



Course Syllabus  
Gyanmanjari Science College  
Semester-3 (B.Sc.)

**Subject:** Microbial Metabolism -BSCMB13305

**Type of course:** Major

**Prerequisite:** Basic knowledge of growth, cultivation, metabolism of microorganisms and Inhibitory compounds.

**Rationale:** This course has been designed to make the students know about to study growth, metabolic activity, various growth factor and various enzyme of microorganisms and various chemotherapeutic agent that have inhibitory effect on Microorganisms and its practical application and in Biotechnological application.

**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	<p><b>Chapter-1: Microbial Nutrition and Metabolism:</b> Modes of nutritional uptake</p> <ul style="list-style-type: none"> <li>• Entry of nutrition in the cell, passive diffusion, facilitated diffusion and active transport.</li> <li>• Classification of bacteria on the basis of growth supporting environmental factors such as oxygen, temperature, pH, osmotic pressure, salt and hydrostatic pressure.</li> <li>• Introduction to Anabolism, Catabolism, Metabolism</li> <li>• Bioenergetics.</li> </ul>	15	25%
2	<p><b>Chapter-2: Enzymes</b></p> <p>➤ <b>General introduction</b></p> <ul style="list-style-type: none"> <li>• Physical and chemical properties.</li> <li>• Structure of enzyme: Prosthetic group, apoenzyme, coenzyme, cofactors.</li> <li>• Localization of enzyme: Extracellular and intracellular.</li> <li>• Nomenclature and classification of enzyme; IUB system of enzyme classification.</li> </ul> <p>➤ <b>Enzyme Action</b></p> <ul style="list-style-type: none"> <li>• Mechanism of enzyme action – Lock and Key, Induced Fit model, Transition state complex and activation energy and binding energy.</li> <li>• Factors affecting enzyme activity.</li> </ul>	10	25%
3	<p><b>Chapter-3: Microbial Growth</b></p> <ul style="list-style-type: none"> <li>• Reproduction- Modes of cell division and new cell formation:</li> <li>• Normal growth curve of bacteria.</li> <li>• Continuous growth and synchronous growth.</li> <li>• Criteria for growth measurement: Cell mass &amp; cell number, methods of their measurement.</li> <li>• Factors affecting growth: pH, Temperature, substrate concentration.</li> </ul>	10	25%



4	<p><b>Chapter-4: Chemotherapy</b></p> <ul style="list-style-type: none"> <li>• Chemotherapeutic agents as growth inhibitors: Principle of Chemotherapy</li> <li>• Characteristics of ideal chemotherapeutic agents.</li> <li>• General mode of action, spectrum, source and adverse effects of various chemotherapeutic agents:</li> </ul> <ol style="list-style-type: none"> <li>1. Antibiotics affecting cell wall synthesis: <math>\beta</math>-lactams (penicillins, cephalosporin) and non <math>\beta</math>-lactams (cycloserine, vancomycin).</li> <li>2. Antibiotics affecting cell membrane formation: polymyxin, gramicidin.</li> <li>3. Antibiotics affecting protein synthesis: tetracyclines, chloramphenicol.</li> </ol>	10	25%
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**Continuous Assessment:**

Sr. No	Active Learning Activities	Marks
1	<p><b>Model Preparation</b></p> <p>Faculty will assign specific topic on which students have to prepare a scientific model and upload it to GMIU web portal.</p>	10
2	<p><b>Analysis of Chemotherapeutic Agent (Project)</b></p> <p>Faculty will provide microbial culture and specific chemotherapeutic agent and students have to check the inhibitory effect of that chemotherapeutic agent (in group of five Students) and prepare report on it and upload it to GMIU web portal.</p>	10
3	<p><b>Chart Preparation</b></p> <p>Faculty will assign specific classification criteria and student has to prepare a chart in soft copy according to those criteria and upload it to GMIU web portal.</p>	10
4	<p><b>Analysis of Enzyme</b></p> <p>Faculty will provide a specific enzyme and students have to prepare a report on it (150 Words) and upload on GMIU web Portal.</p>	10
5	<b>Attendance</b>	10
<b>Total</b>		<b>50</b>



**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	Gain knowledge about modes of nutritional uptake, classification of organisms based on various factor and metabolism.
CO2	Define the types and classification of enzyme and its mechanism of action.
CO3	Describe the modes of cell division, normal growth curve and various factor that affect the growth of microorganisms.
CO4	Analyze the general principle, characteristics, mode of action and the inhibitory effect of various chemotherapeutic agent

**List of Practical:**

Sr. No	Descriptions	Unit No	Hrs
1	To study of protoplast.	4	4
2	To study of standard growth curve of <i>E.coli</i> by turbidometric method.	3	4
3	To understanding synchronous growth of microorganisms.	3	2
4	To study of determination of spectrum activity of an antibiotic by use of agar ditch method.	4	4



5	To study effect of antibiotic on organisms by use of paper disc method.	4	4
6	To study effect of antibiotic on organisms by use of cup borer method.	4	2
7	To study of various mode of cellular division in microorganisms.	3	2
8	Factors affecting growth: pH.	3	2
9	Factors affecting growth : Temperature	3	2
10	Factors affecting growth: Substrate Concentration.	3	2
11	Factors affecting growth: Osmotic Pressure.	3	2
12	To study of Spheroplast.	4	2
13	To study of various microbial interactions.	3	2
<b>Total</b>			<b>34</b>

### 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 & Daginawala, 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

