



Gyanmanjari
Innovative University

Course Syllabus
Gyanmanjari Science College
Semester-4 (B.Sc.)

Subject: Principles of Microbial Biodiversity-BSCMB14311

Type of course: Major

Prerequisite: Basic knowledge of evolution, microscopic methods & basic concepts of prokaryotic & eukaryotic organisms.

Rationale: This course has been designed to make the students know about to evolution of microorganisms, conservation, molecular & genomic methods for evolution and biodiversity of various prokaryotic & eukaryotic organisms.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P	C	SEE		CCE			
				Theory	Practical	MSE	LWA/V	ALA	
3	0	2	4	75	25	30	20	50	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 voice; CCE-Continuous and Comprehensive Evaluation; ALA- Active Learning Activities

3 Credits * 25 Marks = 75 Marks (each credit carries 25 Marks) Theory

1 Credits * 25 Marks = 25 Marks (each credit carries 25 Marks) Practical

SEE 100 Marks will be converted in to 50 Marks

CCE 100 Marks will be converted in to 50 Marks

It is compulsory to pass in each individual component.



Course Content:

Unit No.	Course content	Hrs	% Weightage
1	Chapter-1: Introduction to Biodiversity <ul style="list-style-type: none"> • Concepts of biodiversity • Origin of life, evolution and origin of biodiversity. • Evolutionary tree of microorganisms. • Value of biodiversity. • Conservation: in situ and ex situ. 	10	25%
2	Chapter-2: Methods of assessing Biodiversity <ul style="list-style-type: none"> • Microscopic methods. • Cultural methods. • Molecular and genomic methods: importance of DNA and RNA sequence, nucleic acid hybridization, determination of G+C content. • Concept of non-culturable diversity and VBNC (viable but not culturable) microbes. 	10	25%
3	Chapter-3: Biodiversity of Prokaryotes, Biodiversity of Prokaryotes – Occurrence, morphology and physiology, and ecological characters: <ul style="list-style-type: none"> • Gram positive bacteria: Endospore forming rods, various aerobic and anaerobic cocci, actinomycetes, and Mycobacteria. • Gram negative bacteria: Spiral shaped bacteria, coliform group, and other important genera. (Pseudomonas, Xanthomonas, Rhizobium, Agrobacterium, Salmonella, Shigella, Proteus spp.) • Rickettsia and Mycoplasmas. • Archaeobacteria. 	15	25%



4	Chapter-4: Biodiversity of Eukaryotes <ul style="list-style-type: none"> Eukarya: Morphological, cellular, physiological, metabolic and ecological characteristics of: <ul style="list-style-type: none"> A. Fungi B. Algae C. Lichens as consortium of algae and fungi Chapter-5 A cellular organisms- Virus: <ul style="list-style-type: none"> Discovery, Physiochemical and biological characteristics; Classification (Baltimore), General structure 	10	25%
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Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	Chain Note (Phylogeny preparation) Faculty will assign specific organism name on which students have to prepare a chain note and upload it to GMIU web portal.	10
2	Project based learning Student need to prepare a project (Topic provided by faculty) and after completing that portion students need to write a project report and upload on GMIU web portal.	10
3	Identify the morphology of given Microorganisms. Faculty will give specific microorganisms grown on plate and students have to identify it and write its characteristics and upload it to GMIU web portal.	10
4	Identify fungi from soil sample Students will collect the soil sample and isolate the fungi and identify it and write a report on it in 250 words and upload on GMIU web Portal.	10
5	Attendance	10
Total		50



Suggested Specification table with Marks (Theory):75

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	Evaluate of organisms and conservation methods.
CO2	Apply the molecular and genomic methods.
CO3	Characterize morphology and physiology, and ecological characters of gram positive and gram negative bacteria.
CO4	Illustrate morphology and physiology, and ecological characters of eukaryotic and acellular organisms.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1	To study non-culturable microbial diversity.	2	2
2	Study of polyphasic approach to assess microbial biodiversity.	2	2
3	Study of morphological diversity (performance of Gram staining and relevant special staining): <i>Escherichia coli</i> , <i>Enterobacter aerogenes</i> , <i>Proteus vulgaris</i> , <i>Staphylococcus aureus</i> , <i>Bacillus spp.</i>	3	3



4	Study of cultural / growth diversity using nutrient broth and nutrient agar media and relevant differential, selective or special media (such as EMB, MacConkey, MSA etc.): <i>Escherichia coli</i> , <i>Enterobacter aerogenes</i> , <i>Proteus vulgaris</i> , <i>Staphylococcus aureus</i> , <i>Bacillus spp.</i>	3	3
5	IMViC tests.	3	3
6	To check presence of catalase enzyme in microbes..	3	3
7	To check presence of dehydrogenase enzyme in microbes.	3	3
8	To check presence of oxidase enzyme in microbes.	3	2
9	Fungi: Cultural and microscopic characters of <i>Mucor spp.</i> , <i>Rhizopus spp.</i> , <i>Aspergillus spp.</i> , <i>Penicillium spp.</i> and yeast.	4	3
10	Algae: Study of algae present in pond water; study of permanent slides of <i>Spirogyra</i> and diatoms	4	3
11	Protozoa: Study of presence of protozoa in pond water; study of permanent slides of <i>Amoeba</i> , <i>Euglena</i> and <i>Paramecium</i> .	4	3
12	Determination of alkaline phosphatase activity of milk.	3	2
13	To study different types of lichens and their characteristics.	4	2
Total			34

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 the laboratory.

Reference Books:

- [1] Microbiology: Pelczar MJ, Chan ECS and Kreig NR, Tata Mc Grow Hill.
- [2] General Microbiology: Stanier RY, Adelberg EA and Ingraham JL, Mac Millan Press Inc.
- [3] General Microbiology Vol I & II: Powar & Dagainawala, Himalaya Publishing House.
- [4] Introduction to Microbiology: Ingraham JL and Ingraham CA, Thomson Brooks/Cole.
- [5] Principles of Microbiology: Atlas RM, Wm C brown Publishers.
- [6] Brock's biology of Microorganisms Madigan MT and Martinko JM, Pearson Education Inc.
- [7] Microbiology: An introduction: Tortora GJ, Funke BR and Case CL, Pearson Education Inc.
- [8] Elementary Microbiology: Modi HA, volume- I & II.
- [9] General Microbiology: Dubey RC.
- [10] Practical Microbiology: Patel RJ, Aditya Publications.
- [11] Practical Microbiology: Dubey RC and Maheshwari DK, S Chand Publication.

