

Course Title: Nuclear Spectroscopy Techniques

Semester: VII

Course Code: CH-411

Credit Hours: 3-0

Prerequisite: Nil

### Course Objectives

1. To improve comprehension of students about various analytical nuclear techniques.

### 2. Recommended Books

- a. Fundamentals of Analytical Chemistry by Douglas A. Skoog, Donald M. West, F. James Holler and Stanley R. Crouch, Mary Finch Publications USA. 9<sup>th</sup> Ed. 2014, ISBN-13: 978-0-495-55828-6
- b. Principles of Instrumental Analysis by Douglas A. Skoog, F. James Holler and Stanley R. Crouch, Thomson Books/Cole Publications USA. 6<sup>th</sup> Ed. 2007, ISBN-13: 978-0-495-01201-6.
- c. Instrumental Methods of Analysis by Willard M D Settle CBS Publisher, 7<sup>th</sup> Ed. 2007.
- d. Fundamentals of Molecular Spectroscopy by Colin N Banwell, Elaine M McCash and Hiranya K Choudhury, McGraw Hill Education Publisher, 5<sup>th</sup> Ed. 2013.

### Detailed Contents

3. Nuclear Magnetic Resonance Spectroscopy. Principles of NMR Spectroscopy, Properties of nuclei, Chemical shifts, Spin-spin coupling, Instrumentation details of NMR Spectrophotometer and their function, Continuous-wave NMR Spectroscopy, Pulsed Fourier Transform NMR Spectroscopy, Interpretation of H<sup>1</sup>-NMR Spectra, Interpretation of C<sup>13</sup>- NMR Spectra, Use of NMR imaging in medicine, Analytical applications of NMR Spectroscopy.

4. X-ray Spectroscopy. Theory of X-ray Spectroscopy, Instrumentation details of X-ray Spectroscopy and their function, Direct X-ray methods, X-ray Absorption Methods, X-ray Fluorescence Method, X-ray Diffraction method, Analytical applications of X-ray Spectroscopy.

5. Radiochemical Methods. Nuclear Reactions and Radiations, Measurement of Radioactivity, Neutron Sources, Neutron Activation Analyses, Isotope Dilution Analysis, Other applications of Radionuclides.

6. Mössbauer Spectroscopy. Principles of Mössbauer spectroscopy, Instrumentation of Mössbauer spectroscopy, Analytical applications of Mössbauer spectroscopy.

### Course Outcomes

7. Students will acquire knowledge about different nuclear analytical techniques with special emphasis on the theoretical, instrumental and applications.

Detail of Lab Work: Nil