

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI
INSTRUCTION DIVISION
Course Handout (Part II)

02.08.2016

In addition to part-I (General Handout for all courses appended to the timetable) this portion gives further specific details regarding the course.

Course No. : BIO G525
Course Title : ENVIRONMENTAL BIOTECHNOLOGY AND WASTE
MANAGEMENT

Instructor-incharge : B.VANI

Instructor : Prof. S.K. VERMA

Course Description :

Application of biotechnology to the management of environmental problems. Biotechnology for enhanced plant and animal production through biological insecticides, herbicides resistance, mineral cycling, conservation of genetic resources and biological nitrogen fixation. Use of biotechnological processes for pollution control, bioremediation of toxicants and treatment of domestic and industrial wastes. Ethical issues related with the release of genetically modified organism.

Scope and Objectives:

The major objective of this course is to impart knowledge on application of biotechnological processes for betterment of environment. This course is designed to make the student understand the various biological phenomena, which can be exploited to save environment from eventual deterioration.

Text Book: Environmental Biotechnology by Alan Scragg, Oxford University Press, UK.
2005

Reference Book

RB-1 : Biotechnology, a comprehensive treatise, ed by Rehm H J and Reed G, VCH Verlag,
Germany, 1999

Course Plan

Lecture No.	Learning Objectives	Topics to be covered	Reference Chap./Sec. (Book)
1	Introduction to environmental biotechnology	Basic concept of environment and its components. Biotechnology for environment; definitions and facts	Chap. 1, TB
2-3	Environmental pollution	Sources of various pollutions and their environmental impact.	Chap.1, TB
4-6	Environmental monitoring	Methods for the measurement of pollution. Air, water and soil sampling; Analyses of samples; physical, chemical and biological methods. Nucleic acid based techniques for analyses of diversity, structure and dynamics of microbial community in wastewater treatment, Concept of biomarkers	Chap.3, TB
7-9	Biotechnology of sewage	Basics of sewage treatment processes.	Chap.4 TB

	treatment	Function of various treatment systems. Microbiology of sewage treatment	
10-11	Bioremediation of inorganic pollutants (nitrate and phosphate)	Nitrification and denitrification–microbial fundamentals and application. Biological phosphate removal	Chap. 5 TB RB 1
12-14	Bioremediation of inorganic pollutants (heavy metals and radionuclides)	Microbial interaction with metallic elements. Metal Toxicity. Molecular mechanism of metal resistance. Biosorption and biotransformation of metals and radionuclides. Recent developments in metal bioremediation.	Chap.5, TB & RB 1, Class notes
15-16	Bioremediation of organic pollutants	Aerobic and anaerobic degradation of organic pollutants. Principles, biochemical pathways and genetic regulation. Degradation of aliphatic, aromatic, polyaromatic and chlorinated compounds. Recent developments in waste treatment.	Chap.5 TB RB 1, Class Notes
17-18	Phytoremediation	Use of plants for removal of organic and metallic pollutants	Chap. 5 TB RB 1, Class notes
19-20	Development of clean technology (minimization of waste generation)	Fundamentals of clean technology. Integrated pest management and bio-control of plant diseases. Microbial polymer production and bio-plastic technology	Chap. 6 TB
21-22	Nano-biotechnology and Environment	Pros and cons of nano-biotechnology	Class notes
23-25	Bioresource technology development	Biotechnology for energy production; basic concept. Biological energy sources and bio-fuels. Biotechnology for enhanced oil recovery	Chap. 7 TB
26-29	Bio-mining of metals and radionuclides	Concepts of bioleaching, microbial aspects, regulatory factors and process application	Chap 8 TB Class Notes
30-32	Disposal and treatment of medical waste	Sources, health hazards, treatment and disposal technologies	Lecture Notes
33-36	Biological nitrogen fixation	Importance, mechanism, genetic regulation, organism involved, Application of BNF in agriculture	Lecture Notes
36-38	Biosensor technology	Principle, types and applications	Chap.3 TB, RB 1, Class Notes
39-40	Ethical issues in environmental biotechnology	Release of genetically modified organisms	Chap. 9 TB
41-42	Present state of India 's environment	Pressing environmental issues in India, Government's policies and programs	Class Notes

Examination Scheme :

EC No.	Evaluation component	Duration	Date, time & venue	Weightage (%)	Nature of Component
1	Mid Sem	90 min	<TEST_1>	25	CB
2	Assignment	Take Home		10	
3	Quiz (several)	20 Min		15	CB
4	Seminar	--		15	
5	Comprehensive Examination	3.0 hrs	<TEST_C>	35	CB + OB

Chamber Consultation Hour : To be announced

Notices : Notices will be displayed on Biological Science Notice Board

**Instructor-in-charge
BIO G525**