



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-1(M.Sc.)

Subject: Instrumentation in Biological Sciences- MSCMB11503

Type of course: Major

Prerequisite: to teach students how these techniques are essential for biologists who want to conduct research and make new discoveries.

Rationale: Provide students with the tools they need to study living organisms and their processes. There are many different techniques available, each with its own advantages and disadvantages.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		C	Theory Marks		Practical Marks		
			ESE		MSE	V	P	ALA	
4	0	0	4	60	30	10	00	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.



Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Presentation Faculty will assign topics and students will prepare presentations (Slideshow/video) and upload them to Moodle.	10
2	Quiz Faculty will conduct quiz sessions in the classroom per unit of their respective subject.	10
3	Industrial visit: Students will visit industry and prepare the report on instruments and techniques used in specific industry and upload it to moodle.	10
4	Analysis Faculty will assign scientific pictures and students will analyze and prepare a report in 100 words and upload it to Moodle.	10
5	Look & Learn Lab instrument Photograph will be provided by faculty and students have to Identify, describe and upload the working principle of the assigned photograph on Moodle.	10
Total		50

Course Content:

Unit No	Course content	Hrs	% Weightage
1	Chapter-1: Basic Microtechniques <ul style="list-style-type: none"> • Construction and working of pH meter. • Titrimetric analysis: EDTA, Redox, Acid Base, Dichromate. • Construction, principle and working of Flame photometer. • Microscopy: Stereomicroscopy, Phase Contrast, Confocal, SEM & TEM. 	15	25



2	<p>Chapter-2: Separation Techniques:</p> <ul style="list-style-type: none"> • Centrifugation techniques – Various types of centrifuges and their applications. • Chromatography: Paper chromatography, thin layer chromatography (TLC). • Gas chromatography (GC), High pressure liquid chromatography (HPLC), ion-exchange chromatography. • Electrophoretic techniques: Agarose gel electrophoresis and SDS-PAGE, Native PAGE and IEF - their applications in Biological Sciences. • Blotting techniques. 	15	25
3	<p>Chapter-3: Advances in Instrumentation Principle, working and applications</p> <ul style="list-style-type: none"> • Atomic absorption Spectrophotometer (AAS) • Fourier Transformation Infrared Spectroscopy (FTIR), Matrix Assisted LASER Desorption/Ionization Time of Flight (MALDI-ToF), • Nuclear Magnetic Resonance (NMR) • Spectrophotometer • Atomic absorption spectrophotometry (AAS) • Mass spectrometric techniques (Tandem and ESI) 	15	25
4	<p>Chapter-4: Bio-nanotechnology</p> <ul style="list-style-type: none"> • Introduction to concept and principles of nanotechnology • Nanomaterial in nanotechnology: Nanoparticles, Quantum Dots, Nanotubes, Nanowires • Development of nanotechnology-Timelines and Progress • Techniques and methodology used to study nanoparticles • Biosensors, Molecular recognition devices, Lab on Chip- concepts and applications • Biological Nanoparticles- Plant and Microbial • Application of nanoparticles in molecular biology, industry, agriculture and environment 	15	25



Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	40%	30%	10%	-	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Learn about different microscopic techniques.
CO2	Acquire knowledge about techniques used for the separation of molecules.
CO3	Understand advanced instruments, its application and working.
CO4	Pursue Knowledge on modern development and detailed study of Nanotechnology.

Instructional Method:

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, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

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

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.



Reference Books:

- 1) Instrumental Methods of Chemical Analysis by BK Sharma, Krishna Prakashan Media Pvt Ltd; 1/e edition, (2011).
- 2) Microscopy for Students by JD Casartelli, McGraw-Hill Inc., USA; 2nd Revised edition, 1969.
- 3) Comprehensive Biotechnology (Vol 1 to 4) by Conney and Humphrey, 1st edition.
- 4) Molecular Biotechnology by S B Primrose, Blackwell Scientific Publications, London, UK, 2nd edition, 1991
- 5) Principles of Instrumental analysis by DA Skoog and JJ Leary, 4th edition, 1992.
- 6) Instrumentation by Chatwal and Anand.

