

Semester	3
Course	Major
Paper Code	Code:C2MB230312T
Paper Title	Microbial physiology and metabolism
No. of Credits	4
Theory / Practical / Composite	Composite
Minimum No. of preparatory hours per week a student has to devote	4 hours/week
Number of Modules	No modules
Syllabus	<p><b>Unit 1: Effect of Environment on Microbial Growth</b></p> <ul style="list-style-type: none"> <li>• Microbial growth in response to environment - temperature, pH, oxygen, pressure, solute etc, water activity; the underlying mechanisms. Introduction to nutritional classes of bacteria with examples, nutrient uptake and transport (passive and facilitated diffusion, primary and secondary active transport, concept of uniport, symport, antiport, group translocation).</li> </ul> <p><b>Unit 2: Chemoheterotrophic Metabolism</b></p> <ul style="list-style-type: none"> <li>• Introduction to aerobic respiration, anaerobic respiration, and fermentation.</li> <li>• Aerobic Respiration: Glycolysis i.e. EMP, ED, PPP, TCA cycle</li> <li>• Electron transport chain: composition, mechanism, comparison of mitochondrial and bacterial ETC, uncouplers and inhibitors.</li> <li>• Anaerobic respiration</li> <li>• Fermentation - Alcohol fermentation and Pasteur effect; Lactic acid fermentation, concept of linear and branched fermentation pathways.</li> </ul> <p><b>Unit 3: Chemolithotrophic and Phototrophic metabolism</b></p> <ul style="list-style-type: none"> <li>• Concept to chemolithotrophy with examples (aerobic and anaerobic). Hydrogen oxidation (definition and reaction) and methanogenesis (definition and reaction).</li> <li>• Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria, and cyanobacteria.</li> </ul> <p><b>Unit 4: Nitrogen and sulphur Metabolism</b></p> <ul style="list-style-type: none"> <li>• Introduction to biological nitrogen and sulphur metabolism, Assimilatory and dissimilatory pathways.</li> </ul>

	<b>Practical</b> 1. Study and plot of growth curve of <i>E. coli</i> by turbidometric and standard plate count methods. 2. Calculations of generation time and specific growth rate of bacteria from the graph plotted with the given data. 3. Effect of temperature on the growth of <i>E. coli</i> . 4. Effect of carbon and nitrogen sources on the growth of <i>E.coli</i> . 5. Effect of salt on the growth of <i>E. coli</i> .	
Learning Outcomes	<ul style="list-style-type: none"> <li>• To understand how factors like temperature, pH etc. affects bacterial growth</li> <li>• To study about aerobic and anaerobic respiration and fermentation in microorganisms</li> <li>• To learn about chemolithotrophic and phototrophic metabolism</li> <li>• To study nitrogen and sulphur metabolism</li> </ul>	
Reading/Reference Lists	1. Prescott's Microbiology. 9th edition. McGraw Hill Higher Education. 2. Lehninger's Biochemistry 3. Voet & Voet. Biochemistry 4. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14 <sup>th</sup> edition. Prentice Hall International Inc. 5. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press. 6. Willey JM, Sherwood LM, and Woolverton CJ. (2013).	
Evaluation	Theory 60 (45+15) CIA-10+3+2	Practical 40 CA (38+2)
Paper Structure for Theory Semester Exam	Full Marks: 45 Short questions: 5 (each 1 mark) from 7 (5x1=5) Long questions: 4 (each 10 marks) from 6 (4x10=40)	