

Microbiology - Science

**POST GRADUATE DEGREE
STANDARD**

UNIT I

History of Microbiology:-

Concept of origin of life - abiogenesis - biogenesis - Spontaneous generation theory. Contribution by Luis Pasteur, S.A. Waksman, Alexander Flemming, Robert Koch, Winogradsky, Stanley, Lwenewsky, H.W. Conn, Ewin Smith.

UNIT II

Methods in Microbiology:-

Sterilization - Disinfection; Isolation, Purification and preservation of Microbes, Principles of Staining of microorganisms, Microscopy: Light Phase contrast, Epifluorescence and Electron microscopy - Assay of antibiotics. Preparation of culture media.

UNIT III

Protists:-

Archaeobacteria, Prokaryotic and Eucaryotic microorganisms and their differentiation. Evolution and classification of microorganisms, Protozoa, Algae, Fungi, bacteria, Actinomycetes, Rickettsiae, Mycoplasma and viruses. Modern approaches to taxonomy.

UNIT IV

Morphology and cytology:-

Cytology of microbial cell- comparison of the cytological features of different groups of microorganisms - chemical nature of cell wall. Protoplasm, nucleus, granular materials and other inclusions of microbial cells.

UNIT V

Physiology of Microorganisms:-

Growth and metabolism - growth phases, kinetics and influence of environmental parameters, nutritional requirements, metabolism of Carbohydrates, Nitrogen, Lipids, and nucleic acids, Electron transport, Microbial enzymes and regulation.

UNIT VI

Principles of immunotechnology:-

Antigen and antibody reactions, hypersensitivity, hybridoma, monoclonal serological techniques. Host-microbe interaction - virulent factors - pathogenicity - infection - resistance.

UNIT VII

Advanced Techniques:-

Principles and Application of Gel filtration, ion exchange and affinity, high pressure liquid chromatography (HPLC) as chromatography (GC) Electrophoresis, Electrofocussing, ultracentrifugation ELISA technique Fluorescent Antibody Technique, Radioactive isotopes autoradiography.

UNIT VIII

Microbial genetics:-

Mutations and variations genetics of Neurospora, Aspergillus and Saccharomyces heterozygosity parasexuality genetics of bacteria and bacteriophages, plasmids, episomes and transposons

Transformation, Transduction Conjugation, Genetic Improvement of microorganisms, gene cloning and modern R - DNA- techniques to improve biotechnologically important microorganisms.

UNIT IX

Microbial ecology:- principles and their application to microbial ecosystems. Methods of studying Microbial ecosystem. Interrelationship of microorganisms - biological equilibrium.

UNIT X

Statistics:- elementary principles of statistics, mean, mode and median, chi-square, correlation and regressions, analysis of variance. Statistical methods in biological research-use of Duncan's multiplication range test.

PAPER- II

APPLIED MICROBIOLOGY

UNIT I

Industrial Microbiology:- Production of ethanol and alcoholic beverages, Organic acids, Polysaccharides, Amino acids - Vitamins - enzymes growth regulators, antibiotics fermentation techniques, continuous cultivation of microorganisms, patents terms and regulations. Microbial leaching of ores.

UNIT II

Agricultural Microbiology: Distribution of microorganisms, organic matter decomposition - Microbiology and biochemistry. Biofertilizers Biological Nitrogen fixation, nitrification denitrification and microbial transformation of iron, sulphur and Phosphorus Ecto and Endo mycorrhizal association in plants and their significance, Microbial pesticides - Microbial degradation of pesticides.

UNIT III

Biomass conversion:- Production of biomass with respect to microbial energy conversion-Ethanol from biomass, Biogas Technology - Use of biomass for methaneogenesis - Biogas plants. hydrogen fuel from microbes.

UNIT IV

Plant microbiology:- Concept of phyllosphere, rhizosphere and spermosphere, modification of rhizosphere effect, R:S, ratio, root exudates and their influence on plant growth and microbial community.

UNIT V

Environmental microbiology:- Microbiology of water and Air- Microbial assessment of water quality, safe disposal of sewage and industrial effluents. Waste water treatment and pollution control. Management of organic wastes: Utilization of agricultural wastes through microbial degradation. Microbial composting, disposal of municipal, domestic and industrial wastes through microbial processes. Recycling of sewage water, Microbial deodorization and decolouration of effluents.

UNIT VI

Food Microbiology:- Role of microbes in preparation of sauer- Kraut, bread and pickles. Preservation of food, sources of spoilage of food, food infection, food toxicity, and control of food borne microorganisms, food adulteration and legislation. Microbes as food Single cell protein production, Mushroom production.

UNIT VII

Dairy Bacteriology:- Microbiology of milk - Pathogenic bacteria in milk - Spoilage of fresh milk and milk products - Prevention. Preservation of milk and milk products - production of fermented Dairy products.

UNIT VIII

Microbiology of Fibres: Microbial retting of fibres - Jute - flax - coir, Biodeterioration of cotton - jute, prevention of damage of fibres.

UNIT IX

Microbial diseases and their control:-

Plant diseases:-

Damping off, rots and wilts, mildews, smuts and rusts and leaf spots.

Animal diseases:-

Anthrax foot and mouth disease - Bovine - Rinderpest Human diseases:- Tuberculosis - leprosy - tetanus - Diphtheria, Typhoid - cholera - HIV's.

UNIT X

Microbial Biotechnology:- Developments in microbial biotechnology and Genetic manipulation - recombinant DNA technology - techniques Applications of biotechnology - production of antibiotics, enzymes, Insulin, growth hormones - interferons - monoclonal antibodies.