



# 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<sub>2</sub> and NO<sub>x</sub>); 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

