Gyanmanjari Innovative University

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

Subject: Bacteriology

Type of course: Major (Core)

Prerequisite: Basic knowledge of Bacterial taxonomy, structure and its nutrition.

Rationale: This course has been designed to make the students know about improving and broadening our fundamental understanding of microorganisms, the science of microbiology investigates their morphology, physiology, metabolism, reproduction. This is how microbiology contributes significantly to several industries.

Teaching and Examination Scheme: 200

Teaching Scheme			Credits	Examination Marks		Total Marks
CI	T	P	C	ESE	CCE	
2	0	4	4	100	100	200

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; SEE - Semester End Evaluation; MSE- Mid Semester Examination; LWA - Lab Work Assessment; V – Viva voce; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities.

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Bacterial Identification Challenge** Faculty will provide students with unknown bacterial samples that are cultured on agar plates, Students need to identify the type of organism and report need to upload on GMIU web portal.	10
2	**Microscopy Mystery** Students need to prepare a slide with different bacterial species stained using the Gram stain, bacterial Photo needs to upload on GMIU web	10

	portal.	
3	**Surrounding identification** Students need to observe presence of microorganisms at different surroundings and plate photo need to upload on GMIU web portal.	10
	Total	**30**

Result Calculation:
Examination Component: 120
ALA:30

(Passing Criteria: Minimum 40% overall and at least 30% in each category (Practical, Assignment, Viva, Project)

Course Content:

Sr. No	Course Content	Hrs.	% Weightage
1	**Theory Topics –** **Introduction to Bacteriology:** • Classification system of Microorganisms. • Phylogenetic tree **Practical** • Phylogenetic tree preparation		

Sr. No	Evaluation Methods	ESE	CCE
1	Assignments		10
2	Report preparation: student have to analyses different classification method and prepare report on it.	15	
3	Poster Making	10	
4	Journal		5
5	**Bacterial Identification Challenge** Faculty will provide students with unknown bacterial samples that are cultured on agar plates, Students need to identify the type of organism and report need to upload on GMIU web portal.		10
	Total	25	25

Theory Topics:

External structure of Microorganism

Types of Microbes:

- Overview of bacterial structure (Cell wall, Cell membrane, capsule, pili, flagella).
- Differences between Gram-positive and Gram-negative bacteria.
- Function of bacterial external structures in pathogenicity and survival.

Practical:

- Gram Staining Procedure: Staining of bacterial cultures and observation under a microscope to differentiate Gram-positive and Gram-negative bacteria.
- Flagella Staining: Observe the flagella of bacteria using special staining techniques.
- Capsule Staining: Use negative staining techniques to observe capsules in bacteria.
- Special Staining: Cell Wall staining

2

Sr. No	Evaluation Methods	ESE	CCE
1	Study of lipopolysaccharide.		10
2	Prepare protocol for pathogenicity.	15	
3	Industrial problem solution.	10	
4	Journal		5
5	**Microscopy Mystery** Students need to prepare a slide with different bacterial species stained using the Gram stain, bacterial Photo needs to upload on GMIU web portal.		10
	Total	25	25

3

Theory Topics:

Internal structure of Microorganism

- Overview of bacterial structure (Cytoplasm, Ribosome, Nucleic Acid, Vacoules).
- Spore Formation
- Exospore & Endospore

Practical :

- Endospore Staining
- Study of DNA by chart.

Sr. No	Evaluation Methods	ESE	CCE
1	Survival of microbes.		10
2	Chart Preparation: prepare chart for spore	15	
3	Industrial problem solution.	10	
4	Journal		5
5	**Surrounding identification** Students need to observe presence of microorganisms at different surroundings and plate photo need to upload on GMIU web portal.		10
	Total	25	25

4

Theory Topics:

Nutritional Requirements of Microorganisms

Theory:

- Nutritional requirements of bacteria.
- Nutritional types of bacteria.
- Culture media: Principles of media formulation, media ingredients & types of culture media.
- Physical conditions required for cultivation of bacteria (Temperature, gaseous requirement, acidity & alkalinity, osmotic pressure etc).

Practical :

- Study of effect of temperature on growth of microorganisms.
- Study of the effect of pH on growth of microorganisms
- Study of the effect of osmotic pressure (salt concentrations) on growth of microorganisms.
- Study of the effect of osmotic pressure (sugar concentration) on growth of microorganisms

Sr. No	Evaluation Methods	ESE	CCE
1	Tolerance of microbes.		10

	2	Study of salt concentrations.	15			
	3	Industrial problem solution.	10			
	4	Journal		5		
	5	Flow diagram for Culture media: Principles of media formulation, media ingredients & types of culture media.		10		
		Total	25	25		

Distribution of Marks
(Revised Bloom's Taxonomy)

Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage %	20%	40%	30%	10%	-	-

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand taxonomy analysis study by Whittaker's classification systems.
CO2	Know about morphological and Structural analysis of the organisms.
CO3	Learn about detailed structure study of the organisms.
CO4	Understand requirements for microbial growth, its formulation and components.

Instructional Method:

The course delivery method will depend upon the requirement of content and needs 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 the 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] Microbiology: Pelczar MJ, Chan ECS and Kreig NR, Tata Mc Grow Hill.
[2] General Microbiology: Dubey RC.
[3] Microbiology: An introduction: Tortora GJ, Funke BR and Case CL, Pearson Education Inc.
[4] Elementary Microbiology: Modi HA, volume- I & II.
[5] Practical Microbiology: Patel RJ, Aditya Publications.

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