Ph.D. MICROBIOLOGY
(2013-2014)
Revised SYLLABUS
PAPER I RESEARCH METHODOLOGY

Unit - I Scientific research and scientific writing

Unit - II Biostatistics

Unit - III Basic concepts of computers
History of computers, concept of computer hardware, concept of computer - languages, concept of computer software.

Computer application in Biology
Spreadsheet tools: Introduction to spreadsheet applications, features, using formulae and functions, data storing, features for statistical data analysis. Generating charts/graph and other features, tools Microsoft excel or similar presentation tools: Introduction features and functions. Power point. Presentation, customizing and showing presentation. Introduction to internet, use of internet and WWW, use of search engines.

Unit - IV Bioethics

Unit -V Biosafety
Reference Books

4. Recombinant DNA safety guidelines (January 1990), Department of Biotechnology, Ministry of Science & Technology, Government of India, New Delhi.
Unit - I Soil Microbiology

Unit - II Environmental Microbiology

Unit - III Food Microbiology
Food micro flora - spoilage organisms - Food poisoning - Intoxication and infection - Quality management in food industries - Fermented foods - SCP. Microbial enzymes - Genetically modified foods.

Unit - IV Industrial Microbiology:
Concept and scope of industrial Microbiology – strain improvement; Bioreactors – types, design and functional characteristics. Scale up of fermentations. Production of organic solvents, organic acids and amino acids. Third generation antibiotics, Bioassay techniques of antibiotics. Production of microbial inoculants, Principles of immobilization – different kinds of immobilization techniques and their uses in industries. Intellectual property rights (IPR) Patents, Trademark, copyright, Design registration and know- how – patent system India – patenting microorganisms and microbial products.

Unit - V Medical Microbiology:

References Books
PAPER - III ADVANCES IN MICROBIOLOGY - II

UNIT - I Microbial Physiology

Microbial Energetic, 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 – II Microbial Genetics


UNIT - III Molecular Biology and Genetic Engineering

DNA as Genetic material, DNA replication, Differences in prokaryotic and eukaryotic DNA replication, 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, Ethical, Legal, Social and Environmental Issues related to rDNA technology.

UNIT - IV 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 - V Immunology

Antigens and Antibodies, Immunogenicity versus Antigenicity, Factors that influence immunogenicity, Antigen processing and presentation, MHC molecules. Antibodies – structure and function, antibody diversity, monoclonal antibodies and its clinical applications, Immunity, Innate immunity, Acquired immunity, Humoral or antibody mediated immunity, cell mediated immunity. Immunological disorders: Hypersensitivity Type I to Type IV.

Reference books:

2. White, D., 2006 The Physiology and Biochemistry of Prokaryotes, Oxford University Press
Unit – I Environment and Ecosystems

Unit – II Eutrophication
Water pollution and its control: Need for water management. Sources of water pollution. Measurement of water pollution, Eutrophication: Definition, causes of eutrophication, and microbial changes in eutrophic bodies of water induced by various inorganic pollutants. Effects of eutrophication on the quality of water environment, factors influencing eutrophication. Qualitative characteristics and properties of eutrophic lakes. Measurement of degree of eutrophication. Algae in eutrophication, algal blooms, their effects and toxicity, coloured waters, red tides, and cultural eutrophication. Physico-chemical and biological measures to control eutrophication

Unit – III Aerobiology
Droplet nuclei, aerosol, assessment of air quality, - solid – liquid – impingement methods – Brief account of air borne transmission of microbes – viruses – bacteria and fungi, their diseases and preventive measures.

Unit – IV Waste treatment techniques

Unit – V Bioremediation & Global environmental problems
Microbiology of degradation of xenobiotics in the environment, ecological considerations, decay Behavior, biomagnifications and degradative plasmids, hydrocarbons, substituted hydrocarbons, Oil pollution, surfactants and pesticides. Genetically Modified Organisms released and its Environmental impact assessment and ethical issues. Ozone depletion, UV-B, green house effect and acid rain, their impact and biotechnological approaches for management. Containment of acid mine drainage applying biomining [with reference to copper extraction from low grade ores].
Reference books

Unit – I
History and chronological development of industrial microbiology. Industrially important strains – Isolation and preservation. Inoculums development for various fermentation process. Strain development – mutation, recombinant DNA technology and plasmid fusion.

Unit – II

Unit – III

Unit – IV
Clinical uses of antimicrobial drugs, Microbial spoilage and preservation of pharmaceutical products, Sterilization of pharmaceutical products, Applications of microorganism in the pharmaceutical sciences.

Unit – V
Role of precursors and steering agents in production of antibiotics, vitamins and enzymes. Antiseptics-disinfectants their standardization and Quality control of Pharmaceutical products – Indictable, IV fluids and pyrogen testing.

Reference Books
PAPER IV – C- MEDICAL MICROBIOLOGY

Unit I
Morphology, cultural, biochemical characterization, pathogenicity, lab diagnosis and treatment of gram positive bacteria - Staphylococci, Streptococci, Bacillus sp, Cornebacteria, Mycobacterium. Gram negative bacteria – Enterobacteriacea, Neisseria, Vibrios, Campylobacter and Helicobacter.

Unit II

Unit III
General characteristics, pathogenesis, lab diagnosis and treatment of viruses: Adenoviruses, Pox viruses, Hepatitis viruses, Human retroviruses, Tumor viruses, Rabies viruses, Herpes viruses, Rhino viruses, Influenza viruses, Measles and Mumps viruses.

Unit IV

Unit V

Reference Books
PAPER IV- D - FOOD MICROBIOLOGY

Unit-I

Food Microbiology-Introduction: Types of microorganisms in food – sources of contamination (Primary sources) – factors influencing microbial growth of food (extrinsic and intrinsic).

Unit-II

Study of fermented and process of food: principles of food preservation- methods of preservation. Physical - (irradiation, drying, heat processing, chilling and freezing etc.). Chemical - sodium benzoate class I and II, Food sanitation.

Unit-III

Spoilage and contamination of food– fruits, vegetables, cereals, Sugar products, meat and meat products, milk and milk products, fish and sea foods – spoilage of heated and canned foods.

Unit-IV

Food borne disease: Bacterial: *Staphylococcus, Brucella, Bacillus, Clostridium, Escherichia, Salmonella* (b) fungal: Mycotoxin, including aflatoxins (c) viral: Hepatitis (d) Protozoa – Amoebiasis.

Unit-V


Reference Books