

# BIOTECHNOLOGY

SEMESTER: First

Paper name: **Cell Biology & Biochemistry.**

Paper Code: **BTC-DSC-141**

**Total Marks: 100 (Theory:75; Practical: 25)**

Credit: 4 (Theory:3; Practical: 1)HOURS: 75 (Theory:45; Practical: 30)

## Course Outcome:

**CO1:** Learn & understand the basic concept of developmental biology.

**CO2:** Learn, understand& remember the cellular organization, cell communication and cellular transportation.

**CO3:** Learn & understand the structures, functions and classification of biological molecules (protein, carbohydrate, lipid, nucleic acids).

**CO4:** Understand& remember the basic concept of enzyme function and action, Inhibition of enzyme activity and Vitamins.

### • THEORY

UNIT NO.	SYLLABUS	CLASS HOUR	ALLOTTED MARKS
1	<b>Cell Biology:</b> Structural organization of prokaryotic and eukaryotic cell, Structure of cell membrane, Membrane permeability & transport. Structure and function of membrane bounded organelles. Chromosome: Structure, types & function.	9	15
2	<b>Developmental Biology:</b> Introduction, Early development in Animal: Fertilization, cleavage, blastula formation. Plant development: Apical meristem, primary and secondary growth. Differentiation dedifferentiation & redifferentiation	5	9
3	<b>Interaction of the cell with its environment:</b> cell-cell communications, Cell environment communication. Role of different adhesion molecules: Desmosomes, Hemi-desmosomes, Gap junctions, Tight Junctions, Plasmodesmata.	9	15
3	<b>Chemical foundation of Biology:</b> pH, pK, acid, base, solution, buffer, colloids, chemical bonds.	5	9
4	<b>Basic biochemistry of biomolecules:</b> Carbohydrates- structure, function & metabolism. Lipids- structure function and types & proteins- amino acids. Enzyme- classification & function. Co-enzyme, Ribozyme. Vitamins- water soluble and fat soluble, importance of vitamins in life.	8	14
6	<b>Nucleotides</b> - structure and properties; Watson & Crick model of DNA, types of DNA, Structure of major species of RNA - mRNA, tRNA and rRNA; Denaturation and renaturation of DNA.	9	15

### • PRACTICALS

**(30 contact Hours)**

1. Preparation of normal, molal & standard solution.
2. Estimation of protein.
3. Study the effect of salivary amylase on starch.
4. Cell division – mitosis & meiosis.
5. Isolation of chloroplast.
6. Chromosomes: Mounting of polytene chromosomes.

**Recommended textbook & references.**

1. Karp, G.2010. Cell & molecular Biology: concept and experiments. 6<sup>th</sup> edition. John wily & Sons.
2. T. Devasena 2012. Cell Biology. Oxford University Press.
3. Voet and J.G.Voet, Biochemistry, 3rd edition, John Wiley, New York, 2004.
4. D L Nelson and M M Cox, Lehninger Principles of Biochemistry, 7th edition, Macmillan 2017.
5. Biochemistry by U. Satyanarayana, Elsevier Health Sciences

**BIOTECHNOLOGY**

SEMESTER: Second

Paper name: **Microbiology and immunology**Paper Code: **BTC-DSC-142****Total Marks: 100 (Theory:75; Practical: 25)**

Credit: 4 (Theory:3; Practical: 1)HOURS: 75 (Theory:45; Practical: 30)

**Course Outcome:****CO1:** Learn& remember in details the scope of microbiology.**CO2:** Learn, understand & apply in details about the characteristics and classification of different microbes and how they are cultured.**CO3:**Understand & applythe different staining principle &procedure.**CO4:** Learn, understand & remember the basic concept of immunity, its types and about the antigen & antibody.**CO5:** Learn& Understand about the antigen antibody interaction and the basics of hybridoma technology.**• THEORY**

UNIT NO.	SYLLABUS	CLASS HOUR	ALLOTTED MARKS
1	General concept of microbes, their distribution. Historical milestones in microbiology. Contribution of Scientists to the field of Microbiology: Anton von Leeuwenhoek, Edward Jenner, Louis Pasteur. Importance and applications of microbiology.	4	6
2	<b>Microbial Diversity:</b> Classification of microorganisms: General characteristics and classification of Bacteria, Fungi, Protozoa and viruses.	5	8
3	<b>Microbial growth and culture techniques:</b> Nutritional requirements of microorganisms - Macronutrients, micronutrients and growth factors. Concepts of culture media and its types. Microbial cultures - Pure culture, methods of pure culture, preservation of microbial cultures.	8	12
4	<b>Sterilization and aseptic techniques:</b> Definition of terms -sterilization, disinfectant, antiseptic, sanitizer, microbicidal agents, microbiostatic agents and antimicrobial agent. Physical & chemical methods of sterilization.	6	10
5	<b>Staining techniques:</b> Nature of dyes. Physical and chemical theories of staining- Staining techniques; principle, procedure and applications: Simple staining, differential staining, and structural staining.	6	9

6	<b>General concepts of immunity:</b> Introduction to immunity: Innate and acquired; active and passive; humoral and cell-mediated immunity. Types of cells of immune system – granulocytes, lymphocytes and monocytes.	8	15
7	<b>Antigens and antibodies:</b> Introduction to antigens and haptens. Antibodies - basic structure, types, properties and functions of immunoglobulins, polyclonal and monoclonal antibodies applications. Antigen – antibody interactions; Hypersensitivity and Autoimmunity. Blood grouping, Vaccines.	8	15

• **PRACTICALS**

**(30 contact Hours)**

1. Preparation of culture media for cultivation of bacteria/ fungi
2. Sterilization of medium using Autoclave, handling bacteriological and BOD incubators.
3. Microscopic observation of bacteria, Cyanobacteria, Algae and Fungi.
4. Simple staining and Gram's staining
5. Isolation of pure cultures of bacteria by streaking method.
6. Identification of human blood groups.

**Recommended textbook & references.**

1. Microbiology: An Introduction by Tortora, Funke and Cases. Publisher : Pearson 13<sup>th</sup> edition-2020.
2. Textbook of Microbiology by Ananthanarayan and Paniker. Publisher: University press India Pvt. Ltd, 12<sup>th</sup> edition-2022
3. Microbial Biotechnology by PC Trivedi: Publisher: Pointer-2004.
4. Kuby Immunology. by Jenni Punt, Sharon Stranford, Patricia Jones, Judith A Owen. Publisher: W.H. Freeman & Co Ltd, 7<sup>th</sup> edition-2018.
5. The elements of immunology by Fahim Halim Khan, published by Pearson 4<sup>th</sup> edition-2013

# BIOTECHNOLOGY

SEMESTER: 1

Paper name: **Fundamentals of Biotechnology**

Paper Code: **BTC-MDC-131**

**Total Marks: 75**

Credit:03 (Theory:3; Practical: 0)HOURS: 45 (Theory:45; Practical: 0)

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## Course Outcome:

**CO1:** Learn& remember the scope and branches of biotechnology.

**CO2:** Learn, understand & remember the basics of Cell Theory and Cellular Structure.

**CO3:** Learn & understand the basics of Protein, Carbohydrates, Lipids, Nucleic Acid

**CO4:** Learn& apply the basic of Biosafety and Good Laboratory Practices

## • **THEORY**

UNIT NO.	SYLLABUS	CLASS HOUR	ALLOTTED MARKS
1	<b>Introduction to Biotechnology:</b> History of Biotechnology, Branches of biotechnology, Scope of Biotechnology.	10	15
2	<b>Cell Biology Essentials:</b> History of Cell, Cell theory, Shape and types of cells, Prokaryotic and Eukaryotic, Plant and Animal Cell, Cellular Organization.	12	25
3	<b>Essentials of Biochemistry:</b> Basic understanding of Protein, Carbohydrates, Lipids, Nucleic Acid, Enzymes, Vitamins and their importance.	13	25
4	<b>Genetics:</b> Mendelian genetics, History, Mendelian law, Chromosome structure & function. Genetic disorders.	10	10

## **Recommended textbook & references.**

1. "The Cell: A Molecular Approach" By Geoffrey M. Cooper and Robert E. Hausman
2. "Essential Cell Biology" By Bruce Alberts, Dennis Bray, Karen Hopkin, Alexander D. Johnson, Julian Lewis, Martin Raff, Keith Roberts, And Peter Walter
3. "Biochemistry" Judith G. Voet, 2004
4. "Basic Biotechnology" by Ratledge, Colin

# BIOTECHNOLOGY

SEMESTER: 2

Paper name: **Biotechnology in Human welfare**

Paper Code: **BTC-MDC-132**

**Total Marks: 75**

Credit:3 (Theory:3; Practical: 0)HOURS: 45 (Theory:45; Practical: 0)

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## Course Outcome:

**CO1:** Lear, understand & remember about the basics of Genetics & genetic disorders.

**CO2:** Understand about the basics of molecular biology, mutation.

**CO3:** Understand the applications of biotechnology in different field like genetic engineering & Medicine.

**CO4:** Learn & remember the basics of environmental biotechnology, Biofuels, bio-fertilizers.

## • THEORY

UNIT NO.	SYLLABUS	CLASS HOUR	ALLOTTED MARKS
1	<b>Molecular Biology Basics:</b> Search for genetic material, basic structure of DNA, replication, RNA & protein formation. Mutation	14	20
2	<b>Medical &amp; Industrial Biotechnology:</b> Microbes for human benefit: Fermentation, Genetic engineering basics, GMO, Biotechnology in medicine: Gene-therapy, Biopharmaceuticals & Vaccines, Antibiotics.	18	30
3	<b>Environmental Biotechnology:</b> Bioremediation, Sewage treatment, Biofuels, Biofertilizers.	7	13
4	<b>Introduction to Biosafety and Bioethics:</b> Biohazards, Biosafety Measures, Bioethics, GLP	6	12

## **Recommended textbook & references.**

6. Cell biology, Genetics, Molecular biology, Evolution & ecology by Verma & Agarwal by S. Chand publication.
7. Environmental Biotechnology by P.R Yadav & Rajiv Tyagi.
8. Essentials of Biotechnology by Irfan Khan & Atiya Khanum.
9. Biochemistry by U. Satyanarayana, Elsevier Health Sciences