GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Environmental Engineering

Course / Subject Code: ME01018031

Course / Subject Name : Municipal & Hazardous Solid Waste Managment

w.e.f. Academic Year:	2024-25
Semester:	1st Semester
Category of the Course:	PEC

Prerequisite:	Types of Solid waste, Need for Solid and Hazardous waste management
Rationale:	To develop concepts of Municipal & Hazardous Solid Waste management Practices

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Understand the difference in sources & characteristics of Municipal Solid Waste & Hazardous waste.
02	Explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste
03	Select the collection & transport requirements for solid & hazardous solid waste.
04	Suggest the technical aspects for Municipal & Hazardous solid waste treatment , disposal & landfilling operations.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
A	**Municipal Solid Waste Management**		
1	**Introduction to Solid Waste Management:**Material Flows, Need for ISWM, Legislative & Policy aspects of Solid Waste, Circular Economy & Solid Waste, Current Challenges , Municipal Solid Waste Characteristics and Quantities, Composition and Generation	4	8
2	**Collection and Transportation of Municipal Solid Waste:** Handling & Processing of Municipal Solid Waste: Storage, Conveying, Compacting, Shredding, Pulping, Roll Crushing, Granulating , Linear Programming Application in Collection, Transportation and Transfer of Wastes, Transfer Stations Need & Design requirements	4	10

3	**Processing and Separation of Municipal Solid Waste:**Material Separation: General Expressions, Picking, Screens, Float/Sink Separators, Magnets and Electromechanical Separators, Other Devices, Material Separation Systems, Material Recovery Facilities, Material Recycling	8	12
4	**Recovery of Resources, Conversion Products and Energy:** Heat Value of Refuse, Materials and Thermal Balances, Combustion Hardware Used in MSW, Undesirable Effects of Combustion Biochemical Processes: Methane Generation by Anaerobic Digestion, Composting, Other Biochemical Processes	8	15
5	**Sanitary Landfills:** Planning, Siting, Permitting, Landfill Processes, Landfill Design, Landfill Operations, Post-Closure Care and Use of Old Landfills, Landfill Mining. Application of GIS in Locating Landfill Site, Leachate Management	4	10
B	**Hazardous Waste Management**		
1	**Introduction:** Definition, Classification of Hazardous Solid Waste, Characteristics of Hazardous Waste , Legal Framework	2	**10**
2	**Hazardous Waste Management Concepts:** Waste Minimization, Waste Exchange, Zero Waste , Recycling	4	**10**
3	**Treatment Technologies:** Physico-Chemical Processes, Thermal Methods, Stabilization, Solidification	7	**15**
4	**Secured Landfill:** Site selection criteria, Landfill operation, Liner and Leachate collection system, Cover System, Water Controls, Closure & Post-closure	4	**10**
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
25	**30**	**30**	**10**	**5**	**0**

Where R:Remember; U:Understanding; A:Application, N:Analyze and E:Evaluate C:Create(as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

1. Integrated Solid Waste Management by George Tchobanoglous, Hilary Theisen and Samuel A, Vigil, McGraw- Hill, New York, 1993

2. Manual on Municipal Solid waste management by Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.

3. Hazardous Waste Management: By Michael D. LaGrega, Phillip L. Buckingham, Jefferey C. Evans, McGraw- Hill International Edition

4. Solid Waste Management, Van Nostrand Reinhold Co. 1975.

5. Solid Waste Management by C.L. ell, John Wiley, 1975.

6. Solid waste Management – A Vesilind

7. Hazardous Waste minimization By Harry M Freeman, McGraw Hill publications 8. Hazardous Waste Incineration By Brunners, Calvin R

(b) Open sources of software and website: MOEF&CC, NPTEL

Suggested Course Practical List:

1. Collection of Municipal solid waste sample.
2. Experiment on moisture content.
3. Collection of data with detail investigation on system of solid waste management and analysis of the system.
4. Exercise of collection route analysis.
5. Preparation of report of a city solid waste management system including positive points and lacunae in the present system.
6. Study of hazardous waste producing industry with details of points of generation in various forms.

List of Laboratory/Learning Resources Required:

1. Muffle Furnace
2. Hot Air Oven
3. Weight Balance
4. pH meter

Suggested Activities for Students: Site visit of

i) Sanitary landfill

ii) Secured landfill

****