ENVIRONMENTAL MANAGEMENT
(OPEN ELECTIVE) Hours: 40

Course outcomes:

After successful completion of the course, students will be able to:

CO 1. Know about transfer of nutrients through biogeochemical cycles, toxicity induced by pollutants and their mobility in trophic levels.

CO 2. Acquire knowledge on microbial diversity, pollution indicator organisms, bioremediation, bioconversion, biomagnification etc.

CO 3. Understand *in-situ* and *ex-situ* bioremediation processes, industrial pollution and waste management

CO 4. Understand sustainable development

UNIT I (13 hrs)

Biogeochemical Cycles: Carbon, nitrogen, oxygen, phosphorous, sulphur, iron and calcium. Environmental pollution: Soil (ecotoxicology of pollutants; fate of insecticides, fungicides and pesticides in soil; physicochemical and microbiological analysis), water and air pollution monitoring (e.g. SO_2 and NO_x); Pollution indicator organisms (plants, animals and microbes) (e.g. algae, Chironomids, coliforms, *Salmonella, Shigella, Vibrio*, Hepatitis A).

UNIT II (13 hrs)

Microbial degradation of toxic chemicals (pesticides, detergents, plastics). Degradation of organic compounds (cellulose, lignin, hydrocarbons: aliphatic, aromatic, alicyclic hydrocarbons). Microbial deterioration of textiles, paper, leather, wood. Biomaterials, microbial mining (uranium, copper, gold, iron), microbial influenced corrosion and remedies, bioaccumulation, biomagnification, biogas production as non-conventional energy sources.

UNIT III (14hrs)

Principles of microbial bioremediation, *in situ* and *ex situ* bioremediation, microbiological treatment of solid wastes – composting, land farming, bioreactors. Biological treatment of liquid wastes – aerobic and anaerobic treatments sewage and effluent treatments. Hazardous wastes: microbial processing and disposal (radioactive wastes, sewage, pharmaceuticals, refinery and leather). Waste management and utilization (plantation crop wastes, aquatic weeds, kitchen/garden waste, poultry waste). GMOs, Environmental release and monitoring of GMOs, Ethical issues.

References

1) Ecology. Odum
2) Environmental biotechnology. Jogdand SN., Himalaya Pub. House., 2012
3) Environmental and biochemistry. Kudesia VP and Jetley UK., Pragathi Prakashan Pub., 1991
4) Microbial ecology: fundamental and applications. Atlas RA. and Bartha R., Benjamin/Cummings, 1997
5) Microbial biotechnology. Glazer AN., WH Freeman and Co., 1995
6) Sewage and Industrial Effluent Treatment: A practical guide. Arundel J., Blackwell Science Pub. 1995
7) Soil Microbiology. Subba Rao N.S., Oxford & IBH Pub.
8) Waste Water Engineering. Metcalf & Eddy Inc. McGraw-Hill International