INSTITUTE	**FACULTY OF SCIENCE**
PROGRAM	**BACHELOR OF SCIENCE (MICROBIOLOGY)**
SEMESTER	**5**
COURSE TITLE	**BIOCHEMICAL TECHNIQUES & INSTRUMENTATION**
COURSE CODE	**02MB0307**
COURSE CREDITS	**4**

Objective:

1 To Provide exposure to principles and instrumentation of biochemical techniques used routinely in microbiological laboratories.

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

1 Link the fundamental principles of biochemical studies and their significance in research and industry.

2 Apply knowledge of different types of centrifuges to evaluate their applications and implement safety measures in their usage.

3 Illustrate spectroscopic techniques for the detection and determination of molecules in biochemical studies.

4 Relate separation and detection methods to characterize macromolecules effectively.

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	**Basic principles in Biochemical Studies** SI units; weak electrolytes: Ionisation of weak acids and bases; Measurement and Preparation of Buffer solutions; measurement of pH; Analytical considerations and experimental error in experiments- The nature of experimental errors; Systematic error; Random error; Assessment of the performance of an analytical method; Assessment of precision.	12
2	**Centrifugation** Basic principles of sedimentation; sedimentation coefficient and Swedberg constant. Relative centrifugal force (RCF); types of centrifuge- small bench; clinical; high speed; refrigerated; ultra centrifuge- preparative and Analytical; safety aspects in use of centrifuge.	14

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Contents : Unit	Topics	Contact Hours
3	**Detection and determination of Molecules** Spectrophotometric methods- The Nature of Light; The Electromagnetic Spectrum; Beer's Lambert's Law- Principles; Operating mechanism and application of Spectrophotometer and Fluorescence; spectroscopy; Luminometry.	17
4	**Separation and Detection of Macromolecules** Chromatography: Principles of chromatography; distribution coefficient, retention time, capacity factor; plate height and resolution; peak broadening; TLC and column chromatography. Electrophoresis: principle; paper electrophoresis; gel electrophoresis-column; agarose gel; pulse field; Polyacrylamide gel electrophoresis; capillary electrophoresis; Immuno electrophoresis; Microchip electrophoresis, Blotting techniques.	17
Total Hours		**60**

Textbook :

1 A Textbook of Practical Biochemistry, Rashmi A. Joshi, B. Jain Publishers, 2002

2 Bioanalytical Techniques, Abhilasha Shourie and Shilpa S Chapadgaonkar, Teri Press, New Delhi, 2004

References:

1 Physical biochemistry: Principles and applications, Physical biochemistry: Principles and applications, David Sheeham , John Wiley and Sons, 2009

2 Principles and techniques of practical biochemistry, Principles and techniques of practical biochemistry, Keith Wilson and John Walker , Cambridge University Press, 2002

3 Fundamentals of Analytical Chemistry, Fundamentals of Analytical Chemistry, Douglas Skoog, Donald West, James Holler, Stanley Crouch, Saunders College Pub, 2007

4 Analytical Biochemistry, Analytical Biochemistry, David Holm, Hazel Peck, Prentice Hall, 1998

5 Biochemistry, Biochemistry, Donald Voet and Judith G. Voet, John Wiley and Sons, 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
5.00	10.00	30.00	30.00	20.00	5.00

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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://www.youtube.com/playlist?list=PLAi3JSYaGnl537S5U3f2roZztUP_LZdmu

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