

Syllabus for MRFT

MICROBIOLOGY

UNIT-1. Bioinstrumentation:-

Theory, principles and applications of :-

UV/Visible Spectrophotometry, Atomic Absorption Spectrophotometry, fluorescence spectroscopy, NMR & ESR Spectroscopy, Mass Spectrometry, Electrophoresis, ELISA, Electron Microscopy–Scanning and transmission, Image processing, Chromatography. Centrifugation techniques, pH meter. Northern, Southern and Western Hybridization, Radio isotopic techniques

UNIT-2. Biodiversity:-

Distribution, abundance, ecological niche of bacteria, Archae and Eucaryal

Classifications, Habits of extremely thermophilic Archaeobacteria, Commercial aspects of Thermophiles, Applications of Thermozyms, Alkalophiles and Acidophiles, Halophiles and Basophiles, Space Microbiology

UNIT-3. Food and Dairy Microbiology:-

Industrial food fermentations, quality assurance in foods, food preservation methods, microbiology of cheese and beverage fermentation

Advance food Microbiology:- Genetically modified foods, Biosensors in food, Applications of microbial enzymes in dairy industry (Protease, Lipases), utilization and disposal of dairy by-products.

UNIT-4.Recent trends in virology:-

Classification and morphology of viruses, viroids, prions, cultivation and assay of viruses by physical and chemical methods (Electron microscopy and protein and Nucleic acids studies) Infectivity assays (Plaque and end-point). Purification of viruses by adsorption, precipitation, enzymes, serological methods (agglutination and ELISA)

Viral multiplication, Pathogenesis of viruses, Control of viruses, Emerging viruses.

UNIT-5. Molecular Immunology:-

Immune system, Antigens and Immunoglobulin, Antigen-Antibody reactions, Expressions and Regulations of Immune Response, Immunity and

Immunoassays(SRID, ELISA, ELISA-PCR, RIA, Western Blotting, Immunofluorescences and their applications) Immuno- deficiencies and autoimmunity

UNIT-6. Microbial Physiology:-

Bacterial photosynthesis, Bacterial respiration, Bacterial permeation, Bacterial sporulation, Bacterial chemolithotrophy

Bioenergetics and molecular enzymology: Carbohydrate catabolic pathways (EMP, HMP, ED, Phosphoketolase pathway, TCA cycle, methylglyoxal bypass), Bacterial fermentations

UNIT-7. Enzyme Technology:-

Enzyme properties and Enzyme kinetics Derivation of Michaelis- Menton equation and its significance in enzyme kinetics studies, Lineweaver-Burke Plot, Haldane-Briggs relationship, sigmoidal kinetics, steady state kinetics

Extraction and purification of microbial enzymes, Enzyme inhibition and co-factors, Immobilization of microbial enzymes, Enzyme Engineering, Applications of microbial enzymes in textile, leather, wood industries and detergents, Enzyme in clinical diagnosis

UNIT-8. Bioprocess Engineering and Technology:-

Bioreactors, Mass transfer in reactors, Fermentation process, batch culture, continuous culture, downstream processing, microbial strain improvement, preservation of culture after strain improvement.

UNIT-9. Microbial Genetics:-

DNA structure and mutagenesis, Prokaryotic transcription and translation Regulation of gene expression in prokaryotic, Genetic recombination, Transposons,

Phase Genetics: Life cycle of T4 virulent phage, genetic map and DNA Replications

Lambda temperate phage: Structure, genetic map, Lytic and Lysogenic cycle, Lysogenic repression and phage immunity,

Applications of phage in microbial genetics

UNIT-10. Environmental Microbial Technology:-

Environment and Ecosystem ' Biosphere/ Communities and ecosystems, structure and function of Ecosystems, food chains, food webs and trophic structures, Ecological pyramids, Eutrophication, Effluent treatment techniques, Bioremediation of

xenobiotic, Global environmental problems (ozone depletion, UV-B, greenhouse effect and acid rain, their impact and biotechnological approaches for management)

UNIT-11.Recombinant DNA Technology:-

Techniques and enzymes in genetic recombination plasmids, cosmids, phasmids, specialized cloning strategies, PCR methods and application, molecular mapping of genome- RFLP, RAPD and AFLP analysis, molecular markers, Application of RFLP in forensic, disease prognosis, genetic counselling, animal trafficking and poaching

UNIT-12. Fermentation Technology:-

Microbial fermentation: Metabolic pathways and metabolic control mechanisms, industrial production of citric acid, lactic acid, enzymes (alpha-amylase, Lipase, Xylase, pectinases), acetone-butanol, lysine and glutamic acid.

Microbial production of therapeutic compounds (B-Lactam, aminoglycosides, Rifamycin), Biotransformation of steroids, Vit B₁₂ and Riboflavin in fermentation

Modern trends in microbial production of bio plastics (PHB,PHA), bioinsecticides (thuricide), biopolymer (dextran, alginate), biofertilizers, single cell protein and biological weapons with reference to anthrax,

Biofuels, Immobilization techniques, IPR and Patents.

Unit 13. Bioinformatics, Microbial Genomics and Proteomics:-

Bioinformatics and its application: Computer applications in molecular biology, Protein domains and human genome analysis program (BLAST, FASTA, GCC etc.), search and retrieval of biological information and database sequence, databank (PDB and Gene bank),

Web Genome Analysis: Cosmid Libraries, Bacterial Artificial Chromosomal Libraries, Shotgun Libraries, Conventional sequencing (Sanger, Maxam and Gilbert methods), Automated sequencing,

Use of internet, public domain database for nucleic acid and protein sequences (EMBL, Gene bank), database for protein structure (PDB)

DNA microarray, Proteome Analysis

Unit-14. Pharmaceutical Microbiology:-

Antibiotics and synthetic antimicrobial agents (Aminoglycosides, B-lactams, tetracyclines, ansamycin macrolide antibiotic)

Antifungal Antibiotics, anti-tumour substances, Peptide antibiotics, Chloramphenicols

Sulphonamides and quinolone antimicrobial agents;

Chemical disinfectants, antiseptics and preservatives

Mechanism of action of antibiotics (Inhibitors of cell wall synthesis, nucleic acid and protein synthesis)

Microbial production (Streptokinase and streptodornase) and spoilage of pharmaceutical products

DNA vaccines, synthesis peptide vaccines, multivalent subunit vaccines: Vaccine clinical trial

Regularly practices, biosensors and applications in pharmaceuticals; Quality assurance and validation
