

Course Code	18CEO306T	Course Name	MUNICIPAL SOLID WASTE MANAGEMENT	Course Category	O	Open Elective Course	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	Civil Engineering	Data Book / Codes/Standards			

Course Learning Rationale (CLR):		The purpose of learning this course is to:			Learning			Program Learning Outcomes (PLO)																
CLR-1 :	Identify the sources, types and Charecteristics of solid waste	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15		
CLR-2 :	Sample and characterization of solid waste																							
CLR-3 :	Source reduction and recycling of solid waste																							
CLR-4 :	Waste Collection, Storage and Transport of solid waste																							
CLR-5 :	solid waste processing techniques based on their charecteristics																							
CLR-6 :	Solid waste disposal options and treatment																							
Course Learning Outcomes (CLO):		At the end of this course, learners will be able to:																						
CLO-1 :	Understand the various sources of solid waste	2	85	80																				
CLO-2 :	Able to identify the options for Reduction, reuse and recycling of waste	3	85	75																				
CLO-3 :	Knowl of collection and transport of solid waste	2	80	75																				
CLO-4 :	Able to know about various waste processing technologies	3	85	75																				
CLO-5 :	Understand the waste disposal methods and management	2	85	80																				
CLO-6 :	Know of basic solid waste legislations	2	80	75																				

Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning	PSO - 1	PSO - 2	PSO - 3
H	H	M	L	-	L	H	-	-	-	-	L	H	-	-
H	H	H	H	-	-	H	-	-	-	-	-	H	-	-
H	H	M	M	-	L	H	-	-	-	-	L	H	-	-
H	H	H	H	-	-	H	-	-	-	-	-	H	-	-
H	H	M	M	L	L	M	-	-	-	-	L	H	-	-
H	H	M	-	-	L	M	M	-	-	-	-	H	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	Introduction and Objective of Solid waste management	Waste Generation and source reduction	Waste Collection, Storage and Transport	Waste Processing Techniques	Waste Disposal
	SLO-2	Sources of solid wastes	Waste Stream Assessment (WSA)	Methods of solid wastes collection	Purpose of Processing	Key Issues in Waste Disposal
S-2	SLO-1	Classification of Solid Wastes-Sources & Types based	Rationale for analysis Field investigation	Analysis of collection system	Mechanical Volume and Size Reduction	Disposal Options and Selection Criteria
	SLO-2	Charectistics of waste- Physical, Chemical, Biological.	Onsite seggregation and resoursrce recovery	Analysis of collection system	Volume reduction or compaction	Landfill and its essential components
S-3	SLO-1	Charectistics of waste- Physical, Chemical, Biological.	Waste Generation and Composition	Collection Components	Size reduction or shredding	Types and methods of Landfill
	SLO-2	Charectistics of waste- Problem solving	Waste Generation and Composition	Storage: Containers / Collection Vehicles	Component Separation	Liner and its types
S-4	SLO-1	Salient features of Indian Legislations on management and handling of municipal solid wastes	Factors causing variation	Storage: Containers/Collection Vehicles	Air separation	Materials used for liners
	SLO-2	Public health effect - Environmental effect	Materials used for onsite storage containers	Collection crew safety and monitoring	Magnetic separation	Daily cover and their objectives, materials used

Duration (hour)	9	9	9	9	9
S-5	SLO-1	methods of sampling and characterization	Source Reduction: Basics	Tutorial5: Identify the suitable collection system for urban areas	Screening
	SLO-2	methods of sampling and characterization	Purpose and Implementation	Collection Operation	Other separation techniques
S-6	SLO-1	Tutorial 1: Identify the effects of solid waste.	Monitoring and Evaluation	Movement of collection crew	Composting and their factors
	SLO-2	Tutorial 2: Case Study: Status of Waste Generation in Bangalore	Storage and collection of recyclables	Collection vehicle routing	Benefits, Processes, types, Technologies
S-7	SLO-1	Public awareness and practices in waste management	Processing equipments for recycling	Transfer station and their goals	Biogasification-Anaerobic processing
	SLO-2	Factors affecting SWM system	Material recovery facilities (MRF's)	Types of Transfer station	Composting and Biogasification: Environmental Effects
S-8	SLO-1	Progress of MSW Management in INDIA	Significance of Recycling	Capacity and Viability	Incineration , Pyrolysis and Energy recovery
	SLO-2	Progress of MSW Management in INDIA	Advantages and disadvantages in resource recovery	Waste Collection System Design	Drying and Dewatering
S-9	SLO-1	Solid waste Management System	Tutorial 3: Source Reduction and Recycling in Bangalore:	Record Keeping, Control, Inventory and Monitoring	Drying and Dewatering
	SLO-2	Solid waste Management System	Tutorial 4: Problems solving in recycling	Implementing Collection and Transfer System	Tutorial 6: Identify suitable method of treatment for various types of solid waste

Learning Resources	<ol style="list-style-type: none"> <li>George Tchobanoglous, Hilary Theisen, Samuel Vigil, <i>Integrated Solid Waste Management</i>, McGraw Hill, 1993</li> <li>Michael D. LaGrega, Philip L Buckingham, Jeffrey C. Evans and <i>Environmental Resources Management, Hazardous waste Management</i>, Mc-Graw Hill International edition, New York, 2001.</li> </ol>	<ol style="list-style-type: none"> <li>CPHEEO, "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi, 2000.</li> <li>NPTEL Course-Municipal solid waste mangment. <a href="https://nptel.ac.in/courses/120108005/">https://nptel.ac.in/courses/120108005/</a></li> <li>NPTEL Course-Solid and HAZardous waste mangment <a href="https://nptel.ac.in/courses/105106056/">https://nptel.ac.in/courses/105106056/</a></li> </ol>
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Learning Assessment											
	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)#			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	40 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Understand										
Level 2	Apply	40 %	-	40 %	-	40 %	-	40 %	-	40%	-
	Analyze										
Level 3	Evaluate	20 %	-	30 %	-	30 %	-	30 %	-	30%	-
	Create										
	Total	100 %		100 %		100 %		100 %		100 %	

# CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers		
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