

Course: MICROBIOLOGY PG

Semester	1
Paper Number	MMCB4113
Paper Title	MICROBIAL CELL BIOLOGY
No of credits	6
Non composite/composite	Composite
No. of periods assigned	6
Course description/objective	<ul style="list-style-type: none"> • To characterize microbial cellular structure • To know microbial cellular functioning • To special architecture and functions of microbes with different techniques
Reference List	<p>Review papers on Quorum sensing Mitra, Dutta and Roy (2018) Comprehensive Microbiology. Current Books International, Kolkata. Bruce Alberts, Alexander Johnson, Martin Raff, Julian Lewis, Keith Roberts, Peter Walter, Dennis Bray, James D. Watson. Molecular biology of the cell. Harvey Lodish, David Baltimore. Molecular Cell Biology Gerald Karp. Cell Biology Madigan MT, and Martinko JM (2014). Brock Biology of Microorganism</p>
Evaluation	<p>Theory: 70 (60 End sem + 10 CIA) Practical: 30 (10 End sem + 20 CIA) Question Paper format: <u>Theory: End sem 60 marks</u> Module 1: 30 marks 3 questions form 5 (10x3=30) Module 2: 30 marks 3 questions form 5 (10x3=30)</p> <p>Viva: End sem 10 marks</p>

MICROBIAL CELL BIOLOGY THEORY : 70

❖ MODULE 1: Microbial cellular structure(35 MARKS)

Morphology and ultra structure of bacteria: size, shape, and arrangement of bacteria, ultra structure of bacterial cell wall of eubacteria and archeobacteria. Protoplast and spheroplast formation and L-form. **Bacterial Cell wall:** structures, diversities and biosynthesis, different cell wall hydrolyzing enzymes; **Bacterial endospores:** structure, formation and germination;

Uncommon bacterial genera: Rickettsia, Chlamydia, Mycoplasma, sheathed bacteria, stalked and budding bacteria, gliding bacteria including Myxobacteria.

Structures external to cell wall – Capsule, Flagella, Pili, Sheath, Prostheca, Stalks. (DD+MM)

Cell membrane structure membrane constituents; phospholipids, glycolipids, cholesterol, membrane proteins, receptors and phospholipases; bilayer structure, asymmetry, fluid mosaic model of random diffusion of membrane components, domains in membrane-natural and artificial membranes (SSC)

❖ MODULE 2: Microbial Cellular function(35 MARKS)

Quorum sensing: Overview of quorum sensing, Quorum sensing and cooperation, Quorum sensing and competition, Quorum sensing in Biofilm formation, Applications of Quorum sensing (MMG)

Microbial stress physiology (extremophiles)and lipid raft dynamics and function, Different types of **secretion systems** in microorganisms.(AKM)

Cell signalling - General principles of cell communication, Types of receptors- extracellular and intracellular. G-protein,signaling through G- protein coupled receptors, enzyme linked cell signalling, signal transduction pathways, second messengers, regulation of signalling pathways, bacterial chemotaxis (MM)

Functional aspects of membrane Methods to study diffusion of solutes in bacteria, passive diffusion, facilitated diffusion, different mechanisms of active diffusion, Proton Motive Force, role of permeases in transport, different permeases in *E. coli*. Transport of amino acids and inorganic ions in microorganisms and their mechanisms. (SSC)

PRACTICAL: 30 MARKS

1. Determination of EPS and its characterization, Heavy metal immobilization, Siderophore production and characterization. Cell wall stripping, Plasmid curing. (AKM)
2. To check motility of bacteria by hanging drop and semi-solid agar methods. (MM) To cultivate bacteria in aerobic and anaerobic conditions. (MM)
3. Identification of a prokaryotic and eukaryotic cell by preparation of slides.(MM)
4. UV Survival curve of *E.coli*. or any other bacteria.(MM)
5. Effect of UV, gamma radiations, pH, disinfectants, chemicals and heavy metal ions on spore germination of *Bacillus* sp.(MM)
6. Isolation of Photosynthetic bacteria.(MM)
7. To cultivate bacteria in aerobic and anaerobic conditions.(MM)

8. To check motility of bacteria by hanging drop and semi-solid agar methods. (MM)

Reference:

Review papers on Quorum sensing

Mitra, Dutta and Roy (2018) Comprehensive Microbiology. Current Books International, Kolkata.

Bruce Alberts, Alexander Johnson, Martin Raff, Julian Lewis, Keith Roberts, Peter Walter, Dennis Bray, James D. Watson.

Molecular biology of the cell.

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