

Branch Name:	Environment Engineering
Program Code:	ET212
Subject Title:	Sustainable Waste Management
Subject Code:	2ET2120206T
Pre-requisite Subject:	Waste Water Engineering

Course Objective:

- Student should acquire knowledge of sustainability and to restore the environment for pollution abatement.
- To evaluate the existing water treatment system and adopt harvesting methods for water conservation.
- To study reuse, recycle and reclamation of wastewater.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	3	1	-	4	24	60	16	40	-	-	-	-	100

Subject Contents				
Sr. No	Topic	Total Hours	Weightage (%)	
1	Introduction: Principles of Sustainable Development: History and emergence of the concept of Sustainable Development, Global scenario, Definitions, Environmental issues and crisis, Concept of sustainability in waste management, Environment green technologies	6	10	
2	Water reuse and reclamation, Water reclamation technologies – process flow diagrams; Public health and environmental issues in water reuse, ground water recharge with reclaimed water – ground water recharge Techniques; Risk assessment for water reuse, Industrial water reuse, Rainwater and Roof water harvesting, economic sanitation methods	14	35	
3	Solid waste treatments: Landfills - Classification - Types and methods. Biological process – Composting - production of biofertilizers and energy. Thermal process – Incineration, gasification, wet oxidation, pyrolysis, pelletization and energy production. Waste management through Reduce, Recycle and Reuse. Kitchen waste management. Current Issues in Solid Waste Management, waste to energy concept and its implementation, Composting: A Sustainable Solution for Bio-waste	14	35	
4	Cleaner Production: definition of CP and terminology, the need of CP and its benefits, Cleaner Production (CP) In Achieving Sustainability – Prevention Versus Control Of Industrial Pollution – Environmental Policies And Legislations – Regulation To Encourage Pollution Prevention And Cleaner Production	8	20	

Reference Books:

1. M. H. Fulekar, Bhawana Pathak, R. K. Kale, Environment and Sustainable Development, Springer Nature; 2014 ed. edition (4 October 2013)
2. Urvashi Dhamija, Sustainable Solid Waste Management: Issues Policies and Structures, Academic

Foundation (2006)

3. Cites R.W., Middlebrooks E.J., Reed S.C., Natural wastewater Treatment Systems, CRC Taylor and Francis, 2006.
4. Sanjay K. Sharma (Editor), Rashmi Sanghi (Editor), Wastewater Reuse and Management, Springer; 2013 edition (14 December 2014)
5. Martin, A.M., Biological Degradation of Wastes, Elsevier Appl. Science, New York, 1991.

List of Experiments:

Term work will comprise of assignment and case studies based on natural wastewater system, water conservation systems, smart building, waste to energy, biowastes, Bioremediation etc.

List of Open Source Software/learning website:

1. <https://nptel.ac.in/>

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO-1	To examine the technical points that are required to set up an integrated solid waste management system.	L-4
CLO-2	To evaluate the existing water treatment system and adopt harvesting methods for water conservation.	L-4
CLO-3	To study reuse, recycle and reclamation of wastewater.	L-2
CLO-4	To analyse the existing EMS and check the feasibility of cleaner production in industries at macro level for overall abatement of pollution.	L-4

L1- Remember, L2- Understand, L3- Apply, L4- Analyze, L5- Evaluate, L6- Create

Mapping of CLOs with POs & PSOs

	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO1	M	M	M			M	M		M					M	M
CLO2	M	M	M			M	M	M	M					M	M
CLO3	M	M	M	M		M	M	M	M					M	M
CLO4	M	M	M	M		M	M	M	M					M	M

H: High, M: Medium, L: Low