

336C6A Environmental Microbiology Summary

Course Units

Unit 1: To Discuss The Distribution And Association Of Microorganism

- Microorganisms and their Habitats: Structure and function of ecosystems Terrestrial Environment: Soil profile and soil microflora, Microbial succession in decomposition of soil organic matter.
- Role of microorganisms in elemental cycles in nature: Carbon, Nitrogen.
- Aquatic Environment: Microflora of fresh water and marine habitats, factors influencing microbial growth in the aquatic environments.
- Atmosphere: Aeromicroflora and dispersal of microbes, Assessment of air quality, Enumeration of microorganism in air, Air sanitation.
- Extreme Habitats: Extremophiles: Microbes thriving at high & low temperatures, pH, high hydrostatic & osmotic pressures, salinity, & low nutrient levels.
- Predisposing factors for Environmental diseases – infectious (water and air borne) and pollution related, spread and control of these diseases.
- Environmental Protection Agency (EPA) - role in environmental protection.

Unit 2: Role Of Microorganism In Water Pollution And Water

- Water potability: Sources and types of water surface, ground, stored, distilled, mineral and de-mineralized water and their pollution, biological indicators of water Pollution, Eutrophication.
- Conventional Bacteriological standards of Water Quality, MPN index, coliform test, Membrane filtration.
- BOD, COD.
- Advanced molecular methods for water analysis.
- Water borne diseases.
- Central Pollution Control Board (CPCB) standards.

Unit 3: Microbes As Biofertilizers And The Aspects Of Application

- Microbial Interactions: Rhizosphere microflora.
- Concepts of Nitrogen fixation – Symbiotic and asymbiotic nitrogen fixers.
- Brief account of microbial interactions: Symbiosis, neutralism, commensalism, competition, Ammensalism, Synergism, parasitism, and predation.
- General account and Significance of Biofertilizers and biocontrol agents – Bacterial, cyanobacterial, VAM.
- Mass production of Rhizobial biofertilizer.
- Biocontrol agents – Bacterial, viral, fungal.

Unit 4: To Learn About The Process Of Solid Waste

- Waste treatment and bioremediation: Solid waste management: Sources and types of solid waste, composting, vermicomposting, production of biogas.
- Liquid waste management: Primary, secondary, and tertiary sewage treatment.
- Bioremediation and waste management: Need and scope of bioremediation.

- Degradation of hydrocarbons, oil spills, heavy metals – Chromium, lead, and xenobiotics – PCB.

Unit 5: Various Plant Diseases And Pathogens

- Plant pathology: Mode of entry of pathogens, Microbial enzymes, toxins, growth regulators and suppressor of plant defense in plant diseases.
- Plant defense mechanisms.
- Bacterial diseases – Citrus canker, Blight of paddy.
- Viral disease – TMV, CMV.
- Fungal disease- red rot of sugarcane, Tikka disease.
- Plant disease management.

Course Outcomes

CO1: Describe about the structure and function of ecosystems and understand the role of microbes in various environments

CO2: Identify the cause of water pollution, and perform methods to assess the quality of water.

CO3: Explain the production of biofertilizers and biopesticides.

CO4: Explain about waste treatment process and microbial decomposition and bio-remediation process.

CO5: Describe about plant diseases caused by microbes and acquire a clear idea on plant pathogenic interaction

Text Books

1. Joseph C. Daniel. (2006). Environmental aspects of Microbiology 2nd Edition. BrightSun Publications.
2. Pradipta. K.M. (2008). Textbook of Environmental Microbiology. I.K. Publishing. House.
3. Ramanathan, and Muthukaruppan SM. (2005). Environmental Microbiology. Om Sakthi Pathipagam, Annamalai Nagar.
4. K. Vijaya Ramesh. (2004). Environmental Microbiology. 1st Edition. MJP Publishers.
5. Subba Rao. N.S. (2017). Soil Microbiology. 4th Edition. Oxford and IBH Publishing Pvt. Ltd.

Reference Books

1. Dirk, J. Elsas, V., Trevors, J.T., Wellington, E.M.H. (1997). Modern Soil Microbiology, Marcel Dekker INC, New York, Hong Kong.
2. Ec Eldowney S, Hardman D.J., Waite D.J., Waite S. (1993). Pollution: Ecology and Biotreatment – Longman Scientific Technical.
3. Mitchel, R. (1992). Environmental Microbiology. Wiley – John Wiley and Sons. Inc. Publications, New York.
4. Clescri, L.S., Greenberg, A.E. and Eaton, A.D. (1998). Standard Methods for Examination of Water and Wastewater, 20th Edition. American Public Health Association.

5. Atlas, R.M. and Bartha, R.(1992). Microbial Ecology: Fundamentals and Applications, 2nd Edition. The Benjamin / Cummings Publishing Co., Redwood City, CA.

Web Resources

1. <https://nptel.ac.in/courses/126105016>
2. <https://www.classcentral.com/course/swayam-plant-pathology-and-soil-health-14236>
3. <https://www.wasteonline.org.uk/resources/InformationSheets/WasteDisposal.htm>
4. https://plantpath.cornell.edu/labs/enelson/PDFs/Hill_et_al_2000.pdf
5. <https://onlinelibrary.wiley.com/doi/full/10.1111/j.1365-2389.2005.00781.x>