MANGALORE UNIVERSITY

DEPARTMENT OF BIOSCIENCES

MSc BIOTECHNOLOGY

BTH 552 ENVIRONMENTAL BIOTECHNOLOGY (HARD CORE)

Hours: 52

Course outcome

The students will be able to:

- Learn about transfer of nutrients through biogeochemical cycles
- Understand the toxicity induced by pollutants and their mobility in trophic levels.
- Get knowledge on microbial diversity, pollution indicator organisms, bioremediation, bioconversion, biomagnification etc.
- Understand *insitu* and *exsitu* bioremediation processes, industrial pollution and waste management

UNIT I (13 hrs)

Biogeochemical Cycles: Carbon, nitrogen, oxygen, phosphorous, sulphur, iron and calcium; cycling of toxic metals (Cd, Hg, Pb). 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 (13 hrs)

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. Pollution control measures, international and national pollution regulatory acts; Permissible limits and indices for pollutants; 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).

UNIT IV (13 hrs)

Natural products (wood, rubber, coir and gums). Food processing (dairy, bakery, beverages, vegetable and cashew). Coastal regulatory zone (CRZ) and environmental issues of aquaculture; biofouling (microfouling and macrofouling); biofilms; biomolecules from the sea; scope of marine biotechnology. 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. KudesiaVP. AndJetley UK., PragathiPrakashan 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