



**Sri Satya Sai University of Technology & Medical Sciences,
Sehore (M.P.)**
Scheme of Examination
Third Semester - Master of Science (Microbiology)

Paper code- MMB-301

Environmental Microbiology

UNIT-I

1. Microbial ecology: basic concepts, types and microbial habitats, factors affecting microbial population.
2. Microbial interactions: competition, commensalism, parasitism, mutualism, commensalisms, synergism.
3. Population ecology: characteristics of population, population growth curves (r and k selection) population regulation.
4. Conservation and management of microbial diversity: biodeterioration and biodegradation.

UNIT-II

1. Microbiology of air: microorganism of air, enumeration of air micro flora.
2. Significance of air micro flora.
3. Brief account of air borne transmission of bacteria, fungi, pollens and viruses.
4. Air borne diseases and their prevention.

UNIT-III

1. Soil microbiology: microflora of soil: soil microorganisms associated with plants: rhizosphere, mycorrhizae.
2. Role of microorganisms in organic matter decomposition (cellulose, hemi cellulose, lignin).
3. Bioleaching; introduction, application of bacterial leaching techniques, properties of bioleaching.
4. Microbial degradation of xenobiotics, petroleum and oil spills in environmental decay behaviours and degradative plasmid.

UNIT-IV

1. Water microbiology: aquatic microorganisms; fresh water and sea water microflora. Microorganisms and water quality, water pollution.
2. Water purity test and indicator organisms, method used in environmental studies –BOD, COD, DO.
3. Common water born disease and their control measure.
4. Water purification: flocculation, chlorination and purification.

UNIT-V

1. Microbiology of waste water and effluent treatments, aerobic process: primary, secondary and tertiary treatment: trickle filter, oxidation ponds and stabilization ponds, principle of aerobic digestion.
2. Bioremediation of contaminations.
3. Extremophiles –acidophilic, alkalophilic, thermophilic microbes with adaptation and application in ecosystem.
4. Microbial biofilms: physiology, morphology, biochemistry of microbial biofilms, mechanism of microbial adherence, beneficial and harmful role of biofilms.

Reference Books

1. Microbial Ecology: Fundamentals and applications, Ronald M. Atlas, fourth edition, An imprint of Addison Wesley Longman. Inc, California
2. Environmental chemistry, A.K. De, Wiley Eastern Ltd., New Delhi
3. Environmental Science, Physical Principles and applications; Egbert Boeker et. al.
4. Comprehensive Biotechnology, vol.4, M. Moo-Young (Ed-in-chief), Pergamon Press, Oxford.
5. Wastewater Treatment for Pollution Control By Soli J Arceivala, Second Edition, Tata McGraw- Hill Publishing Company Limited.



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Scheme of Examination
Third Semester - Master of Science (Microbiology)

Paper code- MMB-302

Industrial & Food Microbiology

UNIT I

1. Microorganisms important in food microbiology: molds, yeast and bacteria –general characteristics, classification and importance.
2. Principles of food preservation, preservation by use of high temperature, low temperature, drying and dessication.
3. Chemical preservatives and additives.
4. Preservation by radiation.

UNIT II

1. Factors influencing microbial growth in food: Extrinsic and intrinsic factors.
2. Microbial spoilage of food. Chemical changes caused by the microorganisms during spoilage.
3. Spoilage of fish, meat, poultry, eggs, fruits and vegetables.
4. Detection of spoilage and characterization.

UNIT III

1. Classification of food borne diseases.
2. Food borne infections: *Brucella*, *Bacillus cereus*, *Clostridium perfringens*, *Yersinia enterocolitica* and *Escherichia*, *Salmonella* spp.
3. Food intoxication: Staphylococcal intoxication, Clostridial poisoning (*Clostridium Botulinum*).
4. Food adulteration and prevailing food standards in India.

UNIT IV

1. Microbiology of Milk: Sources of microorganisms in milk and types of microorganisms in milk.
2. Microbiological examination of milk (standard plate count, direct microscopic count, reductase, and phosphatase test).
3. Dehydration and pasteurization of milk.
4. Dairy products from microorganisms: Butter, yoghurt and cheese.

UNIT V

1. Microorganisms as source of food: Single Cell Protein (SCP)
2. Mushrooms and food value of mushrooms
3. Food conversions: Lactic acid conversions, soyabean conversions and Bakery
4. Microbiological estimation of food: Sample collection, preparation and analysis techniques

Reference Books:

1. Food science By Norman N. Potler, Joseph H. CBS Publishers and Distributors, New Delhi
2. Food Microbiology , by William C. Frazier and Dennis Fourth edition, Tata McGraw-Hill Publishing Company Limited, New Delhi
3. Modern Food Microbiology by James M. Jay, Fourth Edition, CBS Publishers, New Delhi.



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Medical Microbiology

UNIT-I

1. Infection: types of infection, sources of infection, reservoirs and vehicles of infection, predisposing factors.
2. Host-parasite relationship governing the infection and establishment of disease, factors affecting virulence.
3. Normal microflora of human body: normal flora of skin, respiratory, gastrointestinal, genital tract, role of resident flora, concept of probiotics.
4. Mode of spread of infection; Respiratory, skin, wound & burn infection, venereal infections, alimentary tract infection, blood born infection and nosocomial infection.

UNIT-II

1. Infections caused by Gram positive cocci and Gram negative cocci: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *Staphylococcus*, *Streptococcus* and *Neisseria* (meningitis, gonorrhoea)
2. Infections caused by Gram negative bacteria of family Enterobacteriaceae: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *E.coli*, *Klebsiella*, *Proteus*, *Pseudomonas*, *Shigella dysenteriae* and *Salmonella typhi*.
3. Infection caused by Gram Positive bacilli: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *Corynebacterium diphtheriae*, *Bacillus anthracis*, *Clostridium tetani*, *Vibrio cholerae*.
4. Disease caused by acid-fast bacteria and intracellular bacteria: Source of infection, Pathogenicity, Epidemiology & Lab diagnosis of *Mycobacterium tuberculosis*, *Mycobacterium leprae*, *Rickettsia* and *Chlamydia*.

UNIT-III

Morphology, pathogenesis, immune response, diagnosis and prevention of

1. Pox viruses (Variola, Vaccinia, Small pox) Herpes Simplex type I and type II, Picorna viruses (Enteroviruses and Polio viruses).
2. Paramyxoviruses (Rubella virus and Parainfluenza viruses), Orthomyxoviruses (Measles & Mumps viruses).
3. Hepatitis viruses (Type A, B, C, D, E), Arboviruses (Alpha virus and Flaviviruses), Rhabdoviruses (Rabies virus).
4. Oncogenic viruses, HIV virus.

UNIT-IV

1. Important protozoal diseases: Route of entry, Life Cycles, Immunity, disease produced, diagnosis & prophylaxis of *Plasmodium vivax*, *P. falciparum*, *P. malariae* (Malaria), *Entamoeba histolytica* & *Entamoeba coli* (amoebiasis),
2. Route of entry, Life Cycles, Immunity, disease produced, diagnosis & prophylaxis of *Leishmania*, *Trypanosoma* and *Toxoplasma*.
3. Fungal infections: description & classification of pathogenic fungi, Infection caused by dermatophytes (*Microsporum*, *Trichophyton* & *Epidermatophyton*)

4. Definition, Causative agent, Source of infection, Epidemiology, Symptomatology & Diagnosis of Candidiasis, Aspergillosis and Histoplasmosis.

UNIT-V

1. Antimicrobial agents: History, Antibiotics, Antifungal and Antivirals (common drugs, their spectrum and mode of action)
2. Methodologies for testing of antibacterial, antifungal, and antiviral drugs (*in vivo* and *in vitro* infectivity models), mechanism drug resistance.
3. Preclinical development: Safety profile of drugs (Pyrogenicity, Toxicity –hepato, - nephro, -cardio and neurotoxicity), Toxicological evaluation of drug (LD50, Acute, subacute and chronic toxicity), Mutagenicity (Ames test, micronucleus test) and Carcinogenicity.
4. Clinical studies: Phase I, phase II, phase III and phase IV of clinical trials –Objectives, Conduct of trials, Outcome of trials.

Reference Books

1. Textbook of Microbiology by Ananthnarayanan and Paniker's, eighth edition, Universities Press.
2. Brock Biology of Microorganisms, M.T, Madigan, J.M. Martinko and J. Parker, Ninth edition, Prentice Hall, Upper Saddle River, NJ.
3. Microbiology: An introduction, G.J. Tortora, B.R. Funke and C.L. Funke.
4. Virology; Renato Dulbecco and Harold S. Ginsberg, Fourth edition, J.B. Lippincott Company, USA
5. An Introduction to viruses, S. B. Biswas and Amita Biswas. Forth edition, Vikas Publishing House PVT LTD New Delhi.



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Third Semester - Master of Science (Microbiology)

Paper code -MMB-304

Agricultural Microbiology

UNIT I

1. Microorganisms of soil
2. Rhizosphere and phyllosphere microflora
3. Brief account of Microbial interactions: antagonism, symbiosis, mutualism, commensalisms, synergism and parasitism.
4. Nutrient cycle: Carbon cycle, nitrogen cycle, phosphorous cycle and sulphur cycle.

UNIT II

1. Role of enzymes and toxins in pathogenesis.
2. Fungal diseases of plants: Rusts of wheat, linseeds; late blight of potato; red rot of sugarcane.
3. Bacterial diseases of plants : Citrus canker, blight of rice
4. Viral diseases of plants: Leaf curl of Papaya, vein clearing of lady's finger

UNIT III

1. Physical and chemical control of plant diseases.
2. Bacterial control of insect pests: *Bacillus thuringiensis* as bacterial insecticide
3. Viral control of insect pests: Nuclear polyhedrosis viruses (NPV) and cytoplasmic polyhedrosis viruses (CPV)
4. Fungal control of insect pests: Entomopathogenic fungi : *Metarhizium anisopliae*, *Beauveria bassiana*, *Verticillium lecani*, *Hirsutiella thompsoni*

UNIT IV

1. Storage fungi: Categories of storage fungi, conditions during storage in relation to damage of seeds, harmful effects.
2. Mycotoxins and their effect on human being.
3. General idea about quarantine.
4. Production of biogas and alcohol from agricultural wastes.

UNIT V

1. Biofertilizers : Types, production and application.
2. Mycorrhizae : Types and their application in agriculture and forestry.
3. Vermicomposting.
4. Reclamation of waste agricultural land by microorganisms.

Reference Books

1. Soil Microbiology by Prof. N.S. Subba Rao, Fourth edition, Oxford and IBH Publishing CO. PVT., LTD., New Delhi
2. Introduction to soil microbiology. Alexander M. (1977) John Wiley & Sons, Inc., New York.
3. Modern Soil Microbiology, Dirk J, Elias V, Trevors JT, Wellington, EMH (1997), New York