Programme: M. Sc. (Biochemistry)

Course Code: **BCO 404** **Title of the Course:** Analytical Biochemistry-II

Number of Credits: 3

Effective from AY: 2021-22

Prerequisites for the course:	Students should have studied the theory/ instrumentation and application of some of the basic bio-analytical techniques. It is assumed that students have a basic knowledge of fundamentals in biochemistry and certain basic techniques in routine laboratory analysis.	
Course Objectives:	1. Introduction of various bioanalytical techniques for analysis. 2. Evaluate the utility of various analytical techniques as a qualitative and quantitative tool. 3. Develop concepts in techniques and instruments required for macromolecule structure determination and other techniques such as tracers for metabolic pathways.	
Course Outcomes:	1. Students should be able to differentiate between various analytical techniques based on their theory and sensitivity achieved. 2. Students should be in a position to explain the principles of various techniques and apply the knowledge of the techniques for designing various experiments in research and development. 3. Students should be able to choose between various techniques of structure elucidation based on the information desired and interpret the data obtained to a fair level.	

Content:	1. **Optical methods of analysis:** Theory and application of UV-visible spectrophotometry, fluorimetry, atomic absorption spectrophotometry (AAS).	**4 h**
	2. **Microscopy:** Basic aspects of compound microscope, theory and applications of Light, Dark, Phase-contrast, and Inverted.	**4 h**
	3. **Bioimaging and image processing:** Principle, application and profile analysis: fluorescence microscopy, epifluorescence, immuno-fluorescence microscopy, and confocal scanning microscopy. Theory, instrumentation and applications of atomic force microscopy (AFM), scanning electron microscopy (SEM), transmission electron microscopy (TEM). Optical tweezers, photography, digital imaging and image processing,	**7 h**
	4. **Radioisotopes:** Nature of radioactivity and its detection, measurement of radioactivity, Disintegration kinetics, Radio-activity counters – GM Counter, Scintillation Counter, Isotope dilution analysis, Autoradiography, radiorespirometry, Tracer techniques for metabolic pathways. Safety measures in handling radioisotopes.	**7 h**
	5. **Spectroscopic techniques for macromolecule structure determination:** Principles, application and profile analysis of FTIR, NMR, X-ray diffraction, optical rotatory dispersion, circular dichroism.	**8 h**
	6. **Mass Spectrometry:** Principle, components, working and applications of mass spectrometer, different types of ionization methods used in mass spectrometer (CI, EI, ESI, FAB), different types of mass analysers used in mass spectrometer (magnetic sector, quadrapole), MALDI-MS, MALDI-TOF-MS, ICP-MS, introduction to GCMS, LCMS.	**6 h**
Pedagogy:	Lectures (online or physical)/ tutorials/ laboratory work/ outreach activities/ project work/ vocational training/ seminars/ term papers/ assignments/ presentations/ self-study etc. or a combination of some	

	of these. Sessions shall be interactive in nature to enable peer group learning.	
Text Books/ References / Readings	1. Wilson, K.; Walker, J.; Principles and Techniques of Practical Biochemistry; Cambridge University Press; 2010/ 7th Edition. 2. Christian, G. D.; Dasgupta, P. K.; Schug, K. A.; Analytical Chemistry; John Wiley & Sons; 2013/ 7th Edition. 3. Skoog, D. A.; Holler, F. J.; Crouch, S. R. Principles of Instrumental Analysis; Cengage Learning; 2016/ 7th Edition. 4. Norris, J. R.; Ribbons, D.W.; Methods in Microbiology; Academic Press; 1971/1st Edition. 5. Parakhia, M. V.; Tomar, R. S.; Patel, S.; Golakiya, B. A.; Molecular Biology and Biotechnology: Microbial Methods; New India, 2010. 6. Homes, D. J.; Peck, H.; Analytical Biochemistry; Pearson Education Limited; 1998, 3rd Edition. 7. de Hoffmann, E.; Stroobant, V.; Mass Spectrometry: Principles and Applications; John Wiley & Sons Ltd; 2007/ 3rd Edition.	