GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL MANAGEMENT (18)

MUNICIPAL & HAZARDOUS SOLID WASTE MANAGEMENT
CONTROL MANAGEMENT
SUBJECT CODE: 2711803
SEMESTER: I

Type of course: Engineering and Technology

Prerequisite: Types of Solid waste: Municipal, Hazardous, Biomedical etc.
Need for Solid and Hazardous waste management
Concept of 3R i.e. Reduce, Recycle and Reuse

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

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks		Practical Marks				
				ESE (E)	PA (M)	PA (V)		PA (I)		
						ESE	OEP	PA	RP	
3	2#	2	5	70	30	20	10	10	10	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
Municipal Solid Waste Management			
1	Integrated Solid Waste Management: History, Economics, Need, Material Flows, Types of Wastes. Municipal Solid Waste Characteristics and Quantities, Composition and Generation; Collection Systems and Design; Linear Programming Application in Collection, Transportation and Transfer of Wastes. Processing of Municipal Solid Waste: Storage, Conveying, Compacting, Shredding, Pulping, Roll Crushing, Granulating, The Pi Breakage Theorem. Material Separation: General Expressions, Picking, Screens, Float/Sink Separators, Magnets and Electromechanical Separators, Other Devices, Material Separation Systems.	16	38
2	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. Combustion and Energy Recovery: 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	12	28
Hazardous Solid Waste Management			
3	Definition, Identification and Classification of Hazardous Solid Waste: Hazardous Waste, Toxicity, Reactivity, Infectiousness, Flammability,	8	19

	Radioactivity, Corrosiveness, Irritation, Bio-Concentration, Genetic Activity, Explosiveness Hazardous Waste Management: Waste Minimization, Waste Exchange, Recycling Treatment Technologies: Biological, Chemical, Physico-Chemical Treatment, Incineration, Stabilization, Solidification etc, and Land Disposal		
4	Biomedical Waste Management: Sources, Generation, Storage, Transportation, Disposal, Waste Treatment: Disinfection, Irradiation, Incineration.	6	15

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 LaGrega
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: On completion of the course, the student is expected to 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 stakeholders' response to the waste and apply the basic scientific principles for solving practical waste management challenges

List of Experiments:

1. Collection of Municipal solid waste sample
2. Experiment on moisture content, volatile matter and fixed matter.
3. Experiment on physical size classification
4. Testing of calorific values and other properties of solid wastes
5. Experimentation on proximate and ultimate analysis of solid waste
6. Collection of data with detail investigation on system of solid waste management and analysis of the system
7. Exercise of collection route analysis
8. Preparation of report of a city solid waste management system including positive points and lacuna in the present system
9. Study of hazardous waste producing industry with details of points of generation in various forms.
10. Visit on sites of transfer station and disposal of solid waste
11. Presentation of report

Design based Problems (DP)/Open Ended Problem:

- Exercise on Solid Waste Collection Route
- Application of GIS in Locating Landfill Site

Major Equipments:

- Calorimeter for calorific value of Solid Waste
- Muffle Furnace
- Hot Air Oven

List of Open Source Software/learning website: http://nptel.ac.in/