fundamentals of Molecular Spectroscopy,Tata McGraw-Hill Education.	2006

4.	Smith, B.C. , Infrared Spectral Interpretations: A Systematic Approach, CRC Press.	1998
5.	Atkins, P.; Paula, J.de., Elements of Physical Chemistry, Oxford University Press.	2016
Mode of Evaluation:		Internal Assessment / End Semester Exam