

DEPARTMENT OF MICROBIOLOGY

MATA GUJRI MAHILA MAHA VIDYALAYA (AUTONOMOUS) JABALPUR SYLLABUS PRESCRIBED FOR THE DEGREE OF MASTER OF SCIENCE IN MICROBIOLOGY

(From 2019-20 onwards)

THIRD SEMESTER Course No. IX: Environmental Microbiology

UNIT-I

Environment: Basic concepts and issues; microbial interactions; competition, Amensalism, parasitism, mutualism, commensalisms, synergism. Biogeochemical cycles: carbon, nitrogen, phosphorous and sulphur cycles, Environmental pollution: types and methods for the measurement, methodology of environmental management- problem solving approach, its limitations, air pollution and its control through biotechnology, air sampling techniques; biodiversity: conservation and management .Environment protection act1986.

UNIT-II

Water pollution and its control: Water as a scarce natural resource, need for water management, sources and measurement of water pollution, waste water treatment- physical, chemical and biological treatment processes, algal blooms and human health. Water borne disease and their prevention.

UNIT-III

Microbiology of waste water treatment: Aerobic process-activated sludge, oxidation ditches, trickling filter, towers, rotating discs, rotating drums, oxidation ponds, anaerobic processes- anaerobic digestion, anaerobic filters, upflow anaerobic sludge blanket reactors, treatment schemes for waste waters of dairy, distillery, tannery industries, biotechnological application of microbes from extreme environment solid wastes, sources and management (composting, vermiculture and methane production).

UNIT-IV

Microbial degradation of xenobiotics in the environment- ecological considerations hydrocarbons, substituted hydrocarbons, oil pollution, surfactants, pesticides, bioaccumulation of metals and radio-nucleids and detoxification, bioremediation.

UNIT-V

Biological N₂ fixation, H₂ production, biofertilizers and biopesticides, Single cell protein (*Spirulina*, yeast, mushroom), global environmental problems-ozone depletion, UV-B green house effect and acid rain, their impact and biotechnology approaches for management.

Practicals

1. Detection of coliforms for determination of the purity of potable water.
2. Determination of dissolved oxygen concentration of water sample.
3. Determination of biological oxygen demand (BOD) of a sewage sample.
4. Determination of the efficiency of removal of air pollutant by using fibrous air filter/Air sampler.
5. Isolation of xenobiotic degrading bacteria by selective enrichment technique.
6. Test for the degradation of aromatic hydrocarbons by bacteria.
7. Survey of degradative of aromatic hydrocarbons by bacteria.
8. Estimation of nitrate, nitrite, and ammonium in drinking water.
9. To study the impact of heavy metals on growth & survival of microbes.
10. To study the impact of pesticides on the growth and survival of microbes.
11. To study the impact of salt and osmotic stress on the growth survival of microbes.
12. To study the biology of N₂- fixing microbes/SCP producing microbes.

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THIRD SEMESTER
Course No. X: Industrial and Food Microbiology

UNIT-I

Biofermentation: designing and application, principles of biofermentation, monitoring and control of parameters (pH, oxygen, agitation, temperature, foam etc.), batch & continuous; production medium, raw materials, isolations, maintenance, preservation & improvement of industrial strains, computer control of fermentation processes.

UNIT-II

Downstream processing: filtration of fermentation broths, ultracentrifugation, recovery of biological products by distillation, superficial fluid extraction.

UNIT-III

Industrial production of solvents: ethyl alcohol, citric and acetic acids, enzymes: amylases, proteases, cellulases, vitamins: vitamin B₁₂, vitamin C, antibiotics (penicillin, streptomycin, tetracycline and griseofulvin). Microbes in petroleum industry (oil recovery). Immobilized cells & enzymes.

UNIT-IV

Microbiology of food: sources and types of microorganisms in food, foodborne pathogens, microbiological examination of food, spoilage of food, food preservation, fermented foods, microbial proteins.

UNIT-V

Dairy microbiology: sources and types of microorganisms in milk, microbial examination of milk, pasteurization and phosphatase test, sterilization of milk, grades of milk, dairy products, fermented milk, butter & cheese.

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THIRD SEMESTER

Course No. XI Medical Microbiology

UNIT-I

Early discovery of pathogenic microorganisms, development of bacteriology as scientific disciplines, contribution made by eminent scientists. Normal microbial flora and the human host; role of resident flora, Classification of medically important microorganisms, Dermatophytes, dimorphic fungi, opportunistic fungal pathogens, laboratory diagnosis of pathogenic fungi.

UNIT-II

Mechanism of pathogenicity, virulence and protection, organs and cells involved in immune system and immune response, antigens, antigenic specificity, antigenic determinants, cellular and humoral basis of immunity, immunoglobulins, antigen and antibody reactions, immunological (serological as well as cellular) methods.

UNIT-III

Classification of pathogenic bacteria- *Staphylococcus*, *Streptococcus*, *Pneumococcus*, *Corynebacteria*, *Bacillus*, *Clostridium*, non-sporing anaerobes, Organisms belonging to *Enterobacteriaceae*. *Vibrios*, non-fermenting bacilli, *Yersinia*, *Haemophilus*, *Bordetella*, *Brucella*, *Mycobacteria*, *Spirochaetes*, *Actinomycetes*, *Rickettsiae*, *Chlamydiae*.

UNIT-IV

Important RNA and DNA viral pathogens, virus host interactions, pox viruses, adenoviruses, picornaviruses, orthomyxoviruses, paramyxoviruses, arboviruses, rhabdoviruses.

General properties of pathogenic protozoans and diseases caused by them, slow virus disease.

UNIT-V

Laboratory control of antimicrobial therapy, strategies/ approaches (conventional and modern) in the diagnosis of important disease/ syndrome, meningitis, urinary tract infection, sexually transmitted diseases, pyrexia of unknown origin, wound infection etc.

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THIRD SEMESTER
Course No. XII: Agricultural Microbiology

UNIT – I

History, scope and development of agricultural microbiology, rhizosphere and phyllosphere: concept, importance, factors affecting microbial diversity.

UNIT – II

Soil health: crop residues, humus, mineralization, immobilization, soil-sickness, composting, vermicomposting, green manure. Effect of crop residues on plant growth, biodegradation of pesticides and pollutants, biodegradation fate, bioavailability, acceleration, bioremediation. Biofertilizers: types, production, formulation and constraints.

UNIT – III

General idea about major agricultural pests: Plant diseases- late blight potato, downy mildew of pea, stem gall of coriander, powdery mildew / rust / smut, rust of linseed, Ergot of bajara, Anthracnose of soybean, Tikka disease of groundnut, wilt of arhar, bacterial blight of paddy, citrus canker, leaf curl of papaya, little leaf of brinjal. Insects: gram, soybean. Weeds: parthenium, xanthium, waterhyacinth, cyperus, phalaris

UNIT – IV

Post harvest losses of agricultural products: causes, problems and management, recent trends in pest management: strategies, mass production, formulation and application technology, achievements, constraints

UNIT – V

Biotechnology in agriculture: the new green revolution, transgenic crops, gene protection technology, frost control technology, resistant varieties. Bioconversion futurology: exploitation of agricultural wastes for food / feed and fuel

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FOURTH SEMESTER

Course No. XIII: DISSERTATION