

**COURSES OF STUDY IN M.Sc. MICROBIOLOGY
FIRST SEMESTER**

Course Code MBC101: Bacteriology (Total credits: 3)

Theory

UNIT-I

History, scope and development of bacteriology, sterilization, isolation, enrichment, pure culture and staining techniques, systematic study of bacteria; morphological, physiological, biochemical and serological studies, genetic characterization, identification & classification chart.

UNIT-II

Habitat, structure, reproduction & classification of bacteria (morphological, biochemical, serological, chemical and molecular aspects), Actinomycetes, Mycoplasma, Rickettsiae, Chlamydiae and their significance.

UNIT-III

The photosynthetic bacteria; cyanobacteria, green bacteria, halobacteria and their economic importance. Methanogenic bacteria and their significance. Chemoautotrophs and Methylootrophs; nitrifying bacteria, sulfur oxidizers, iron bacteria, hydrogen bacteria and their economic importance.

UNIT-IV

Enterobacteriaceae and related organisms, their morphological & physiological characters, genetic interrelationship, taxonomic sub-division & their importance in human health. Myxobacteria, cytophage group, filamentous & gliding chaemoheterotrophs & filamentous sulphur oxidizing bacteria.

UNIT-V

Gram positive spore forming bacteria; unicellular endospore formers- *Bacillus*, *Clostridia*. *Miscellaneous bacteria*; *lactic acid bacteria*, *Micrococci*, *Corynebacteria*, *Mycobacteria*.

Course Code MBC102: Virology (Total credits: 3)

Theory

UNIT-I

General virology: History and development of virology, origin, distinctive properties, ultrastructure and chemistry of viruses. virus related agents (viroids, prions), significance of viruses.

UNIT-II

General methods for isolation, identification, characterization and cultivation of viruses: Methodology for isolation, adsorption, One-step growth and burst size of virus. Determination of titre value, isolation of phage resistant strain, cultivation and maintenance of plant, animal and bacterial / cyanobacterial viruses. identification of viruses by physical, chemical and serological techniques.

UNIT-III

Bacterial/ cyanobacterial viruses: Structure and multiplication of lytic and lysogenic bacteriophage. Significance of lysogeny. Brief account of M13, Mu, T4 and λ , history, structure, genetics and life cycle of cyanophages, significance of bacteriophages and cyanophages.

UNIT-IV

Plant viruses: classification and nomenclature, structure and multiplication of plant viruses with special reference to TMV, cauliflower mosaic virus, effect of viruses on plants. Some common

viral diseases of plants (TMV, CMV, leaf Curl of papaya). Transmission of plant viruses and control of viral diseases of plants.

UNIT-V

Animal viruses: Classification and nomenclature of animal and human viruses. Brief account of Adeno-, Herpes, Hepatitis, HIV and other oncogenic viruses. Prevention, treatment and control of viral diseases. Viral vaccines including DNA vaccines and interferons.

Course Code MBC103: Mycology (Total credits: 3)

Theory

UNIT-I

Status of fungi in the living world, general features of fungi and fungus like organisms; recent trends in the classification of fungi; physiology and growth of fungi; nutritional and environmental factors affecting growth; saprotrophs, parasites and mutualistic symbionts; physiology of reproduction in fungi, phylogeny of fungi.

UNIT-II

Fungal diversity-major taxonomic group, structure, reproduction, life cycle and significance of the following representatives:

i) Gymnomycota-general account – cellular slime moulds (*Dictyostelium*), plasmodial slime moulds (*Myxomycetes*).

ii) Mastigomycota- *Coelomomyces*, *Lagenidium*, *Achlya*, *Phytophthora*, *Peronospora*, *Plasmodiophora*.

iii) Amastigomycota- *Zygomycotina*- *Mucor*, *Syncephalastrum*, *Blakeoclea*, *Cunninghamella*, *Entomophthora*.

UNIT-III

Fungal diversity contd. structure, reproduction, life cycle and significance of the following representatives:

i) Ascomycotina- *Taphrina*, *Emericella*, *Chaetomium*, *Morchella*, *Neurospora*, *Claviceps*, *Erysiphae*.

ii) Basidiomycotina- *Puccinia*, *Melampsora*, *Ustilago*, *Polyporus*, *Lycoperdon*, *Ganoderma*.

iii) Deutromycotina- *Fusarium*, *Cercospora*, *Curvularia*, *Beauveria*, *Microsporum*, *Phoma*, *Collectotrichum*.

UNIT-IV

Fungal genetics:

i) Life cycle and sexual process in fungi; structure and organization of fungal genomes (mitochondrial genes, plasmids and transposable elements, virus and viral genes).

ii) Genetic variations in fungi- nonsexual variations-haploidy, heterokaryosis, parasexuality; sexual variations- mating or breeding systems- homothallism and heterothallism, mutation, physiological specialization; strain improvement.

UNIT-V

Fungi and biotechnology: production of alcoholic beverages, antibiotics, organic acids, ergot alkaloids; the cultivation of fungi for food-mushrooms, myco protein and mycofoods; role of fungi in agriculture and forestry- mycorrhizae and their application, mycopesticides, mycotoxins, conservation of fungal germplasm.

Course Code MBE101 : BIOMOLECULES (Total Credits =03)

UNIT I

Structure of water and its solvent properties, Acid- bases, pH and buffer, Bi and polyprotic buffer. Free energy and spontaneity of reactions, ATP and other phosphorylated compound with their free energy of hydrolysis, Phosphoryl group transfer, Biological oxidation reductions reaction, Coupled reaction and oxidative phosphorylation, Inhibitors and uncouplers.

UNIT II

Enzyme classification, Specificity, Active site, Enzyme kinetics, Michealis Menton equation, Determination of kinetic parameters, Bi-substrate reaction and their kinetics, Enzyme inhibition and kinetics, Allosteric enzyme. Kinetics and Allosteric regulation of phosphofructo kinase

UNIT III

Structure and chemistry of macromolecules, Proteins, Carbohydrates and Lipids, Protein folding, Structure and chemistry of biomolecules such as antibiotics, Pigments, Vitamins as coenzymes, Lipid analysis by GLC and Mass Spectrometry, Oligosaccharide and Polysaccharide analysis.

UNIT IV

Biosignaling molecular mechanism of signal transduction, Gated ion channels, Nicotinic acetyl choline receptor, Receptor enzyme, The insulin receptor, G- proteins and cyclic AMP membrane transport, Biomembrane, Nutrient transport across membranes, Active and passive diffusion, Symport, Antiport and uniport, Na^+ K^+ pumps and their metabolic significance.

UNIT V

Chromatographic technique, Paper and TLC , Gel filtration, Ion exchange, Affinity, HPLC, SDS, PAGE, Isoelectric focusing, Western blotting, Protein sequencing, Mass spectrometry, MALDI , TOF, MS.

Course Code MBE102: Bioenergetics and Intermediary Metabolism (Total Credits = 03)

UNIT I

Bioenergetics: energy transformation, biological oxidations, oxygenases, hydroxylases, dehydrogenases and energy transducing membranes; free energy changes and redox potentials, phosphate potential, ion and proton electrochemical potentials, membrane potentials, chemo-osmotic theory; ion transport across energy transducing membranes, influx and efflux mechanisms, transport and distribution of cations, anions and ionophores. Uniport, antiport and symport mechanisms, shuttle systems.

UNIT- II

The mitochondrial respiratory chain, order and organization of carriers, proton gradient, iron sulphur proteins, cytochromes and their characterization; the Q cycle and the stoichiometry of proton extrusion and uptake. Oxidative phosphorylation, uncouplers and inhibitors of energy transfer. Fractionation and reconstitution of respiratory chain complexes. ATP synthetase complex, microsomal electron transport.

UNIT- III

Carbohydrates: glycolysis, citric acid cycle- its function in energy generation and biosynthesis of energy rich bonds, pentose phosphate pathway, alternate pathways of carbohydrate metabolism, gluconeogenesis, inter-conversions of sugars, biosynthesis of glycogen, starch and oligosaccharides.

UNIT- IV

Lipids: fatty acid biosynthesis: acetyl CoA carboxylase, fatty acid synthase; fatty acid oxidation: α , β , oxidation and lipoxidation; lipid biosynthesis: of triacylglycerols, phosphoglycerides and sphingolipids, biosynthetic pathways for terpenes and steroids.

UNIT- V

Amino acids and nucleic acids: biosynthesis and degradation of amino acids and their regulation, specific aspects of amino acid metabolism, urea cycle and its regulation, in-born errors of amino acid metabolism; Nucleic acids: degradation of purines and pyrimidines, regulation of purine and pyrimidine biosynthesis, structure and regulation of ribonucleotide biosynthesis, biosynthesis of ribonucleotides, deoxyribonucleotides and polynucleotides, inhibitors of nucleic acid biosynthesis.