



Semester–3

BRANCH	SubjectTitle	SubjectCode
B.Sc.(MICROBIOLOGY –MAJOR)	Microbial Physiology and Metabolism	MBM1-131

Course Objective

- Microbial Physiology is an intensive course with the goal of integrating biochemistry and genetics to enhance the understanding of the microbial cell and the robust and diverse nature of life.

Course Learning Outcomes(CLO)-

On completion of this course, learners will be able to understand-

1. Role of various biomolecules.
2. Structure and metabolism of Carbohydrates.
3. Structure and metabolism of Amino acids and Proteins.
4. Mechanism of enzyme action.
5. Structure and metabolism of lipids.
6. Structure, types and roles of Nucleic Acids..

Unit –I

1.1 Bio-molecules: An Overview.

1.2 Carbohydrate:

Characters, Classification and Structure of Monosaccharides, Disaccharides, Polysaccharides (Storage polysaccharides and structural polysaccharides).

1.3 Synthesis and Breakdown of Carbohydrates:

Aerobic and anaerobic chemolithotrophy with an example of each. Phototrophic metabolism. Aerobic respiration, anaerobic respiration and fermentation. Sugar degradation pathways i.e. EMP (Embden- Meyerhof-Parnas), ED (Entner-Doudoroff), Pentose phosphate pathway (PPP), TCA (Tricarboxylic Acid) cycle.

Electron transport chain (ETC): Components and comparison of mitochondrial and bacterial ETC.



Unit-II

Protein

2.1 Amino acids: Classification, biochemical structure and Significance.

2.2 Protein:

Primary, secondary, tertiary and quaternary structures. Denitrification; nitrate/nitrite and nitrate/ammonia respiration; Fermentative nitrate reduction.

Introduction to biological nitrogen fixation Ammonia assimilation. Assimilatory nitrate reduction, dissimilatory nitrate reduction,

2.3 Enzymes:

Structure of enzyme, Apoenzyme and cofactors, prosthetic group-TPP, coenzyme -NAD, metal cofactors. Classification of enzymes, Nomenclature,

Mechanism of action of enzymes: active site, transition state complex and activation energy. Lock and key hypothesis, and Induced Fit hypothesis. K_m , and allosteric mechanism. Effect of pH and temperature on enzyme activity. Enzyme inhibition: competitive; non-competitive.

Unit -III

Lipids and Vitamins

3.1 Lipids: Definition and major classes of storage and structural lipids.

Biosynthesis of lipids and fatty acids.

3.1.1 General structure of lipids, Fatty acids - structure and functions. Storage lipids, Structural lipids.

3.1.2. Phosphoglycerides: Building blocks, general structure, functions and properties,

3.1.3 Functions of lipids

3.2 Vitamins:

Concept and types of vitamins -water soluble and fat soluble, their structure, biosynthesis and their role in metabolism

Unit-IV

Nucleic acids

4.1 Nucleic acids: Physical and chemical properties of Nucleic Acids, Biosynthesis of nucleotides, Structure and functions of DNA and RNA.

4.2 Basic concept of nucleic acids protein interactions.



Practical Course

1. Qualitative/Quantitative tests for carbohydrates, reducing sugars, non-reducing sugars.
2. Qualitative/Quantitative tests for proteins.
3. Study of secondary and tertiary structures of protein with the help of models
4. Qualitative/Quantitative tests for lipids.
5. Study of effect of temperature, substrate concentration, enzyme concentration, pH and heavy metals on enzyme activity.
6. : Study of Structure of DNA and RNA with the help of Charts and models.
7. Separation of amino acids by Paper Chromatography
8. Separation of Sugars by Paper Chromatography.
9. ISOLATION OF DN
10. Any other practical's based on theory paper



Semester – 4

BRANCH	SubjectTitle	SubjectCode
B.Sc.(Microbiology– Major)	Microbial Diversity and Growth	MBM1-141

Course Objectives

- This course deals with characteristics, properties and biological significance of the biomolecules of life. In depth knowledge of the energetic and regulation of different metabolic processes in microorganisms.

Course Learning Outcomes(CLO)-

- On completion of this course, learners will be able to -
- Classify bacteria into groups and their salient characteristics.
- Describe the nutritional requirements of bacteria for growth.
- Understand viruses and viral diseases.
- Know about diversities in Fungi and Algae
- Develop a basic idea about Protozoa.

Unit -I

Virology

1.1 Discovery of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Concept of Theories of viral origin- Progressive, Regressive and The Virus-first theory. Structure of Viruses. Salient features of viral nucleic acid and the presence of unusual bases. Influenza and Hepatitis B virus, HIV, Polio virus, Vaccinia virus, Rabies Virus. TMV, Cauliflower Mosaic Virus, Bacteriophage

1.2 Viral taxonomy: Classification and nomenclature of different groups of viruses. Baltimore system of classification.

1.3 Modes of viral transmission: Persistent, non- persistent,

1.4 Replication: Assembly, maturation and release of viruses in Lytic and lysogenic cycles.



Unit-II

Archaeobacteria and Eubacteria

2.1 General characteristics. Phylogenetic overview of archaeobacteria. Differences between Eubacteria and Archaeobacteria. Classification of Bacteria - Outline of Bergey's Manual of Systematic Bacteriology. General accounts of Mycoplasma, Actinomycetes, Rickettsias, Chlamydia and Cyanobacteria. Nutritional requirements in bacteria and nutritional categories.

2.2 Bacterial Growth- Logarithmic representation of bacterial populations, phases of growth, calculation of generation time and specific growth rate. Techniques of Measurement of bacterial growth, Factors affecting Bacterial growth

Unit -III

Mycology

3.1 Fungi : Characteristics and classification. Cellular structure and thallus organization of fungi.

3.2 Classes of Fungi: General features, structure, nutrition and reproduction of different fungi groups - Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes.

3.3 Type study of: Phytophthora, Morchella, Claviceps and Cercospora

3.4 Diversity of fungi - Nutritional, Physiological and Ecological Diversity

Unit-IV

Phycology and Protozoa

4.1 Algae- General characteristics of Algae. Occurrence, thallus organization, algal cell ultra-structure, pigments, food reserves; Vegetative, asexual and sexual reproduction. Outline of Classification of algae with emphasis on Phytoplanktons

4.2 Type study of: Chlorella, Pinnularia and Navicula.

4.3 Lichens- General Account



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4.4 Protozoa- General characteristics, classification and economic Importance of Protozoa.



PartB-ContentofPracticalCourse

1. Gram staining
2. Acid fast staining
3. Isolation of bacteria from soil, water and air.
4. 4 Isolation of fungi from soil, water and air.
5. Isolation of algae from water.
6. Identification of common Bacteria, Fungi and Phytoplanktons
7. Study of common algae and fungi through permanent slides and specimen.
8. Study of common protozoan through permanent slides.
9. Any other practical based on theory paper