

ENVIRONMENTAL BIOTECHNOLOGY

Module-I

Introduction to environmental biotechnology, Environmental monitoring bioreporter, biomarker. Bioprospecting, Biomicroelectronics and biosensor technology
Introduction to environmental pollutants: Water, Soil and Air: their sources and effects. Removal of Specific Pollutants: Sources of Heavy Metal Pollution, Microbial Systems for Heavy Metal Accumulation, Biosorption & detoxification mechanisms. Microbiology and biochemistry of waste water treatment: Biological Treatment of anaerobic and aerobic; methanogenesis, methanogenic, acetogenic, and fermentative bacteria- technical process and conditions; Use of Genetically Engineered Organisms. emerging biotechnological processes in waste - water treatment; Applications include treatment of municipal and industrial wastewaters,

Module-II

Biodegradation of xenobiotic compounds: Xenobiotic compounds : Aliphatic, Aromatics, Polyaromatic Hydrocarbons, Polycyclic aromatic compounds, Pesticides, Surfactants and microbial treatment of oil pollution. Biotransformations and biocatalysts: Basic organic reaction mechanism, Common prejudices against Enzymes. Advantages & Disadvantages of Biocatalysts, Isolated Enzymes versus whole cell systems. Mechanistic Aspects and Enzyme Sources. Biocatalytic Application, Catalytic Antibodies; Stoichiometry, kinetics, and thermodynamics of microbial processes for the transformation of environmental contaminants.

Module-III

Biooxidation & microbial leaching: Biooxidation – Direct and Indirect Mechanisms, Recovery of metals from solutions; Microbes in petroleum extraction; Microbial desulfurization of coal. Clean technologies: Composting Technology and Organic farming, biofertilizers, biopesticides, microbial polymer production and bio plastic technology. Biotechnology of fossil fuels: desulfurization of coal, oil shales, microbial enhanced oil recovery (MEOR). Biofuels: Biogas technology, biohydrogen, bioethanol production. Biotechnology of mineral processing. Ethical issues in environmental biotechnology and regulatory framework.

Text Books

1. Rittmann B and McCarty P, Environmental Biotechnology Principles and Applications Mc Graw Hill 2001
2. Evans, G.M., Furlong, J C., " Environmental Biotechnology- Theory and application", John Wiley & Sons, Ltd, USA. 2003
3. Environmental biotechnology, Scragg Alan, Oxford University Press, 2005
4. Environmental Microbiology, W.D. Grant & P.E. Long, Blakie, Glasgow and London.
5. Microbial Gene Technology, H. Polasa (ED.) South Asian Publishers, New Delhi.
6. Biotreatment Systems, Vol. 22, D. L. Wise (Ed.), CRC Press, INC.
7. Standard Methods for the Examination of Water and Waste Water (14 th Edition) , 1985. American Public health Association
8. Environmental Biotechnology by Bruce Rittmann and Perry McCarty 6. Biotransformations : K. Faber (1995), Springer- Verlag.