



Department of Biotechnology	LP:BY18009
<del>B.E/B.Tech/M.E/M.Tech</del> : Biotechnology Regulation:2018	Rev. No: 00
PG Specialisation : Not Applicable	Date: 13-07-2021
Sub. Code / Sub. Name : BY18009 / Environmental Biotechnology	
Unit : I	

#### Unit Syllabus: 1

Microbial flora of soil, Ecological adaptations, Interactions among soil microorganisms, biogeochemical role of soil microorganisms. Biodegradation, Microbiology of degradation and its mechanism, Bioaugmentation, Biosorption, Bioremediation - Types of Bioremediations, Bioreactors for Bioremediation, Metabolic pathways for Biodegradation for specific organic pollutants.

Objective: To learn about the role of microorganisms in the bioremediation

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Microbial flora of soil, Ecological adaptations, Interactions among soil microorganisms, biogeochemical role of soil microorganisms.	RB10-Ch1 (1-121)	Online (GCR)
2.	Biodegradation, Microbiology of degradation and its mechanism,	RB15-Ch7 Pg. 201-221	Online (GCR)
3.	Bioaugmentation	5-Ch5 (148,192-193,198,407)	Online (GCR)
4.	Biosorption, Bioremediation	5-Ch5 (216-218)	Online (GCR)
5.	Bioremediation - Types of Bio-remediation	5-Ch5 (173-229)	Online (GCR)
6.	Bioreactors for Bioremediation	5-Ch5 (201-203)	Online (GCR)
7.	Metabolic pathways for Biodegradation for specific organic pollutants.	5-Ch5 (224-229)	Online (GCR)
<b>Content beyond syllabus covered (if any):</b>			
Microorganisms in xenobiotic /pop removal			

\* Session duration: 50 minutes



Sub. Code / Sub. Name:BY18009 / Environmental Biotechnology

Unit : II

Unit Syllabus : 2

Pollution - Sources of pollutants for Air, Water (ground water, marine), Noise, Land and its characteristics - Pollution control and management - Environmental monitoring & sampling, Physical, chemical and biological methods and analysis - Air pollution - control and treatment strategies. Modes of Biological treatment methods for wastewater - aerobic digestion, anaerobic digestion, Anoxic digestion, the activated sludge process, Design and modeling of activated sludge processes, Aerobic digestion, Design of a trickling biological filter, Design of anaerobic digester.

Objective: To understand about different pollution types and pollution control strategies

	Topics to be covered	Ref	Teaching Aids
8.	Pollution - Sources of pollutants for Air,	Internet Source	Online/GC R/PPT
9.	Pollution - Sources of pollutants for Water (ground water, marine), Noise, Land and its characteristics	Internet Source	Online/GC R/PPT
10.	Pollution control and management - Environmental monitoring	RB13-Ch5 Pg.65-88	Online/GC R/PPT
11.	sampling, Physical, chemical and biological methods and analysis	5-Ch3 Pg.83-88	Online/GC R/PPT
12.	Air pollution - control and treatment strategies	RB13-Ch5 Pg.65-88	Online/GC R/PPT
13.	Modes of Biological treatment methods for wastewater - aerobic digestion	5-Ch4 Pg.116-139	Online/GC R/PPT
14.	anaerobic digestion	4-Ch5 (165-172)	Online/GC R/PPT
15.	Anoxic digestion	Internet Source	Online/GC R/PPT
16.	The activated sludge process, Design and modeling of activated sludge processes	5-Ch4 (124-125,135-	Online/GC R/PPT
17.	Design of a trickling biological filter	4-Ch5 (121-124)	Online/GC R/PPT
18.	Design of anaerobic digester	2-Ch10 Pg.983-	Online/GC R/PPT

**Content beyond syllabus covered (if any):**

Design of Microbial fuel cells in the Aerobic digester for the treatment of industrial effluents

\* Session duration: 50 mins



Sub. Code / Sub. Name:BY18009 / Environmental Biotechnology

Unit : III

Unit Syllabus: 3

Industrial waste management - Dairy, Paper & Pulp, Textile, leather, hospital and pharmaceutical industrial waste management, e-waste - radioactive and nuclear power waste management - Solid waste management.

Objective: To understand about different sources of waste management.

Session No *	Topics to be covered	Ref	Teaching Aids
19.	Solid Waste Management	RB15-Ch8 Pg. 264-	Online PPT/BB
20.	Industrial waste management - Dairy	RB15-Ch5 Pg. 159-	Online PPT/BB
21.	Industrial waste management - Paper	Internet Source	Online PPT/BB
22.	Industrial waste management - Pulp	RB15-Ch5 Pg. 161-	Online PPT/BB
23.	Industrial waste management - Textile	Internet Source	Online PPT/BB
24.	Industrial waste management - Leather	RB15-Ch5 Pg. 158-	Online PPT/BB
25.	Industrial waste management - Hospital	RB15-Ch8 Pg. 313-	Online PPT/BB
26.	Industrial waste management - Pharmaceutical industry	Internet Source	Online PPT/BB
27.	e-waste - radioactive and nuclear power waste management	Internet Source	Online PPT/BB

**Content beyond syllabus covered (if any):**

Industrial waste management using Biotechnological principles- Boon justify

\* Session duration: 50 minutes



Sub. Code / Sub. Name:BY18009 / Environmental Biotechnology

Unit : IV

Unit Syllabus: 4

Molecular biology tools for Environmental management, rDNA technology in waste treatment, Genetically modified organisms in Waste management, Genetic Sensors, Metagenomics, Bioprospecting, Nanoscience in Environmental management, Phytoremediation for heavy metal pollution, Biosensors development to monitor pollution.

Objective: To understand the application of different molecular biology tools for environmental biotechnology.

Session No *	Topics to be covered	Ref	Teaching Aids
28.	Molecular biology tools for Environmental management	Internet Source	PPT/BB
29.	rDNA technology in waste treatment,	Internet Source	PPT/BB
30.	Genetically modified organisms in Waste management,	Internet Source	PPT/BB
31.	Genetic Sensors	5-Ch3 Pg. 103-	PPT/BB
32.	Metagenomics	Internet Source	PPT/BB
33.	Bioprospecting	Internet Source	PPT/BB
34.	Nanoscience in Environmental management	Internet Source	PPT/BB
35.	Phytoremediation for heavy metal pollution	5-Ch5 Pg. 204-	PPT/BB
36.	Biosensors development to monitor pollution.	5-Ch3 Pg. 102-	PPT/BB

**Content beyond syllabus covered (if any):**

Nano -Smart sensors for the detection and monitoring of pollutants

\* Session duration: 50 mins



Sub. Code / Sub. Name:BY18009 / Environmental Biotechnology

Unit : V

Unit Syllabus: 5

Alternate Source of Energy, Biomass as a source of energy, Biocomposting, Vermiculture, Biofertilizers, Organic farming, Biofuels, Biomineralization, Bioethanol and Biohydrogen, Bio-electricity through microbial fuel cell, energy management and safety.

Objective: To understand about alternate source of energy.

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Alternate Source of Energy	5-Ch7 Pg. 292-	PPT/BB
38.	Biomass as a source of energy	5-Ch7 Pg. 293-	PPT/BB
39.	Bio-composting	RB15-Ch8 Pg. 283-	PPT/BB
40.	Vermiculture	RB15-Ch8 Pg. 294-	PPT/BB
41.	Biofertilizers	RB14-Ch1 Pg. 156-	PPT/BB
42.	Organic farming	Internet Source	PPT/BB
43.	Biofuels – Bioethanol and Biohydrogen	5-Ch7 Pg.307- 316,	PPT/BB
44.	Biomineralization	Internet Source	PPT/BB
45.	Bio-electricity through microbial fuel cell, energy management and safety	Internet Source	PPT/BB

**Content beyond syllabus covered (if any):**

Review on Biomass for the production of compounds from wastes- green energy possibilities





## SRI VENKATESWARA COLLEGE OF ENGINEERING

## COURSE DELIVERY PLAN - THEORY

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**TEXT BOOKS:**

1. Chakrabarty K.D., Omen G.S., Biotechnology And Biodegradation, Advances In Applied Biotechnology Series, Vol.1, Gulf Publications Co., 1989.
2. Metcalf and Eddy, Waste water Engineering Treatment, Disposal and Reuse. 3rd Ed., Mc Graw Hill, 1991.
3. Forster, C. F and Waste, D.A. J. Environmental Biotechnology, Ellis Horwood Halsted Press. 1987.
4. Bailey, J. E. and Ollis, D. F., Biochemical Engineering Fundamentals, 2nd Ed., MacGraw Hill, 1986.
5. Alan Scragg, Environmental Biotechnology, Longman, 1999.
6. Bruce E. Rittmann, Eric Seagren, Brian A.Wrenn and Albert J. Valocchi, Chittaranjan Ray, Lutgarde Raskin, In-situ Bioremediation, 2nd Ed., Naves Publication, 1991.
7. Old R.W., and Primrose, S.B., Principles of Gene Manipulation, 3rd Ed., Blackwell Science Publication, 1985.

**REFERENCES:**

1. Stanier R.Y., Ingraham J.L., Wheelis M.L., Painter R.R., General Microbiology, 5th Ed., Macmillan Publications, 1989.
2. G. Mattock E.D., New Processes of Waste water treatment and recovery, Ellis Horwood, 1978.
3. Jogdand, Environmental Biotechnology, 1st Ed., S.N. Himalaya Publishing House, 1995.
4. Young Murray Moo, Comprehensive Biotechnology (Vol. 1-4), Elsevier Sciences, 1985.
5. Standard Method for Examination of Water & Waste water, 14th Ed., American Public Health Association, 1985.
6. Lee, C.C. and Shun dar Lin, Handbook of Environmental Engineering Calculations, McGraw Hill, 1999.
7. Hendricks D, Water Treatment Unit Processes – Physical and Chemical, 1st Ed., CRC Press, 2006.
8. Martin A.M., Biological Degradation of Wastes, Elsevier Appl. Science, 1991.
9. Saylor, Gray S. Robert Fox and James W. Blackburn, Environmental Biotechnology for Waste Treatment, Plenum Press, 1991.
10. Bruce E. Rittmann, Perry L. McCarty - Environmental Biotechnology\_ Principles and Applications-McGraw-Hill (2001)

	Prepared by	Approved by
Signature		
Name	Dr G Karthigadevi	Dr. V. Sumitha
Designation	Assistant Professor	HOD - Incharge
Date	13-07-2021	13/7/21
Remarks *: If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD.		