

SEMISTER –II

Code: 202104	Title : Analytical Chemistry	Credits : 4
Objectives: - <ol style="list-style-type: none"> 1. Describe and understand the basic profile of electromagnetic radiations, scientific notations for absorption, emission, transmission, reflection, dispersion, polarization and Classify electromagnetic spectrum ion of spectra. 2. Describe basic concept of microwave spectroscopy and classify molecules on the basis of structural parameters like moment of inertia and intermolecular distances 3. To use/apply the basic statistical treatment of the analytical data for getting a correct result 4. Participants will be able to work more efficiently with knowledge of basic principles. 5. Able to collect data, literature survey for research project. 		
Paper -I		60 Hours
Unit I	General introduction of spectral methods of analysis:- Characterization of electromagnetic radiations, Regions of the spectrum, Interaction of radiations with matter - absorption, emission, transmission, reflection, dispersion, polarization and representation of spectra, basic elements of practical spectroscopy, resolving power, signal to noise ratio. Uncertainty relation and natural line width, natural line broadening, intensity of spectral lines, energy levels, selection rules, components of spectrometer and their functions. Microwave spectroscopy: Rotation of molecules, rotational spectra, diatomic molecules - rigid diatomic molecules, intensities of spectral lines, effect of isotopic substitution, non-rigid rotator, the spectrum of non-rigid rotator, polyatomic molecules, technique and instrumentation in outline, applications, numerical problems.	
Unit II	Laboratory work:- <ol style="list-style-type: none"> 1. Fundamental Laboratory Techniques:- Basic principles, Health and safety, Working with liquids, Basic laboratory procedures I & II, Principles of solution chemistry, pH and buffer solutions. 2. The investigative approach:- Making and recording measurements, SI units (International System of Units) and their use, Scientific method and design of experiments, Project work. Collection of data (primary, secondary), literature survey & review. 3. Analysis and presentation of data: Using graphs, Presenting data in tables, Hints for solving numerical problems, Descriptive statistics, Choosing and using statistical tests, drawing chemical structures, Chemo metrics, Computational chemistry. 4. Statistical Packages for Social Science (SPSS) Workshop. 	15 Lectures
Unit III	Data Analysis:- <ol style="list-style-type: none"> 1. Analysis and presentation of data: Using graphs, Presenting data in tables, Hints for solving numerical problems, Descriptive statistics, Choosing and using statistical tests, drawing chemical structures, Chemo metrics, Computational chemistry. 2. Statistical Packages for Social Science (SPSS) Workshop. 	15 Lectures

Unit IV	<p>Spectroscopy:- Vibrational spectroscopy Review of linear harmonic oscillator, the vibrating diatomic molecule, the simple harmonic oscillator, the anharmonic oscillator, the diatomic vibrating rotator, the vibration-rotation spectrum of carbon monoxide, breakdown of the Born-Oppenheimer approximation, the vibration of polyatomic molecules, overtones and combination frequencies, the influence of rotation on the spectra of polyatomic molecules, the influence of nuclear spin, symmetric top molecules, analysis by Infra-red technique - Group frequencies, outline of technique and instrumentation. Raman spectroscopy: Classical and quantum of theory of Raman effect, pure rotational, vibrational and vibrational-rotational Raman spectra, rule of mutual exclusion, overtone and combination vibrations, Rotational fine structure, outline of technique and instrumentation, applications.</p>	15 Lectures
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Reference Books :

1. Instrumental Methods of Chem. Analy. Chatwal and Anand.
2. Instrumental Methods of Chemical Analysis - Willard, Merritt, Dean & Seale
3. Instrumental Methods of Chemical Analysis - Chatwal, Anand
4. Instrumental Methods of Chemical Analysis - R.D. Braun
5. Fundamentals of Molecular Spectroscopy: Banwell.
6. Atomic and Molecular Structure : Manas Chanda
7. Spectroscopic Methods in Organic Chemistry : D.H. Williams and I. Fleming.
8. Organic Spectroscopy: William Kemp (3rd Edition).
9. Inorganic Chemistry - Atkins and Shriver.
10. Principles of Instrumental Analysis - Skoog, Holler and Nieman, 5th Edition.
11. Undergraduate Instrumental Analysis, 6th Edition, J W Robinson, Marcel Dekker.
12. Quality Control and Total Quality Management - P.L. Jain-Tata McGraw-Hill (2006) Total Quality Management - Bester field - Pearson Education.
13. Industrial Hygiene and Chemical Safety, M H Fulekar.
14. 3000 solved problems in chemistry, Schaums Solved problem series, David E. Goldbers, Mc Graw Hill international Editions.