

INSTITUTE	FACULTY OF SCIENCE
PROGRAM	MASTER OF SCIENCE (MICROBIOLOGY)
SEMESTER	1
COURSE TITLE	BIOANALYTICAL TECHNIQUES
COURSE CODE	02MB0409
COURSE CREDITS	4

Objective:

- 1 Exposure to principles and usage of analytical methods used routinely in microbiological laboratories.

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

- 1 Describe scientific concepts behind various instruments commonly used in microbial laboratories.
- 2 Comprehend the knowledge of various assay procedures and formats in microbiology.
- 3 Analysis and interpretation of data obtained from various microbiological experiments.
- 4 Devise novel strategies using the knowledge in analytical techniques to assay various important molecules or phenomena in microbiology.
- 5 Safely operate various microbiological instruments and understand the safety requirements while designing laboratory experiments.

Pre-requisite of course:NA

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	50	30	20	0	0

Contents : Unit	Topics	Contact Hours
1	Centrifugation & Cell Imaging Technique Basic principles of sedimentation;, centrifugal field and relative centrifugal force;, types of centrifuges;, types of rotors;, types of centrifugation techniques., Safety aspects of centrifuges., Cell imaging technique: Microscopy–Compound, Phase contrast, SEM, TEM, AFM. Flow cytometer, FACS.	12
2	Spectroscopy 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.	19

Contents : Unit	Topics	Contact Hours
3	Chromatography Principles of chromatography;, distribution coefficient;, retention time;, capacity factor;, plate height and resolution;, peak broadening;, TLC and column chromatography;, matrix materials;, HPLC; normal phase and reversed phase chromatography;, ion exchange chromatography;, gel exclusion chromatography;, affinity chromatography;, Gas chromatography.	17
4	Electrophoresis General principle of electrophoresis;, support media (agarose and polyacrylamide gels);, electrophoresis by SDS-PAGE; native PAGE., Gradient gels;, isoelectric focusing;, two dimensional PAGE;, Pulse Field Gel Electrophoresis (PFGE);, capillary electrophoresis.	12
Total Hours		60

Textbook :

- 1 Principles and techniques of practical biochemistry, Keith Wilson and John Walker, Cambridge University Press, Cambridge., 2002
- 2 Fundamentals of Analytical Chemistry, Douglas Skoog, Donald West, James Holler, Stanley Crouch, Saunders College Pub, 2007

References:

- 1 Physical biochemistry: Principles and applications, 2nd edition,, Physical biochemistry: Principles and applications, 2nd edition,, David Sheeham , John Wiley and Sons. New Jersey, USA., 2009
- 2 Principles and techniques of practical biochemistry., Principles and techniques of practical biochemistry., Keith Wilson and John Walker, Cambridge University Press, Cambridge., 2002
- 3 Biochemistry 4th Edition, Biochemistry 4th Edition, Donald Voet and Judith Voet, John Wiley and Sons. New Jersey, USA., 2010

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	25.00	25.00	10.00	10.00

Instructional Method:

- 1 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.
- 2 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.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

Supplementary Resources:

- 1 <https://archive.nptel.ac.in/courses/102/103/102103044/>
- 2 <https://archive.nptel.ac.in/courses/102/107/102107028/>