

ENVIRONMENTAL BIOTECHNOLOGY

Semester	Subject Code	Category	Lecture		Theory		P	C
VI	21CBT6E	Elective -IV	4 hrs per week	60	4 hrs per week	60	0	3

COURSE OBJECTIVE: In this course, students will

- Understand the fundamental concepts and underlying principles in the Environmental biotechnology and explain various strategies of bioremediation and methods of producing biofuels.

COURSE OUTCOMES: Up on successful completion of course, students will be able to

CO NUMBER	CO STATEMENT	KNOWLEDGE LEVEL (K1-K4)
CO1.	Recall what is environment and identify environmental problems	K1
CO2.	Illustrate and classify various waste water treatment processes	K2
CO3.	Differentiate various solid waste treatment methods	K4
CO4.	Explain different strategies of bioremediation	K3
CO5.	Summarize different methods of producing biofuels and bioplastics	K2

Knowledge level: K1- Remember; K2- Understand; K3- Apply; K4- analyze

Mapping with Programme Outcomes

COS	PO1	PO2	PO3	PO4	PO5	PO6
CO1	S	S	M	M	M	M
CO2	S	S	M	M	M	M
CO3	M	M	M	M	M	M
CO4	M	M	S	S	M	S
CO5	M	S	M	M	S	M

S-strong; M- medium; L-low

UNIT I INTRODUCTION TO ENVIRONMENTAL ISSUES**10 Hours**

Introduction to Environment, Environmental components-, Environmental pollution, bioindicators of pollution, and control measures, ozone depletion, acid rain, greenhouse gases and their effects.

UNIT II WASTE WATER TREATMENT**10 Hours**

Municipal waste water treatment – Physical, chemical and Biological processes-aerobic Activated Sludge Process, Trickling filters, Aerated Lagoons, Oxidation Pond and anaerobic- contact reactor and the up flow reactor, Conventional digester, Packed anaerobic filter, upflow anaerobic sludge blanket, Anaerobic membrane reactor, Waste water treatment in tanneries.

UNIT III SOLID WASTE MANAGEMENT**15 Hours**

Types of solid wastes, thermal treatment- incineration, *Gasification and Pyrolysis*, open burning, dumps and landfills- sanitary landfill, controlled dumps, bioreactors, landfill, composting, vermicomposting, sludge treatment- aerobic and anaerobic.

UNIT IV BIOREMEDIATION**10 Hours**

Bioremediation- insitu, exsitu, slurry phase- advantages and disadvantages, phytoremediation, Biostimulation, Bioaugmentation, Biosparging, Bioventing, Biodegradation of hydrocarbons, xenobiotics, Genetically Engineered Microorganisms used in biodegradation of oil spills advantages and disadvantages

UNIT V BIOENERGY AND APPLICATIONS OF FRESH & MARINE WATER ENVIRONMENT**15 Hours**

Electricity from biomass, Biofuels- biogas, syngas, biodiesel, green diesel, bioethanol, biobutanol and biohydrogen, bioplastics, sources, types, uses.

Applications of fresh & marine water environment: Introduction aquatic resources disease in aquaculture, diagnostics of disease. Bioactive compounds from marine sources (Bacteria and Algae)

Distribution of Marks: Theory 80% and Problems 20%

TEACHING METHODOLOGY

- Class room teaching
- Assignments
- Discussions
- Home work
- PPT presentations
- Seminars
- Models/Charts

TEXT BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	Michael DP, Philip LB, Jeffrey CE	Hazardous Waste Management	Waveland Press Inc.	2010
2.	Chatterjee AK	Introduction to Environmental Biotechnology	PHI, New Delhi, India	2011
3.	Jogdand SN	Environmental Biotechnology: Industrial Pollution Management	Himalaya Publishing, India.	2005
4.	Leslie Jr CP, Glen TD, Nancy GL, Carlos DM	Biological Wastewater Treatment	CRC Press, Taylor & Francis Group, USA.	2011
5	Agarwal .S.K.	Advanced Environmental Biotechnology	APH publishing	2005

REFERENCE BOOKS:

S.NO.	AUTHORS	TITLE	PUBLISHERS	YEAR OF PUBLICATION
1.	P.NicholasCheremisinoff	Biotechnology for Wastewater Treatment	Prentice Hall Of India	2001
2.	P.K. Mohapatra	Text book of environmental biotechnology	I.K. International Pvt. Ltd.	2010
3.	U.Satyanarayana	Biotechnology	Books & allied (p) ltd.-kolkata	2008
4.	Murray Moo Young W.A and Chakrabarty A.M	Environmental Biotechnology	Springer Science & Business Media	1996
5.	Daniel A. Vallero	Environmental Biotechnology	Academic Press	2010

WEB SOURCES

1. https://www.researchgate.net/publication/26789987_Biodegradation_of_aromatic_compounds_Current_status_and_opportunities_for_biomolecular_approaches
2. <https://www.european-bioplastics.org/bioplastics/>
3. <https://www.energy.gov/eere/bioenergy/biofuels-basics>
4. http://www.esru.strath.ac.uk/EandE/Web_sites/02-03/biofuels/what_bioethanol.htm
5. <http://livinggreen.ifas.ufl.edu/waste/composting.html>

Syllabus Designer:

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