LPUNEST
Syllabus for Ph.D. Entrance
MICROBIOLOGY

UNIT 1: Microbial Taxonomy and Diversity

Microbial World, Concepts and Scope, Classifying and Naming Microorganisms, ICNB Rules, Major Characteristics used to Classify Microorganisms, Importance and Conservation of Microbial Diversity,Metagenomics,*In situ* Conservation and *Ex situ* Conservation, Role of Culture collection centers in conservation.

UNIT 2: Microbial Physiology

Microbial Energetics, Microbial enzymes, Metabolism of Carbohydrate,Alternate pathways of Carbohydrate Metabolism, Gluconeogenesis, Utilization of sugars other than glucose, Lipid metabolism, Nitrogen metabolism, Nucleic acid metabolism,Photosynthetic bacteria,Autotrophic Mechanisms in bacteria, Microbial Stress Responses to different conditions.

UNIT 3: Microbial Genetics

Generalized reproductive cycles of microbes: Viruses, Bacteria, *Neurospora*, *Saccharomyces, Chlamydomonas* and *Acetabularia.* Viral Genetics: Phage Phenotypes, Phenotypic Mixing, Bacterial Genetics: Bacterial Transformation,Bacterial Conjugation,Hfr conjugation. Transduction: Generalized and specialized transduction, Mutation and mutagenesis, Fungal and algal genetics.

UNIT 4: Environmental Microbiology

Microbiology of air, water and soil, Sources of water pollution, Biological indicators of water pollution, Water and air borne diseases. Determination of potable quality of water, Microbes in extreme environment and their survival mechanisms, Microbes in the degradation of wastes, Microbial degradation of pesticides, Xenobiotics, bioremediation advantages and disadvantages,Geomicrobiology: Microbes in metal extraction, mineral leaching and mining.

UNIT 5: Food Microbiology

Concepts and scope, Detection of food-borne microorganisms,Microbial spoilage of foods, Food poisoning and intoxication,Food borne diseases, Food preservation, Microbial indicators of food safety and quality, Food laws and standards.

UNIT 6: Agricultural Microbiology

Introduction to Agricultural Microbiology, Plant pathology, Diagnosis of plant diseases, Parasitism and disease development, Entry of pathogens to the host, Effect on physiology of host, Plant disease epidemiology, Environment and Plant diseases, Defense Mechanism of Plant

Disease, Plant Diseases and their management, Host pathogen interaction, Biofertilizer, PGPR, Biopesticides.

UNIT 7: Medical Microbiology

Milestones in the development of Medical Microbiology, Microbial Infections, Urinary tract infections, Sexually transmissible infection, Oral cavity and respiratory infection, Gastrointestine infection, Nosocomial infections, General concepts for specimen collection and handing of specimen, Epidemiology, Pathogenesis, Spectrum of disease, Laboratory diagnosis and Prevention.Diseases caused by Viruses,Bacteria, Fungi,Chlamydiae, Protozoa and emerging diseases,

UNIT 8: Industrial Microbiology

Concepts and Scope of industrial Microbiology, Fermentation, Development of inocula, Fermenters, Batch and Continuous fermentation, Industrially important microorganisms, strain improvement and preservation, Media for industrial fermentation, sterilization, upstream processing, downstream processing, Industrial production of energy fuels (solvents), organic acids, enzymes (amino acids), food additives, Health care products (antibotics, vitamins), probiotics, biomass production (SCP), hydrocarbons, recombinant proteins, quality control of fermented products, IPR, Patents, Biosafety and Entrepreneurship.

UNIT 9: Molecular Biology and Genetic Engineering

Concept and scope of Molecular Biology and Genetic engineering, Microbes in Molecular Biology, DNA as Genetic material, DNA replication, Differences in prokaryotic and eukaryotic DNA replication,Protein synthesis, Gene expression, Regulation of gene expression in prokaryotes, eukaryotes and bacteriophages, Gene silencing, Importance of gene cloning and future perspectives,Enzymes in genetic engineering,Cloning vectors,Applications of Genetic Engineering,Antisense technology,Safety of rDNA technology, Restriction and regulation for the release of GMO^{s}into Environment, Ethical, Legal, Social and Environmental Issues related to rDNAtechnology.