

Course	Discipline Specific Elective
Semester	VI
Paper Number	MBTDS6041T
Paper Title	MICROBIAL PHYSIOLOGY
No. of Credits	6
Theory/Composite	Theory
No. of periods assigned	5 Theory + 1Tutorial
Course description/objective	<ol style="list-style-type: none"> 1. This paper aims at introducing the students to the basic regulatory mechanisms underlying chief physiological processes in microbes. 2. Through this paper, students will be explained about the details of bacterial stress response. 3. The membrane transport processes will be elaborated in this paper. 4. Through this paper, students will be explained the details of growth physiology and nutritional diversity of microbes. 5. Phototrophic metabolism of microbes will also be elaborated in this paper. 6. The effect of the environment on microbial growth will be elaborated in this paper.
Syllabus	<p>Module A: (60 Marks)</p> <p>UNIT I: Effect of the environment on microbial growth: Temperature - temperature ranges for microbial growth, classification based on temperature ranges and adaptations, pH-classification based on pH ranges and adaptations, solutes and water activity, oxygen concentration, radiation and pressure; diauxic growth curve; bacterial stress response: mechanisms of sensing stresses: regulation of translation of RpoS (the general stress response activator); small molecules (The stringent response), translational response, tmRNA; mechanisms of mitigating stresses: pumping out toxins (Antibiotics); promoting tolerance (extreme heat and cold), molecular chaperones.</p> <p>UNIT II: Transport processes: Metabolite Transport, Diffusion: Passive and facilitated, primary active and secondary active transport, group translocation (phosphotransferase system), symport (sodium-glucose co-transport), antiport (sodium-potassium antiport) and uniport (transport of glucose and lactose), electrogenic and electro-neutral transport (energetics), transport of iron; yeast ABC-transporters.</p> <p>No. of Classes: 4 Classes per week including tutorial</p> <p>Module B: (20 Marks)</p> <p>UNIT III: Growth physiology: Reproductive strategies in bacterial cells; bacterial cell cycle (including chromosome replication and partitioning – MreB model, cytokinesis – Z ring and Divisome complex, and cellular growth and determination of cell shape); balanced and unbalanced growth, the mathematics of growth - generation time, specific growth rate; microbial growth in natural environments (Liebig's Law of the Minimum, Shelford's Law of Tolerance, and Quorum sensing).</p>

	<p>UNIT IV: Nutritional diversity: Chemolithotrophic metabolism: physiological groups of aerobic and anaerobic chemolithotrophs, hydrogen-oxidizing bacteria and methanogens.</p> <p>UNIT V: Phototrophic metabolism: Diversity of phototrophic bacteria; chemicals and structures; physiology of bacterial photosynthesis: light-dependent reactions, cyclic and non-cyclic photophosphorylation, anoxygenic and oxygenic photosynthesis, light-independent reactions, carbon dioxide fixation (Calvin-Benson cycle).</p> <p>No. of Classes: 2 Classes per week including tutorial</p>
Readings	<p>Module A:</p> <ol style="list-style-type: none"> 1. Alberts B, <i>et al.</i> Molecular Biology of the Cell. 2. Karp G. Cell and Molecular Biology – Concepts and Experiments. 3. Weaver. Molecular Biology. 4. Relevant Scientific Literature. <p>Module B</p> <ol style="list-style-type: none"> 5. Bauman RW. (2011). Microbiology: With Diseases by Taxonomy. 3rd edition. Pearson / Benjamin Cummings. 6. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag 7. Madigan MT, Martinko JM and Parker J. (2003). Brock Biology of Microorganisms. 10th edition. Pearson / Benjamin Cummings. 8. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons. 9. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India. 10. Stanier RY, Ingrahm JI, Wheelis ML and Painter PR. (1987). General Microbiology. 5th edition, McMillan Press. 11. Willey JM, Sherwood LM, and Woolverton CJ. (2008). Prescott, Harley and Klein's Microbiology. 7th edition. McGraw Hill Higher Education.
Evaluation	<p>Continuous Internal Assessment: 20 marks</p> <p>End-Semester Theory Examination: 80 marks</p>
Paper Structure for End Sem Theory	<p>Module A (60 marks)</p> <p>1 question (Compulsory) and any two from the remaining three questions.</p> <p>Compulsory question (20 marks)</p> <p>Any two out of rest four questions (10 marks each) i.e. 10 x 4 = 40 marks.</p> <p>Module B (20 marks)</p> <p>1 question (Compulsory) and any two from the remaining three questions.</p> <p>Compulsory question (5 marks)</p> <p>Any two out of three questions (7.5 marks each) i.e. 7.5 x 2 = 15 marks.</p>