

Subject Code: 1SC1020301	Subject Title: MICROBIAL PHYSIOLOGY AND METABOLISM
COURSE TYPE: CORE COURSE	

Course Objective:

It is essential and very vital to learn the basic and fundamental aspects of Physiology and Metabolism for a student of Microbiology. The core metabolic and physiological processes that take place inside a microbial cell and its thorough knowledge opens up new avenues for research in biological sciences. This course will surely help inculcate the interests in the students of biological sciences.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
3	-	3	-	3	70	30	-	-	100

Unit	Content	Lectures	Weightage
1	<p>Unit 1:- Microbial Growth and Effect of Environment on Microbial Growth:</p> <ul style="list-style-type: none"> ✓ Definitions of Microbial Growth, Mathematical Expressions of Microbial Growth, Steps in the Cell Division Process of <i>E.coli</i>, Normal Growth Cycle of Bacteria, Methods for the Measurement of microbial growth, Batch culture, Continuous culture, generation time and specific growth rate, synchronous growth, diauxic growth curve ✓ Microbial growth in response to environment -<i>Temperature</i> (psychrophiles, mesophiles, thermophiles, extremophiles, thermodurics, psychrotrophs), pH (acidophiles, alkaliphiles), <i>solute and water activity</i> (halophiles, xerophiles, osmophilic), <i>Oxygen</i> (aerobic, anaerobic, microaerophilic, facultative aerobe, facultative anaerobe) ✓ Microbial growth in response to nutrition and energy –Autotrophy & Heterotrophy, Basic Concepts of Chemotrophy and Phototrophy with suitable examples. 	15	33%
2	<p>Unit 2:- (A) Chemoheterotrophic Metabolism - Aerobic Respiration</p> <ul style="list-style-type: none"> ✓ Concept of aerobic respiration, anaerobic respiration and fermentation Sugar degradation pathways i.e. EMP, ED, Pentose phosphate pathway TCA cycle Electron transport chain: components of respiratory chain <p>(B) Chemoheterotrophic Metabolism- Anaerobic respiration & fermentation</p> <ul style="list-style-type: none"> ✓ Anaerobic respiration with special reference to dissimilatory nitrate reduction (Denitrification; nitrate /nitrite and nitrate/ammonia respiration; fermentative nitrate reduction), Fermentation - Alcohol fermentation and Pasteur effect; Lactate fermentation (homofermentative and heterofermentative pathways) 	15	33%
3	<p>Unit 3:- (A) Chemolithotrophic and Phototrophic Metabolism</p> <ul style="list-style-type: none"> ✓ Introduction to aerobic and anaerobic chemolithotrophy with an example each. Hydrogen oxidation (definition and reaction), Methanogenesis (definition and reaction), ✓ Introduction to phototrophic metabolism - groups of phototrophic microorganisms, anoxygenic vs. oxygenic photosynthesis with reference to photosynthesis in green bacteria, purple bacteria and cyanobacteria <p>(B) Nutrient uptake and Transport</p> <ul style="list-style-type: none"> ✓ Passive and facilitated diffusion ✓ Primary and secondary active transport, concept of uniport, symport and antiport ✓ Group translocation 	15	34%

Learning Outcome:

The students by offering this course will learn the fundamental aspects of microbial physiology and metabolism. They will learn the basics of microbial growth, metabolism and nutrient uptake mechanisms along with different important cellular aspects operating in microbial cells.

Reference Books:

1. Madigan MT, and Martinko JM (2014). Brock Biology of Microorganisms. 14th edition. Prentice Hall International Inc.
2. Moat AG and Foster JW. (2002). Microbial Physiology. 4th edition. John Wiley & Sons
3. Reddy SR and Reddy SM. (2005). Microbial Physiology. Scientific Publishers India
4. Gottschalk G. (1986). Bacterial Metabolism. 2nd edition. Springer Verlag
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). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.