MOHANLAL SUKHADIA UNIVERSITY, UDAIPUR

B. Sc. BIOTECHNOLOGY I YEAR TDC (2016-17)

Paper III : *Microbial Biology and Diversity*

Unit-I

Introduction to microbial world, definition, history and scope of microbiology, Modern systems of classification of bacteria. General features, distribution, cell size, shape and arrangement, structure of bacterial cell capsule, flagella, pilli, (structure outside the cell), cell wall – chemical composition and wall characteristics, plasma membrane, mesosomes, cytoplasm, nucleoids, plasmids, types of plasmid-fertility factor, R plasmid, Col plasmid virulence, metabolic, cryptic plasmid and cytoplasmic inclusions, mode of nutrition with growth sporulation and bacteria transformation, transduction, conjungation. Important diseases of plants (citrus canker, crown gall, blight of rice), humans (tuberculosis, pneumonia, enteric fever) and animals.

15 Credit hours

Unit-II

Cell structure of cyanobacteria – sheath, cell wall, plasma membrane, cytoplasm, cytoplasmic inclusions – cyanophycin, gas vacuoles, carboxysomes, phosphate bodies, phycobilisomes, specialized structures – hormogones and heterocysts, endospores, exospores, nonocysts, akinetes, heterocysts. Morphology and classification, distribution, organization, nutrition, mode of reproduction and economic importance.

Mycoplasma – history, ultrastructure, nutrition, classification, phylogeny, reproduction and methods of cultivation. Elementary account of most common human /animals diseases (Pulmonary pneumonia, urethritis) caused by mycoplasma. Brief account of phytoplasma and important diseases caused by them (Sesame phyllody, little leaf of brinjal, grassy shoot of sugarcane). L-Phase variants.

15 Credit hours

Unit-III

Viruses – theory, classification and phylogeny, general features-virus architecture and structure, replication in bacteriophages, plant and animal viruses, transmission of plant viruses, effect of viruses on plants (symptoms), virus animal interactions, virus epidemiology, some important diseases of plants (yellow vein mosaic of bhindi, leaf curl of tomato and bean mosaic), humans (Aids, Polio, Hepatitis) and

animals (yellow fever, influenza, encephalitis) general features and classification of rickettsias, archebacteria, actinomycetes, viroids and prions.

15 Credit hours

Unit-IV

Methods in microbiology – microbial cultures, physical conditions for growth, requirement of gases, chemical selection, natural selection, methods for culturing aerobic and anaerobic bacteria. Sterilization and disinfection – sterilization by dry heat, moist heat, filtration, radiation, chemical agents – types of disinfectants, testing of disinfectants, incinerators, chemotherapy. Methods of isolation and maintenance of pure culture – streak plate, pour plate and spread plate methods, stab cultures. Culture media – selective and differential media nutrient agar, nutrient Broth, enrichment media and other media. Measurement of microbial growth, cell counting by use of counting chamber and spectrophotometer. Staining and smearing, negative staining, simple staining, differential staining and acid fast staining, special stains – negative stains for capsule, endospore-staining, flagella staining.

15 Credit hours

Unit-V

Plant-microbe interaction: bacterial (associative symbiont, PGPR, *Rhizobium*, fungal symbiosis-mycorrhiza), symbiotic association (bacteria and fungi, microbe-microbe interactions-symbiosis between algae and fungi : lichens) : Antagonistic interactions – amensalism, competition, parasitic and predation.

Soil Microbiology – Soil as a habitat, soil quality-Physico-Chemical properties of soil (organic matter, soil water and air) soil microbes – algae, bacteria, actinomycetes, bacteriophages, nematodes and fungi, microbial balance, rhizosphere and rhizoplane microorganisms.

15 Credit hours

Recommended Books

1. Pelczar and Krieg. Microbiology. McGraw Hill.
2. Prescot, H. and Klein. 2000. Microbiology. McGraw Hill.
3. Tortora. Microbiology : An Introduction. Pearson Education.
4. Stainer, R.Y., Ingrahm, J.L., Wheelis, M.L. and Painter, P.R. General Microbiology. The MacMillian Press Ltd.

5. Madigan, M.T., Martinko, J.M. and Parker, J. B. Biology of Microorganism. Prentice-Hall.
6. Cappuccino, J.G. and Sherman, N. Microbiology – a laboratory manual. Addison Wesley.
7. Alexander, M. Introduction to soil microbiology. John Wiley and Sons.
8. Colwd, D. Microbial Diversity. Academic Press.
9. Dubey, R.C. and Maheshwari, D.K. A Text Book of Microbiology. S. Chand and Company.
10. Dimmock, N. J. and Primrose, S.B. Introduction to Modern Virology, IV Edition. Blackwell Scientific Publications. Oxford.