

Subject Name: Microbial Physiology
Subject Code: 02MB0202
B.Sc. Semester - III

Objective: To familiarize students with different conditions and requirements associated with microbial growth and reproduction.

Credits Earned: 6 Credits

Course Outcomes: After completion of this course, student will be able to

- Design synthetic media for screening of specific culture.
- Describe and differentiate type of growth requirement for specific microbial culture.
- Depict the role of pigments associated with microbes.

Pre-requisite of course: N.A.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Practical (PR)	
4	0	2	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
I	Microbial Nutrition Nutritional types; Requirement of Nutrients for microbes and classification of microorganisms based on carbon, energy and electron sources viz. Photoautotrophs; Photoorganotrophs; Chemo-lithotrophs (ammonia, nitrate sulphur, hydrogen, iron oxidizing bacteria); Chemo-organotrophs. Primary and secondary active transport; Passive and facilitated diffusion.	17
II	Media type and Preservation Components; criteria and role of macro and micro-nutrients. Natural, Synthetic, Complex, Selective media & Differential Media; Methods for culturing aerobic and anaerobic bacteria; Colony and broth culture characteristics; Maintenance and preservation of Microorganisms.	13
III	Microbial Growth Growth in Microbes (growth phases, generation time, growth curve). Measurement of cell mass and cell number; Factors affecting microbial growth; Continuous and batch cultures; details of synchronous and Diauxic growth curve. Physical factors influencing growth: Temperature; PH; Atmospheric Pressure; Salt Concentration. Chemical factors: heavy metal (copper), surfactants. Control of Microorganisms: patterns of microbial death, control of microorganism growth by antiseptics.	15
IV	Microbial Photosynthesis Concept of photosynthesis and associated pigments in microbes; photosynthetic apparatus in pro and eukaryotes; anoxygenic and oxygenic photosynthesis; light and dark reaction; photorespiration and its significance; Effect of light, temperature; pH and CO ₂ concentration on photosynthesis; measurement of net photosynthetic yield.	15
	Total Hours	60

References:

1. Moat A.G. and Foster S.W. *Microbial Physiology* (4th Ed.) (2004). John Wiley and Sons, New York.
2. Gerald Karp. *Cell Biology* (3rd Ed.) (2003). McGraw Hill Book Company, New York.
3. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. *General Microbiology*. (5th Ed.) (1987). McMillan Press. UK.
4. Dubey RC and Maheswari DK. *A Text book of Microbiology*. (2005). S. Chand & Company Ltd., New Delhi.
5. Nelson D. L. & Cox M. M. *Lehninger's Principles of Biochemistry*, 4th edition. (2005). W. H. Freeman & Co. NY.
6. Pelczar Jr, M J, Chan E C S., Krieg N R, *Microbiology*, (5th Ed.), (2001). McGraw Hill Book Company, NY.

Instructional Method:

- a. 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, etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room in the form of attendance, assignments, verbal interactions etc.
- c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.

List of practicals:

1. Introduction of media and its constituents for microbial growth.
2. Different methods for isolation and maintenance of microorganisms.
3. Isolation of microbes using differential media.
4. To study and plot the growth curve of *E. coli* using turbidometric method and to calculate specific growth rate and generation time.
5. To study and plot the growth curve of *Aspergillus niger* by radial growth measurements.
6. To study the effect of temperature of *Aspergillus niger* by dry weight method.
7. Demonstration of the thermal death time and decimal reduction time of *E. coli*.