


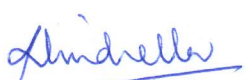



National Institute of Technology, Tiruchirappalli-620015

Department of Chemistry

COURSE PLAN			
Course Title	Molecular Spectroscopy		
Course Code	CH 608	No. of Credits	3
Department	Chemistry	Faculty	Dr. S. Amudhan Senthan
Pre-requisites Course Code	NA		
Course Coordinator (if, applicable)	Dr. S. Amudhan Senthan		
E-mail	amudhansenthan.s@gmail.com	Mobile No.	9840699833
Course Type	Core course		
COURSE OVERVIEW			
This is a core three credit course offered to I M.Sc. Chemistry students. Three theory classes will be conducted per week.			
COURSE OBJECTIVES			
Enabling the students to grasp the basics of spectroscopy and to gain a clear mental picture of the principles and processes which underlie the subject, with the minimum of mathematics.			
COURSE OUTCOMES (CO)			
The students will familiarize themselves in <ul style="list-style-type: none">✓ Learning about the interaction of electromagnetic radiation and matter.✓ Understanding the fundamentals of different modes of spectroscopy.✓ Using spectroscopy to determine the structure of matter.			
COURSE TEACHING AND LEARNING ACTIVITIES			
S.No	Week	Topic	Mode of Delivery
1	I week of Jan 2017	UNIT-I Electromagnetic Radiation: Interaction of radiation with matter-Spectroscopic Transitions-Einstein coefficients	C&T, PPT
2	II week of Jan 2017	Transition probability-transition dipole moments -energy levels in atoms and molecules Relaxation phenomena- Born-Oppenheimer approximation	C&T, PPT

3	III week of Jan 2017	Selection rules - Intensity and width of spectral lines - Fourier transformation.	C&T, PPT
4	IV week of Jan 2017	UNIT-II Rotational spectroscopy: Principal moments of Inertia - Diatomic and polyatomic molecules - selection rules	C&T, PPT
5	I week of Feb 2017	Diatomic Rigid Rotor – Non Rigid Rotor – Nonlinear polyatomic molecules-Effect of Nuclear spin	C&T, PPT
6	II week of Feb 2017	Inversion Phenomenon – The Stark Effect – Applications and Experimental Considerations	C&T, PPT
7	III week of Feb 2017	UNIT-III Vibrational spectra: Polyatomic molecules -harmonic oscillators – Anharmonic oscillators Morse potential-selection rules – Fermi Resonance-Group Frequencies.	C&T, PPT
8	IV week of Feb 2017	Normal modes of vibrations of polyatomic molecules-selection rules-Fourier transformation in IR spectroscopy-Instrumentation.	C&T, PPT
9	I week of Mar 2017	Raman spectroscopy – fundamentals- rotational Raman - vibrational Raman spectra - Selection rules – Resonance Raman - Surface Enhanced Raman –Non-linear effects	C&T, PPT
10	II week of Mar 2017	UNIT-IV Electronic spectroscopy: Atoms and molecules-term symbols - Frank Condon principle- vertical transitions-selection rules.	C&T, PPT
11	III week of Mar 2017	Parity, symmetry and spin selection rules-polarization of transitions - Fluorescence and phosphorescence- Russell Sanders coupling-different types of electronic transitions.	C&T, PPT
12	IV week of Mar 2017	Electronic spectra of conjugated systems - transition metal complexes - surface plasmon resonance - dynamic light scattering	C&T, PPT
13	I week of Apr 2017	UV-Vis instrumentation – Fluorescence Spectroscopy – Jablonski Diagram- Kashas rules - circular dichorism – ORD –cotton effect - selection rules - applications	C&T, PPT
14	II week of Apr 2017	UNIT-V Electron spectroscopy: Photoelectric effect, basic principles of electron spectroscopy, classification - electron energy analysis-photon sources - UV, X-ray, synchrotron, theory.	C&T, PPT
15	III week of Apr 2017	Angular dependence-cross section and its determination-Introduction to ESCA- Auger electron spectroscopy-EXAFS.	C&T, PPT

COURSE ASSESSMENT METHODS				
S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assignment/Quiz/Seminar	I week of February	Depends on the activity	5
2	Cycle Test - I	III week of February	1 h	20
3	Assignment/Quiz/Seminar	III week of March	Depends on the activity	5
4	Cycle Test - II	I week of April	1 h	20
5	End Semester	IV week of April	3 h	50
ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc				
<ol style="list-style-type: none"> 1. C. N. Banwell and E. M. McCash, <i>Fundamentals of Molecular Spectroscopy</i>, 4th revised edition, Tata McGraw Hill, New Delhi, 2011. 2. J. M. Hollas, <i>Modern Spectroscopy</i>, 4th edition, John Wiley & Sons Ltd., Chichester, 2004. 3. D. N. Sathyanarayana, <i>Handbook of Molecular Spectroscopy - From Radio Waves to Gamma Rays</i>, IK International Publishing House, 2015. 4. D. L. Pavia, G. M. Lampman, G. A. Kriz, and J. R. Vyvyan, <i>Introduction to Spectroscopy</i>, 5th ed., Brooks Cole, 2015. 5. R. M. Silverstein and F. X. Webster, <i>Spectroscopic Identification of Organic Compounds</i>, 6th ed., John Wiley & Sons, New York, 2003. 6. D. C. Harris and M. D. Bertolucci, <i>Symmetry and Spectroscopy</i>, Dover, 1990. 7. R. S. Drago, <i>Physical Methods in Chemistry</i>; Saunders: Philadelphia, 1977. 				
COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)				
<ol style="list-style-type: none"> 1. Feedback from students during class committee meetings. 2. Anonymous feedback through questionnaire (as followed previously). 				
COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)				
<ol style="list-style-type: none"> 1. Tests I and II will be conducted in regular class. 2. The question paper for end semester examination will be set by the course faculty. 3. 75% attendance is mandatory for writing the end semester examination. 4. A retest will be conducted for those who missed the CT - I or II for genuine reasons. 				
ADDITIONAL COURSE INFORMATION				
The course faculty will be available for consultation at times as per the intimation by the faculty.				
FOR SENATE'S CONSIDERATION				
<div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;">  Course Faculty </div> <div style="text-align: center;">  CC-Chairperson </div> <div style="text-align: center;">  HOD </div> </div>				