MMB - C104
ENVIRONMENTAL MICROBIOLOGY

L T Credit
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Learning objectives:

- To understand howmicroorganism adapt to different environment and their interaction with different habitat and also the spread of microorganisms from the environment.
- To know different techniques of detection of air , soil and aquatic
- To acquire knowledge of treating sewage and industrial water through different means.
- To understand how biological organism can be utilized for remediation of heavy metal as well as industrial pollutant.

Learning outcomes:

At the end of course student will be able to

- Isolate and identify pathogenic microorganism from air, soil and water habitats
- Characterize the waste water and also explain the method that can be utilized in waste water treatment.
- Describe the concept of bioremediation for the remediation of pollutants.

UNIT - 1

Aeromicrobiology : Adaption of microorganism to the air environment, Bioaerosol: Sources, survival and spread, Biological aerosol as a source of human diseases, Droplet nuclei, aerosol, assessment of air quality, brief account of air-borne microbes-bacteria, fungi, viruses, their diseases and preventive measures; phylloplane and phyllospheremicroflora. Detection of microbes in air by microscopic and culture methods.

(10 Lectures)

UNIT – II

Soil Microbiology: Soil-physical and chemical characteristics, soil as a habitat for microorganisms, microbial interactions in soil, microflora of various soil types, rhizosphere and rhizoplanemicroflora and its estimation, root exudates, its composition and effects on soil microorganisms; actinorrhiza; mycorrhizal fungi and its effect on plants; molecular markers for ecological study of soil microorganisms.

(13 Lectures)

UNIT – III

Aquatic Microbiology: Water ecosystems- types, fresh water, (pond, lakes), marine habitats (estuaries, deep sea, hydrothermal vents); potability of water as per norms of CPCB and APHA, microbial assessment for water quality, Water Quality Index (WQI), water purification, physical, chemical; microbiological characteristics of sewage.

(10 Lectures)

UNIT – IV

Waste Treatment – Types of wastes–, characterization of solid and liquid wastes, physical, chemical and biological (aerobic, anaerobic- primary, secondary, tertiary) treatment; solid waste treatment; fuel (methanol, methane), fertilizer (composting); liquid waste treatment- trickling filter, activated sludge, oxidation ponds.

(15 Lectures)

UNIT – V

Bioremediation: Interaction of microorganisms with contaminated soil and groundwater, syntrophism and co-metabolism, Bioremediation as technology, design of bioremediation in practice: in-situ bioremediation and ex-situ bioremediation, Bioaugmentation: principle of bioaugmentation, application of genetic engineering in bioremediation, advantages and disadvantages of bioremediation methods, Bioremediation of inorganic pollutants and organic compounds, degradationof hydrocarbons and xenobiotics.

(10 Lectures)

Suggested Reading

1. N.S. SubbhaRao, Soil Microbiology, Science Publisher, ISBN: 9781578080700
2. Dubey, R.C. *Advanced Biotechnology*. S. Chand & Co. P Ltd, New Delhi, p. 1161; ISBN: 81:219-4290-X.
3. P.D. Sharma, Microbiology, Rastogi Publication ISBN:978-8171339358.
4. Dubey R.C. and Maheshwari, D.K. *A Textbook of Microbiology*. 3rd ed., S. Chand & Co, Ram Nagar, New Delhi, p. 1034. ISBN 81-219-2620-3

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