

**Subject Code: 02CY0501****Subject Name: Advanced Analytical Techniques****M.Sc. Sem - III****Objectives:**

- To learn about advance techniques used in spectroscopic and spectrometric analysis.
- To understand Principal and instrumentation of various instruments.
- Aware about analysis and characterization of various compounds.

**Credits Earned:** 6 Credits**Course Outcomes:**

After the successful completion of the course, students will be able to understand,

- Spectroscopic and spectrometric methods
- Principle, theory, instrumentation and applications of spectroscopy and spectrometry.

**Pre-requisite of course:** NA.**Teaching and Examination Scheme**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
4	3	0	6	50	30	20	25	25	150

**Contents:**

Unit	Topics	Contact Hours
1	<b>UV-Visible Spectrophotometry</b> Principles of UV-Visible Spectrophotometry, theory and applications. Theory of electronic spectroscopy, absorption by organic molecules, choice of solvent and solvent effects. Instrumentation, light source sample preparation.	15
2	<b>Infrared Spectroscopy</b> Introduction, IR Frequency Range and Spectrum Presentation, Theory of Infrared Absorption, Dispersive Spectrometers, Fourier Transform Spectrometers, Hyphenated Methods Involving Infrared, Analytical Information : Qualitative and Quantitative Applications	15
3	<b>Nuclear Magnetic Resonance Spectroscopy</b> Introduction, Physical and Chemical Principles, Instrumentation, Analytical Information : Qualitative and Quantitative Applications	15
4	<b>Raman Spectroscopy</b> Introduction, Dispersive Spectrophotometers, Fourier Transform Spectrometers, Normal Raman, Resonance Raman, FT – Raman, Surface – enhanced Raman Spectroscopy (SERS), Raman Microprobe, Remote Raman Analysis, Raman Depolarization Ratios, Analytical Information, Applications  <b>Mass spectrometry:</b> Principle, theory, instrumentation, fragmentation and applications.	15
	<b>Total Hours</b>	60

**References:**

1. Introduction to instrumental analysis –R.D.Broun, McGraw Hill (1987)
2. Instrumental methods of chemical analysis – H. Willard, L.Merrit, J.A. Dean and F.A. Settle. Sixth edition CBS (1986)
3. Thermal analysis –W.W. Wendlandt, John Wiley, (1986)
4. Fundamentals of analytical chemistry –D.A.Skoog, D.M. West and H.J. Holler sixth edition (1992)
5. Nuclear Analytical Chemistry – J. Tolgyessy and S. Verga vol. 2, university Park press, (1972)
6. Radiochemistry and Nuclear methods – W.D. Ehmann and D.E. Vance, John Wiley and Sons.
7. Instrumental methods of chemical analysis, In; Introduction to Analytical chemistry: Sharma BK. Goel Publishing House Meerut, 23<sup>th</sup> edition; 2004

**Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
30%	25%	15%	15%	10%	5%

**Instructional Method:**

- The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
- The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.
- Use of hazardous/toxic chemicals should be avoided as far as possible in laboratory.
- All students in the laboratory must wear safety goggles and lab coats during lab session.

**Supplementary Resources:**

- <http://www.nptel.ac.in/courses/104103069/#>
- <http://ocw.mit.edu/courses/chemistry/>
- <http://vlab.amrita.edu/index.php?sub=2>
- [http://www.vlab.co.in/ba\\_labs\\_all.php?id=9](http://www.vlab.co.in/ba_labs_all.php?id=9)