

# GUJARAT TECHNOLOGICAL UNIVERSITY

## ENVIRONMENTAL SCIENCE AND TECHNOLOGY (35)

### MUNICIPAL WASTE & SEWAGE MANAGEMENT

SUBJECT CODE: 2183508

B.E. 8<sup>TH</sup> SEMESTER

**Type of course:** Environmental Science & Technology

**Prerequisite:** A good fundamental knowledge of municipal waste source and sewage management.

**Rationale:** This subject is intended to make students aware about the basic fundamentals of municipal waste, sources of waste, collection, conveyance of municipal and sewage waste. This subject also make student aware about the issues and challenges in waste management.

#### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
			ESE (E)	PA (M)		ESE (V)		PA (I)		
				PA	ALA	ESE	OEP			
4	1	0	5	70	20	10	30	0	10	150

#### Content:

Sr. No.	Content	Total Hrs	% Weightage
1.	<b>Municipal Waste</b> Introduction of Municipal Waste, Elements of integrated solid waste management, Municipal Solid Waste Generation and Sources, Characteristics; Composition ; Generation rate, Onsite Handling, Storage and Processing: Handling Methods; Factors Considered for Storage; Onsite Processing, Collection of Municipal Waste : Collection Services; Collection Systems and Equipments, Means of Transport of municipal waste,	8	25
2.	<b>Solid waste management</b> Material Recovery; Recovery of chemical and biological products; Recovery of Energy, Disposal of Solid Waste and Residual Matter : Landfilling Biomedical Waste Management: Sources; Generation; Classification; Storage; Transportation; Disposal; Waste Treatment: Disinfection, Irradiation and Incineration. Recycling, RDF, Waste Exchange; Treatment Technologies: Biological, Chemical; Physico-Chemical Treatment: Incineration, Stabilization, and Solidification	11	25
3.	<b>Sewage Management-I</b> Introduction of Sewage, Systems of sanitation, Quantity of sanitary sewage, Source of Sanitary sewage, Factors affecting	9	25

	sanitary sewage, Design of sewers, Drains and Sewers.		
4.	<b>Sewage Management-II</b> Wastewater pumps and pumping stations, sewer appurtenances; Planning factors, partial flow in sewers, economics of sewer design; material, construction and maintenance of sewers; Sewage disposal, sewage treatment process, Excreta disposal in unsewered areas, Kitchen waste and Plastic waste management, Biogas plant	9	25

**Suggested Specification table with Marks (Theory):**

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
<b>31</b>	<b>35</b>	<b>16</b>	<b>5</b>	<b>13</b>	<b>-</b>

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Reference Books:**

- 1) Integrated Solid Waste Management : Engineering Principles and Management Issues by George Tchobanoglous, McGraw-Hill Publication
- 2) Hazardous Waste Management by M LaGrega and others, McGraw-Hill Publication
- 3) Manual on Municipal Solid waste management by Central Public Health and Environmental Engineering Organization (CPHEEO), Government of India, New Delhi, latest edition
- 4) Wastewater engineering by Dr. B.C Punamia, Er Ashok Kumar Jain.
- 5) S.K. Garg," Water supply and Sanitary Engineering" Kanna publishers, Delhi 5th Edition, 2001.
- 6) K.S. Rangwala, " Water supply and Sanitary Engineering"
- 7) Integrated Solid Waste Management by Hilary Theisen and Samuel A, Vigil, George Tchobanoglous,, McGraw- Hill, New York, 1993
- 8) G.S. Birdie and JS. Birdie," Water supply and Sanitary Engineering" Dhanpat rai publishers Delhi, 6th Edition,2002.

**Course Outcome:** On successful completion of this course unit, the student should be able to:

1. Understand various physical, chemical and biological characteristics of solid waste
2. Know the generation rates of various solid waste
3. Describe the major environmental problems caused by inappropriate production and disposal of solid by-products manufacturing and consumption
4. Identify and describe the role of various systems of treatment of hazardous wastes
5. Classify and model sources of solid wastes
6. Apply principles of sustainable development to the management of solid by-products
7. Identity design inputs to enable the avoidance, minimization, recycling, re-use and treatment of solid by-products
8. Analyze the role of regulatory systems in solid & hazardous wastes management

**List of Tutorials:**

1. Study of waste generation and sources
2. Study on classification all types of wastes
3. Study of identification and characterization of wastes

4. Collection of data with detail investigation on system of solid waste management and analysis of the system
5. Preparation of report of a city solid waste management system including positive points and lacuna in the present system
6. Study of hazardous waste producing industry with details of points of generation in various forms.
7. Study of manifestation system of particular hazardous waste with processes including handling, storage, transportation and disposal
8. Study on treatment technology of hazardous waste

**List of Open Source Software/learning website:**

<http://elearning.vtu.ac.in/>

[www.nptel.iitm.ac.in/courses/](http://www.nptel.iitm.ac.in/courses/)

**ACTIVE LEARNING ASSIGNMENTS:** Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.