

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: ENVIRONMENTAL MANAGEMENT (18)
SUBJECT NAME: MUNICIPAL & HAZARDOUS SOLID WASTE MANAGEMENT
SUBJECT CODE: 3711803
M.E. 1st SEMESTER

Type of course: Engineering & Technology

Prerequisite: Types of Solid waste, Need for Solid and Hazardous waste management

Rationale: To develop concepts of Municipal & Hazardous Solid Waste management Practices

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
Municipal Solid Waste Management			
1	<p>Introduction to Solid Waste Management: History, Material Flows, Need for ISWM, Legislative & Policy aspects of Solid Waste, Circular Economy & Solid Waste, Current Challenges</p> <p>Municipal Solid Waste Characteristics and Quantities, Composition and Generation; Collection Systems and Design; Linear Programming Application in Collection, Transportation and Transfer of Wastes, Transfer Stations Need & Design requirements</p> <p>Handling & Processing of Municipal Solid Waste: Storage, Conveying, Compacting, Shredding, Pulping, Roll Crushing, Granulating</p> <p>Material Separation: General Expressions, Picking, Screens, Float/Sink Separators, Magnets and Electromechanical Separators, Other Devices, Material Separation Systems, Material Recovery Facilities, Material Recycling</p>	12	27
2	<p>Combustion and Energy Recovery: Heat Value of Refuse, Materials and Thermal Balances, Combustion Hardware Used in MSW, Undesirable Effects of Combustion</p> <p>Biochemical Processes: Methane Generation by Anaerobic Digestion, Composting, Other Biochemical Processes</p> <p>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</p>	10	24

	Management		
Hazardous Solid Waste Management			
3	Definition, Classification of Hazardous Solid Waste, Characteristics of Hazardous Solid Waste Hazardous Waste Management: Waste Minimization, Waste Exchange, Recycling Treatment Technologies: Physico-Chemical Processes, Thermal Methods, Stabilization, Solidification Land Disposal: Site selection criteria, Landfill operation, Liner and Leachate collection system, Cover System, Water Controls, Closure & Post-closure	10	24
4	Biomedical Waste Management: Sources, Generation, Storage, Transportation, Disposal Waste Treatment: Disinfection, Irradiation, Incineration	4	10
5	E-Waste Generation: Sources, Global Perspective of E-waste Generation, Current status in India E-waste Management: E-waste Recovery and Recycling technologies, Disposal	4	10
5	Radioactive Waste: Sources, Types of Wastes, Management & Containment	2	05

Reference 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.

Course Outcome:

After learning the course the students should be able to:

- Understand the characteristics of different types of solid and hazardous wastes and the factors affecting variation.
- Define and explain important concepts in the field of solid waste management and suggest suitable technical solutions for treatment of municipal and industrial waste.
- Understand the role legislation and policy drivers play in stakeholder's response to the waste and apply the basic scientific principles for solving practical waste management challenges.

List of Experiments/Tutorials:

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.

Major Equipment:

- Hot Air Oven

List of Open Source Software/learning website: MOEF&CC, NPTEL