

HMBCR2042T

SEMESTER –II

C-4: ENVIRONMENTAL MICROBIOLOGY (THEORY)

Total hours: 52

Total Marks: 60

Credits: 4

Module 1

Marks 30

Unit 1 Microorganisms and their Habitats

No. of Hours: 8

Structure and function of ecosystems; Terrestrial Environment: Soil profile and soil microflora; Aquatic Environment: Microflora of fresh water and marine habitats; Atmosphere: Aeromicroflora and dispersal of microbes Animal Environment: Microbes in/on human body (Microbiomics) & animal (ruminants) body; Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels. Microbial succession in decomposition of plant organic matter

Unit 2 Microbial Interactions

No. of Hours: 8

Microbe interactions: Mutualism, synergism, commensalism, competition, amensalism, parasitism, predation
Microbe-Plant interaction: Symbiotic and non-symbiotic interactions
Microbe-animal interaction: Microbes in ruminants, nematophagus fungi and symbiotic luminescent bacteria

Unit 3 Biogeochemical Cycling

No. of Hours: 8

Carbon cycle: Microbial degradation of cellulose, hemicelluloses, lignin and chitin
Nitrogen cycle: Nitrogen fixation, ammonification, nitrification, denitrification and nitrate reduction
Phosphorus cycle: Phosphate immobilization and solubilisation ; Sulphur cycle: Microbes involved in sulphur cycle; Other elemental cycles: Iron and manganese

Unit 4 Microbial Bioremediation

No. of Hours: 6

Principles and degradation of common pesticides, organic (hydrocarbons, oil spills) and inorganic (metals) matter, biosurfactants

Module 2

Marks 20

Unit 5 Waste Management

No. of Hours: 12

Solid Waste management: Sources and types of solid waste, Methods of solid waste disposal (composting and sanitary landfill)
Liquid waste management: Composition and strength of sewage (BOD and COD), Primary, secondary (oxidation ponds, trickling filter, activated sludge process and septic tank) and

tertiary sewage treatment

Unit 6 Water Potability

No. of Hours: 10

Treatment and safety of drinking (potable) water, methods to detect potability of water samples: (a) standard qualitative procedure: presumptive test/MPN test, confirmed and completed tests for faecal coliforms (b) Membrane filter technique and (c) Presence/absence tests

HMBCR2042P

C-4: ENVIRONMENTAL MICROBIOLOGY (PRACTICAL)

TOTAL HOURS: 39

CREDITS: 2

1. Analysis of soil - pH, moisture content, water holding capacity, percolation, capillary action.
2. Isolation of microbes (bacteria & fungi) from soil (28°C & 45°C).
3. Isolation of microbes (bacteria & fungi) from Rhizosphere and Rhizoplane.
4. Assessment of microbiological quality of water, MPN, IMViC
5. Determination of BOD of waste water sample.
6. Study the presence of microbial activity by detecting (qualitatively) enzymes (dehydrogenase, amylase, urease) in soil.
7. Isolation of *Rhizobium* from root nodules.
8. Study of parasitology

SUGGESTED READINGS

1. Atlas RM and Bartha R. (2000). Microbial Ecology: Fundamentals & Applications. 4th edition. Benjamin/Cummings Science Publishing, USA
2. Madigan MT, Martinko JM and Parker J. (2014). Brock Biology of Microorganisms. 14th edition. Pearson/ Benjamin Cummings
3. Maier RM, Pepper IL and Gerba CP. (2009). Environmental Microbiology. 2nd edition, Academic Press
4. Okafor, N (2011). Environmental Microbiology of Aquatic & Waste systems. 1st edition, Springer, New York
5. Metcalf and Eddy. Waste water management
6. Barton LL & Northup DE (2011). Microbial Ecology. 1st edition, Wiley Blackwell, USA
7. Campbell RE. (1983). Microbial Ecology. Blackwell Scientific Publication, Oxford, England.
8. Coyne MS. (2001). Soil Microbiology: An Exploratory Approach. Delmar Thomson Learning.
9. Lynch JM & Hobbie JE. (1988). Microorganisms in Action: Concepts & Application in Microbial Ecology. Blackwell Scientific Publication, U.K.
10. Martin A. (1977). An Introduction to Soil Microbiology. 2nd edition. John Wiley & Sons Inc. New York & London.
11. Subba Rao NS. (1999). Soil Microbiology. 4th edition. Oxford & IBH Publishing Co.

New Delhi.

12. Willey JM, Sherwood LM, and Woolverton CJ. (2013). Prescott's Microbiology. 9th edition. McGraw Hill Higher Education.