

**JIIWAJI UNIVERSITY, GWALIOR-474011**  
**M.SC. BIOTECHNOLOGY**

**CURRICULUM - 2015-2017**

Semester	Course Code	Title of the Paper	Type	Credits
<b>First</b>	BT-101	Cell Biology	Core	03
	BT-102	Microbiology	Core	03
	BT-103	Bioinstrumentation	Core	03
	BT-104	Biomolecules and Metabolism	Core	03
	BT-105	Practical-I	Core	03
	BT-106	Practical-II	Core	03
	BT-107	Seminar	Core	01
	BT-108	Assignment	Core	01
	BT-109	Comprehensive Viva Voce	Virtual	04
				<b>Total Credits</b>
<b>Second</b>	BT-201	Molecular Biology	Core	03
	BT-202	Immuno-technology	Core	03
	BT-203	Enzyme-technology	Core	03
	BT-204	Environmental & Animal Biotechnology	Core	03
	BT-205	Practical-I	Core	03
	BT-206	Practical-II	Core	03
	BT-207	Seminar	Core	01
	BT-208	Assignment	Core	01
	BT-209	Comprehensive Viva Voce	Virtual	04
				<b>Total Credits</b>
<b>Third</b>	BT-301	Bioprocess Engineering & Microbial Technology	Core	03
	BT-302	Genetic Engineering & its Applications	Core	03
	BT-303A BT-303B	Fermentation Technology & Downstream Processing Biostatistics, Bioinformatics & Technical writing	Centric Elective	03
	BT-304A BT-304B	Emerging Trends in Biotechnology Plant Biotechnology	Generic Elective	03
	BT-305	Practical-I	Core	03
	BT-306	Practical-II	Generic	03
	BT-307	Seminar	Core	01
	BT-308	Assignment	Core	01
	BT-309	Comprehensive Viva Voce	Virtual	04
				<b>Total Credits</b>
<b>Fourth</b>	BT-401	Project Work	Core	15
	BT-402	Seminar	Core	05
	BT-403	Assignment	Core	02
	BT-404	Comprehensive Viva Voce	Virtual	02
			<b>Total Credits</b>	<b>24</b>

-Minimum Number of credits be earned for award of degree- 96 credits

**[Valid credits 80 + Virtual credits 16]**

\*Evaluated both by the Internal & External examiner at the time of presentation. There shall not be compulsory project works during first three semesters. There are weekly seminars and continuous internal assessment throughout the course.

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## 101: CELL BIOLOGY

### UNIT I

1. Cell Membrane: physicochemical properties and asymmetrical organization of lipids, proteins and carbohydrates
2. Transport of small molecules across cell membranes: types and mechanism
3. Active Transport by ATP-powered pumps types: p-type, V-type, F-type ABC transporters
4. Properties and mechanisms of transporters; patch pump technique

### UNIT II

1. Protein targeting-cell map: signal hypothesis and default protein secretory pathway
2. Protein targeting- endoplasmic reticulum, golgi body, lysosome and mitochondria
3. Protein glycosylation-N and O linkages
4. Transport by vesicle formation: endocytosis and exocytosis

### UNIT III

1. Ultra structure and function of lysosomes
2. Ultra structure and function of peroxisomes
3. Cell motility: structure and functions of microfilaments and microtubules and intermediate filaments
4. Cell junctions: occluding junctions, anchoring junctions and communicating junctions

### UNIT IV

1. Molecular mechanism of  $Ca^{++}$  dependent cell adhesion
2. Molecular mechanism of  $Ca^{++}$  independent cell adhesion
3. Organization and functions of extra-cellular matrix in animals
4. Extra-cellular matrix receptors on animal cells: integrins

### UNIT V

1. Cell Signaling: G-Protein signaling, initiation and regulation of MAP kinase and tyrosine kinase pathway
2. Molecular events accompanying eukaryotic cell cycle
3. The cell cycle control proteins: cyclins
4. Apoptosis: Morphological, biochemical changes and significance

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A handwritten signature, possibly "Adeeb", is written in cursive. Below it, there is a line of handwritten text in Urdu script, which appears to be "مدرسہ اسلامیہ" (Islamic School).

### Practical Exercises

1. Sub cellular fractionation
2. Chromosome preparation: Mitosis – Onion root tip, rat/mouse cornea, rat/mouse bone marrow, human lymphocytes
3. Chromosome preparation: Meiosis – Rat/mouse testis, Grasshopper testis
4. Polytene chromosome preparation from *Drosophila* salivary gland
5. Identification of tissue typing: Histological preparation of tissue
6. Identification of different biomolecules in different tissues by histochemical techniques
7. Electron microscopy: Demonstration and good photographs for interpretation.

### Reference Books

1. Molecular Biology of the Cell (2002), Alberts et al
2. Molecular Cell Biology (2004), Lodish et al
3. Working with Molecular Cell Biology: A study Companion (2000), Storrie et al
4. Cell and Molecular Biology: Concepts and Experiments (3<sup>rd</sup> Ed., 2002), Gerald Karp
5. The Cell: A Molecular Approach (2004), G.M. Cooper
6. The Word of the Cell (1996), Becker et al
7. Cell Proliferation and Apoptosis (2003), Hughes and Mehnet
8. Essential Cell Biology (1998), Alberts et al
9. Biochemistry and Molecular Biology of Plants (2000), Buchanan et al
10. Harpers Biochemistry Murray et al

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Naveen Sivarani

## 102. MICROBIOLOGY

### UNIT I

1. Classification of Microorganisms
2. Morphology and structure of cell wall; eubacteria, archaebacteria and fungi
3. Preparation of culture media, pure culture techniques and microbial staining
4. General account and economic importance cyanobacteria

### UNIT II

1. Sterilization: physical and chemical methods
2. Microbial growth: growth curve, measurement of growth and factors affecting growth
3. Nutrition based classification of Microorganisms, Different carbon and nitrogen sources, transport of nutrition across membrane
4. Oxygen toxicity: Study of catalase, peroxidase, superoxidase dismutase, mechanism of oxygen toxicity

### UNIT III

1. Infection and disease, types of infection, mechanism of pathogenesis of bacterial and viral diseases
2. *Staphylococcal* and *Clostridia* food Poisoning, Bacterial Diseases: *Salmonellosis* and *Shigellosis*
3. Fungal Diseases: *Aspergillosis* and *Candidiasis*
4. Viral diseases: Hepatitis B and HIV

### UNIT IV

1. Viruses: types, isolation, cultivation and identification
2. Lytic and lysogenic cycle of bacteriophages
3. Life cycle of DNA viruses: SV 40, RNA viruses: Retroviruses
4. Plant viruses: TMV and Gemini

### UNIT V

1. Bacterial Recombination: transformation, conjugation, transduction, F-duction
2. Chemotherapeutic agents: classification of antibiotics, broad and narrow spectrum antibiotics; antibiotics from prokaryotes
3. Anti-fungal and antiviral antibiotics, mode of action of antibiotics
4. Mechanism of drug resistance and plasmids

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viral diseases

### Practical Exercises

1. Preparation of Liquid and Solid media for growth of microorganisms.
2. Isolation and maintenance of organisms by plating, streaking and serial dilution method, slant and stab cultures, storage of microorganisms.
3. Isolation of pure cultures from soil and water
4. Growth; Growth curve; Measurement of bacteria population by turbidometry and serial dilution methods. Effect of temperature, pH and carbon and nitrogen sources on growth.
5. Microscopic examination of bacteria, Yeast and mold and study of organism by Gram's stain, acid fast stain and staining for spores
6. Study of mutation by Ames's Test.
7. Assay of antibiotics and demonstration of antibiotic resistance
8. Analysis of water for potability and determination of MPN.
9. Bacterial transformation.
10. Biochemical Characterization of selected microbes.
11. One Step growth curve of coliphage.

### Reference Books

1. General microbiology, R.Y. Ingraham, J.L. Wheelis, M.L. and Painter, P.R. The Macmillan Press Ltd.
2. Brock Biology of microorganism, M.T. Martinko, J.M. and Parker, J. Prentice-Hall.
3. Microbiology, Pelczar, M.J., Chan E.C.S. and Kreig, N.R., Tata McGraw Hill.
4. Microbial Genetics, Malloy, S.R., Cronan, J.E. Jr and Freifelder, D.Jones, Bartlett Publishers
5. Microbiology-A Laboratory Manual, cappuccino, J.G. Sherman, N. Addison Wesley.
6. Microbiological Applications (A Laboratory Manual in General microbiology) Benson, H.J. WCB: Wm C Brown Publishers

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