Master of Science – Materials Science

(M.Sc.)(Materials Science) Semester –II

Course Code	PS02CMTS52	Title of the Course	Spectroscopy
Total Credits of the Course	4	Hours per Week	4 hrs

Course Objectives:	1. Characterization methods used for different materials by various spectroscopic techniques 2. Theoretical aspect and interpretation of spectral data for different spectroscopic technique 3. principal of NMR and Mossbauer spectroscopic techniques and molecular structure determination

Course Content		
Unit	Description	Weightage* (%)
1.	Atomic absorption and flame emission spectroscopy. uv, visible and photoelectron spectroscopy introduction, theoretical consideration, application.	25%
2.	Introduction of microwave spectroscopy, rigid rotors, microwave spectra of diatomic and linear triatomic molecules, numerical problems. Harmonic and anharmonic oscillation in presence of IR, group frequency concept and its limitation, classical theory of Raman effect, selection rule for IR/Raman active vibrations.	25%
3.	Principle of NMRspectroscopy, chemical shift, local contribution to chemical shift, neighbour anisotropic contribution to chemical shift, ring current effect, spin-spin splitting and effect of spin-spin splitting on the spectrum. spin decoupling techniques, molecular structure studies by NMR.	25%
4.	Mossbauer spectroscopy, resonance absorption in solids, the mossbauer effect, experimental set up, factors affecting the MB spectra, applications. Development of masers and lasers, principle of masers action and types of masers, laser-generation of coherent radiation, type of lasers, application of lasers.	25%

Teaching-Learning Methodology	Group discussion/ Panel/Presentation

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learnerwill be able to	
1.	Students will learn about various spectroscopic techniques used for the analysis of the materials.
2.	Basic principles of absorption and emissions spectroscopic technique and interpretation of the data from the spectrum
3.	Knowledge will be useful in R & D and industries

Suggested References:	
Sr. No.	References
1.	Banwell, C. N. (2013). *Fundamentals of molecular spectroscopy*. McGraw-Hill Education
2.	Boyd, R. N., Morrison, R. T. (2001). *Organic Chemistry*. Prentice Hall of India.
3.	Kalsi, P. S. (2007). *Spectroscopy of organic compounds*. New age international.
4.	Abramczyk, H. (2005). *Introduction to laser spectroscopy*. Elsevier.
5.	Wertheim, G. K. (2013). *Mossbauer Effect: Principles and Applications.* Elsevier Science.
6.	Rao, C. N. R. (1967). *Ultra-violet and Visible Spectroscopy: Chemical Applications*. United Kingdom: Butterworths.
7.	Rao, C. N. R. (2012). *Spectroscopy in Inorganic Chemistry (V2).* Elsevier Science.

On-line resources to be used if available as reference material
On-line Resources
Fundamentals of Spectroscopy, Prof. Sayan Bagchi, , NCL Pune and Prof. Anirban Hazra, IISER Pune https://nptel.ac.in/courses/104/106/104106122/

*****