GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Bio-Technology

Subject Name: **Environmental Biotechnology**
Subject Code: **160403**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	2	5	70	30	50

UNIT I **Introduction**

Sr. No	Course Content	Total Hrs.
1.	Bacterial Metabolism in Wastewater Treatment Systems, Industrial Wastewater Sources and Treatment Strategies, Activated Sludge Process, Basics of Modeling of Aerobic Wastewater Treatment Processes, overview of High-rate Anaerobic Wastewater Treatment, overview of Biogas Reactors, Bioreactors for environmental cleanup (aerobs and effluent)	15

UNIT II **Biotechnology and waste**

Sr. No	Course Content	Total Hrs.
1.	Composting of Organic Waste, Anaerobic Fermentation of Wet and Semidry Garbage Waste Fractions, Process Engineering of biological waste gas Purification, Commercial Applications of biological waste gas Purification, Perspectives of waste water, waste, off-gas and soil treatment	6

UNIT III **Pollution Control**

Sr. No	Course Content	Total Hrs.
1.	Cleaner Technologies (Fermentation Technology, Paper Industry, Plastic Industry),ISO 14000 and EMS (Environment Management System),Reducing Environment Impact of Industrial Effluents(Treatment of distillery effluent, Reducing heavy metal's pollution caused by industrial effluents, Biodegradation of pollutants, Toxic site reclamation)	6

UNIT IV **Bioremediation**

Sr. No	Course Content	Total Hrs.
a.	Bioremediation using naturally occurring microorganism,	12
b.	Removal of spilled oil and grease deposits (Use of oleophilic fertilizers, Use of a mixture of bacterial strains,Use of genetically engineered microbes)	
c.	Reducing environment Impact of agricultural practices (Weed control and herbicides, Pest control and biopesticides, Eco-friendly strategy to check soil borne diseases: soil solarization, Biofertilizers)	
d.	Biosensor to detect environmental pollutants (In situ bioremediation of both soil and ground water contamination, Bioremediation of contaminated soil only, Bioremediation of contaminated surface waters (pits, ponds and lagoons) only, Treatment of toxic wastes before they reach environment, Conservation of soil city wastes,SPCI's strategy on biotreatment	
e.	Bioremediation using Genetically Engineered Microbes (GEM) (GEM for detecting PAHs in the soil,GEM for treating oil spills,GEM for sequestering of heavy metals)	
f.	Phytoremediation (Bioavailability of metals, Plant biology of heavy metal accumulation, Naturally occurring plants for Phytoremediation, Transgenic plants for Phytoremediation, Bioremediation Market)	

UNIT V **Environment and Energy**

Sr. No	Course Content	Total HRs.
a.	**Renewable sources of Energy** Biomass production and its utilization for energy(Waste materials for energy,Biogas production,Large scale growing of energy crops,Cellulose as a source of energy), Energy and Fuel using microorganism(Hydrogen production,Hydrocarbon production).Conservation of Energy	9
b.	**Restoration of Degraded Lands:** Reforestation through micro propagation, Casuarina for Tropical reforestation on adverse sites, Development of stress tolerant plants, Use of Mycorrhizae in reforestation, Use of microbes for improving soil fertility(Nitrogen fixing bacteria for nodulation in legumes, Nitrogen fixing bacteria for nodulation in non legumes, Nitrogen fixing actinomycetes: Frankia for nodulation in non legumes),Restoration of Soils contaminated with heavy metalsLand fill Systems, Sanitary Land filling of solid wastes, and longterm problems with Leachate, Sanitary Landfills : Long-term stability and Environmental Implications	

Practical:

1. Study of Sampling Technique and Sample Preservation.
2. Collection of Grab And Composite Sample
3. A) To Estimate Total Hardness of Water
   B) To Estimate Calcium Hardenss of Water
4. To Estimate The Total Solids (Ts), Total Dissolved Solids (TDS) And Suspended Solids (SS) In The Given Water Sample.
5. To Estimate Dissolved Oxygen Content Of Wastewater.(DO)
6. To Estimate Chemical Oxygen Demand of The Given Sample(COD)
7. To Estimate Biological Oxygen Demand (BOD)
8. To Measure The Concentration of Chloride In The Given Sample
9. To Estimate The Amount of Ammonical Nitrogen In The Given Sample
10. To Estimate The Amount of Nitrate Nitrogen
11. To Estimae The Amount of Nitrite Nitrogen
12. To Estimate The Amount of Phosphorus Phosphate In The Given Sample
13. To Measure The Sulfite (SO_3^{-2}) Content In The Given Sample By Iodometric Titration.
14. To Find Out Acidity of The Given Sample.
15. To Find Out The Most Probable Number of Coliforms In The Given Water Sample
16. Practical on soil Bioremediations
17. Visit to waste water treatment plant

Text Books:

UNIT 1

1. Environment Biotech ,Edited by : Hans-Jonchim Jorbening and Joseph Winter, Wiley-VCH Verlag GmbH & Co.

UNIT IV

2. A Textbook of Biotechnology, R.C.Dubey, S.Chand Co ltd.

UNIT III and V

3. Biotechnology and Genomics,P.K.Gupta,Rastogi Publications

UNIT II

4. Environmental Biotechnology-Theory and Applications, Gareth M.Evans and Judith Furlong,WILEY

Reference Book:

1. Environmental Biotechnology, Bimal Bhattacharya and Rintu Banerjee, Oxford University Press