Session: 2025-26			
Part A – Introduction			
Name of Programme	**M.Sc. Biochemistry**		
Semester	**Semester – II**		
Name of the Course	**Biochemical and Biophysical techniques**		
Course Code	**M24-BCH-202**		
Course Type	**CC-6**		
Level of the course	400-499		
Pre-requisite for the course (if any)			
Course Learning Outcomes (CLO) After completing this course, the learner will be able to:	CLO 1: know the radio-isotopic techniques and centrifugation and their applications in biological science research. CLO 2: understand the basic principles and techniques of chromatography and protein purification and their applications CLO 3: gain insight knowledge of the principle of electrophoresis and the various electrophoretic techniques for proteins and nucleic acids CLO 4: understand spectroscopy to elucidate the chemical structure of molecules and acquire knowledge of microscopy and its applications in various fields of research.		
Credits	Theory	Practical	Total
	4	0	4
Teaching Hours per week	4	0	4
Internal Assessment Marks	30	0	30
End Term Exam Marks	70	0	70
Max. Marks	100	0	100
Examination Time	3 hours		

Part B- Contents of the Course

Instructions for Paper- Setter: The examiner will set 9 questions asking two questions from each unit and one compulsory question by taking course learning outcomes (CLOs) into consideration. The compulsory question (Question No. 1) will consist at least 4 parts covering entire syllabus. The examinee will be required to attempt 5 questions, selecting one question from each unit and the compulsory question. All questions will carry equal marks.

Unit	Topics	Contact Hours
I	**Radioisotope techniques:** Basic concepts (types of radioactive decay, rate of radioactive decay, radioactive isotopes and their half-lives and units of radioactivity); GM and scintillation counter; autoradiography; specific activity of a radioisotope; safety aspects; applications of radioisotopes in biological sciences. **Centrifugation:** Basic principle of sedimentation, factors affecting sedimentation; different types of centrifuges; types of rotors; analytical and preparative ultracentrifugation	15
II	**Chromatography:** Principles and applications of paper, thin layer chromatography, ion-exchange chromatography, affinity chromatography, gel filtration chromatography, Determination of molecular weight using gel filtration chromatography, gas liquid	15

	chromatography and High-performance liquid chromatography **Protein purification techniques:** Selection of source, criteria of purity and monitoring protein purification, use of chromatography techniques for protein purification	
III	**Electrophoretic techniques:** Principle of electrophoretic separation, Native and SDS-PAGE, Determination of molecular weight and subunits using SDS-PAGE, Detection and quantification of proteins in gels; Recovery of proteins from gels. Iso-electric focusing (IEF), Western blotting Electrophoresis of nucleic acids: agarose gel electrophoresis, pulse field electrophoresis; capillary electrophoresis; microchip electrophoresis	15
IV	**Spectroscopy:** Nature of electromagnetic radiations; Principles and applications of UV, Visible, Infrared, Raman, Fluorescence and NMR spectroscopy; ORD and CD, Atomic absorption spectroscopy **Microscopy:** Resolving power and magnification power, principle and applications of Phase contrast, Fluorescence microscopy and Electron microscopy (Scanning electron microscopy and Transmission electron microscopy)	15
	Total Contact Hours	60

Suggested Evaluation Methods

Internal Assessment: 30		**End Term Examination: 70**	
➢ **Theory**	**30**	➢ **Theory:**	**70**
• Class Participation:	5	Written Examination	
• Seminar/presentation/assignment/quiz/class test etc.:	10		
• Mid-Term Exam:	15		

Part C-Learning Resources

Recommended Books/e-resources/LMS:

1. Principles and Techniques of Practical Biochemistry, 6th edition by Keith Wilson and John Walker (2000), Cambridge University Press.
2. Physical Biochemistry, 2nd edition, by D Friefelder (1983), W H Freeman and Co., USA.
3. Biophysical Chemistry: Principles and Techniques, 2nd edition by A Upadhyay, K Upadhyay and N Nath (1998), Himalaya Publishing House, Delhi.
4. Physical Biochemistry, 2nd edition, by K. E Van Holde (1985), Prentice Hall Inc, New Jersey.
5. Instrumental Methods of Analysis, 7th edition by H.H.Willard, L L Merritt Jr., J A Dean and F A Settle Jr. (1996), CBS Publishers and Distributors, New Delhi.
6. Kuby Immunology, 4rd ed. by R A Goldsby et al, W H Freeman and Co.