



Course Syllabus
Gyanmanjari Science College
Semester-2 (B.Sc.)

Subject: Fundamental of Microbial Culture -BSCMB12304

Type of course: Major

Prerequisite: Basic knowledge of growth and cultivation of microorganisms.

Rationale: This course has been designed to make the students know about to study individual microbes, cultivation enable research and practical application and control is essential for biotechnological processes.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
CI	T	P		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	<p>Chapter-1: Techniques to study Microorganisms</p> <ul style="list-style-type: none"> • Concept of pure and axenic culture. Principles and methods of obtaining pure culture: Isolation by liquid media – serial dilution Isolation by plating media – streak, pour and spread plate method Single cell isolation by micromanipulator Selective methods – using physical and chemical agents. • Maintenance and preservation of pure culture: Periodic subculturing, refrigeration, mineral oil overlaying, liquid nitrogen, lyophilization. • Culture collection centers. 	15	25%
2	<p>Chapter-2: Cultivation and Identification of Microbes-I</p> <ul style="list-style-type: none"> • Cultivation of aerobic bacteria: Media: Nutrient broth and agar, MacConkey agar, EMB agar, mannitol salt agar, SS agar, WB agar. Cultivation of aerobic bacteria by using solid and liquid media. • Cultivation of anaerobic bacteria: Media: Thioglycollate broth, Robertson's cooked meat medium, litmus milk medium. Cultivation of anaerobic bacteria by using broth medium and anaerobic jar. 	10	25%
3	<p>Chapter-3: Cultivation and Identification of Microbes II</p> <ul style="list-style-type: none"> • Cultivation of fungi and yeast: (i) Media: Potato dextrose agar, rose Bengal agar, Czapek Dox agar, glucose yeast extract agar. (ii) Cultivation of fungi and yeast by solid media. • Criteria used for microbial identification: (i) Morphological characteristics (ii) Cultural characteristics (iii) Microscopic features. 	10	25%



4	<p>Chapter-4: Microbial Control</p> <ul style="list-style-type: none"> • General principles of microbial control. • Characteristics of ideal antimicrobial agents. <ul style="list-style-type: none"> • Physical agents used for microbial control: pH, temperature, radiation, osmotic pressure. • Understanding of terms: Bacteriostatic, bactericidal, germicidal, disinfectants, antiseptic, sanitizer. • Chemical agents of microbial control: Major groups of antimicrobial chemical agents – phenolics, halogens, surfactants, alcohols, dyes, heavy metals and gaseous agents. 	10	25%
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Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	<p>Organism Identification Faculty will assign organism on plate, students need to identify and describe in detail and upload it to GMIU web Portal.</p>	10
2	<p>Journal reading Faculty will provide microbial journal and students have to submit abstract report on that given chapter of journal and will upload on the GMIU web portal.</p>	10
3	<p>Analysis Faculty will assign scientific pictures (it could be any scientist or instrument) and Group of the students (5 Students) will analyze and prepare a report in 100 words and upload it to GMIU web Portal.</p>	10
4	<p>Plate Preparation Faculty will provide culture and students have to strict or spread culture on plate and upload photo on to the GMIU web Portal.</p>	10
5	<p>Attendance</p>	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	Isolate pure and axenic culture and learn about various methods to obtain them from the resource.
CO2	Maintain purity of cultures and their preservation Techniques.
CO3	Acquire knowledge about microbial nutrition, types of microbes based on it.
CO4	Apply general principles of microbial control, characteristics of ideal antimicrobial agents.

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1	Study of selective and differential media: MacConkey's agar medium, EMB agar medium, Mannitol salt agar, Potato dextrose agar, rose Bengal agar, Sabouraud dextrose agar, Czapek Dox agar, Glucose yeast extract agar..	1	2
2	Preparation of media for anaerobes: Thioglycollate broth medium, Robertson's cooked meat medium, litmus milk medium.	1	2
3	Isolation of bacteria from soil / water – (a) Streak plate method (b) Pour plate method (c) Spread plate method.	1	2
4	To perform Endospore Staining of given bacterial culture	1	4



5	To perform Capsule Staining of given bacterial culture	1	4
6	To perform Cell wall Staining of given bacterial culture	1	4
7	Preservation of microbial cultures by periodic subculturing and storage at low temperature (refrigeration).	1	2
8	Preservation of fungi by soil culture method.	1	2
9	Preservation and sealing of agar slant with paraffin oil / wax.	1	2
10	Cultivation of microbes by solid & liquid culture technique.	2	2
11	Preparation and study of different types of culture media - I: Nutrient broth and nutrient agar.	3	2
12	Study of effect of chemicals on microbial growth.	4	2
13	Study of effect of Heavy metal ions and their oligodynamic action on E. coli.	4	2
Total			32

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

