

Institute of Microbiology and Molecular Genetics
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline



Programme	BS	Course Code	MMG202	Credit Hours	3(2+1)
Course Title	MICROBIAL PHYSIOLOGY AND METABOLISM				
COURSE INTRODUCTION					
<p>The Microbial Physiology and Metabolism course will give the students an overall vision of the operation of different biochemical processes of prokaryotic cells and their adaptation to changing environments. The subject describes the various mechanisms to generate energy to support microbial life. This course also focuses on the biosynthesis of different cell structures and their roles in chemotaxis and translocation of virulent factors outside the bacterial cells. Overall, the students will be able to learn how microbial cells use different substrates to generate energy and their response to environmental stressors.</p>					
LEARNING OUTCOMES					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand microbial cell structure, functions, metabolism, and how microbial physiology introduces interrelatedness among different disciplines such as microbiology, genetics, and biochemistry. 2. Study microbial genetic regulation with reference to mechanisms regulating enzyme synthesis and microbial stress responses. 3. Describe the key physiological and metabolic processes that regulate microbial growth, energy production, and survival. 4. Apply microbial physiology and metabolism knowledge to understand how microorganisms adapt to various ecological niches. 					
COURSE CONTENT					
<p>Introduction to microbial physiology and metabolism, Composition and functions of prokaryotic cells: Bacterial flagella synthesis and chemotaxis, Outer membrane and its functions, Macromolecular synthesis: Translation, Protein folding and chaperones, Protein degradation, Antibiotics that affect nucleic acid and protein synthesis, Protein trafficking, Protein translocation across the outer membrane in gram-negative bacteria, Anaerobic fermentation: Ethanol, lactate, butanol, and propionate fermentation, Heterotrophic metabolism on substrates other than glucose: Starch, cellulose and protein hydrolysis, Hexose and pentose utilization, Methanotrophy, Chemolithotrophy: Nitrification, Sulfur bacteria and the oxidation of sulfur compounds, hydrogen oxidizing bacteria, Metabolic regulation: Mechanisms regulating enzyme synthesis, Microbial stress responses: Osmotic stress and osmoregulation, Aerobic to anaerobic transition, Oxidative and thermal stress, pH stress and acid tolerance.</p>					
PRACTICALS					
<p>Determination of chemical requirements of a microbe, Effect of physical factors (heat, pH, osmotic pressure) on carbohydrate and nucleic acid metabolism, Techniques for the cultivation of aerobic and anaerobic bacteria, Effect of antibiotics and chemical compounds on bacterial physiology and metabolism, Isolation of bacterial cell wall polymers, Bacterial motility, and chemotaxis.</p>					

TEXTBOOKS AND READING MATERIAL

1. Kim, B.H., & Gadd, G.M. (2008). Microbial Physiology and Metabolism, Cambridge University Press, Cambridge CB2 8RU, UK.
2. Moat, A.G., Foster, J.W., & Spector, M.P. (2002). Microbial Physiology, Fourth Edition, A John Wiley & Sons, INC, Publication.
3. White, D. (2000). The Physiology and Biochemistry of Prokaryotes. Second Edition, Oxford University Press.
4. Poole, R.K. (1995). Advances in Microbial Physiology, First Edition, Vol 37, Academic Press.

ASSESSMENT

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on activities, short tests, projects, practicals, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on a term paper, research proposal development, fieldwork, report writing, etc.