Syllabus for Master of Science in Biotechnology

Subject Code: 02BT0451

Subject Name: Bioanalytics (Core)

M. Sc. Semester- II

Objective: Describe scientific concepts behind various instruments commonly used in analytical laboratories.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, student will be able to

1. Understand the basic concept of spectroscopy and able to interpret spectroscopic data collected by the various methods.
2. Interpret centrifugation and chromtography concepts and applications for biomolecules seperation.
3. Conception and interpretation of Electrophoresis in separation and characterization of biomolecules.
4. Relevance of the biological insights and its use in applied biological techniques

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE(I)	Viva (V)	Practicals/ TW	
4	0	0	4	50	30	20	0	0	100

Contents:

Unit	Topics	Contact Hours
1	Properties of electromagnetic radiations and their interaction with matter; UV and visible light spectroscopy; Beer-Lambert's law; spectrofluorimetry; CD spectroscopy; Mass spectrometry; components of mass spectrometer; methods of ionization and mass analysis including MALDI-TOF; IR spectroscopy; NMR spectroscopy, Atomic Absorption Spectroscopy.	14
2	Centrifugation: Basic principles of sedimentation; derivation of sedimentation coefficient. Centrifugation: Principles. Differential centrifugation. Density gradient centrifugation. Analytical centrifugation. Chromatography: Principles of chromatography; distribution coefficient; retention time; capacity factor; plate height and resolution; peak broadening; TLC and column chromatography; HPLC; normal phase and reversed phase chromatography; ion exchange chromatography; gel exclusion chromatography; affinity chromatography; Gas chromatography.	22
3	Electrophoresis and blotting techniques: General principle of electrophoresis; electrophoresis by SDS-PAGE; native PAGE. Gradient gels; isoelectric focusing; two dimensional PAGE; Pulse Field Gel Electrophoresis (PFGE); capillary electrophoresis, Microchip electrophoresis and blotting techniques.	12
4	Biosensors: Principles and applications of electrochemical, thermometric, optical and piezoelectric biosensors. Glucose biosensors. Microarrays: Basic principles. Introduction to different types. Methods of manufacture. Applications – differential expression, SNP analysis. Radioisotope Techniques: GM counter; scintillation counter; autoradiography.	12
	Total Hours	**60**

References:

1. David Sheeham (2009). *Physical biochemistry: Principles and applications*, 2nd edition, John Wiley and Sons. New Jersey, USA.
2. Keith Wilson and John Walker (2002). *Principles and techniques of practical biochemistry*. Cambridge University Press, Cambridge.
3. Douglas Skoog, Donald West, James Holler, Stanley Crouch. (2007). *Fundamentals of Analytical Chemistry*. Saunders College Pub.
4. David Holm, Hazel Peck. (1998). *Analytical Biochemistry*. Prentice Hall. New Jersey, USA.
5. Donald Voet and Judith Voet. *Biochemistry*, 4th Edition. (2010). John Wiley and Sons. New Jersey, USA.
6. Abhilasha Shourie and Shilpa S Chapadgaonkar. *Bioanalytical Techniques*. (2004). Teri Press, New Delhi. India.
7. Rashmi A. Joshi. *A Textbook of Practical Biochemistry*. (2002). B. Jain Publishers. India.

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
20%	20%	30%	15%	10%	5%

Instructional Method:

a. 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, etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.