Municipal Solid Waste Management

01CI1807

Objective of the Course:

1. To analyze the intricate challenges of SWM by deconstructing its six functional elements for effective and sustainable management.
2. To evaluate how changing technologies and infrastructure demands impact optimal SWM practices.
3. To understand the current SWM crisis through in-depth exploration of waste generation to disposal stages.
4. To apply best practices for each stage of the SWM cycle, considering future implications and funding limitations.

Credit Earned: 03

Prerequisite: Basics of Environmental Studies.

Student's learning outcomes:

1. Understanding of the six functional elements of SWM and their impact on effective and sustainable waste management.
2. Critically evaluate how future technological advancements and infrastructure changes will influence SWM strategies.
3. Develop a comprehensive diagnosis of the current SWM crisis by analyzing the entire waste lifecycle from generation to disposal.
4. Apply best practices for each stage of the SWM cycle, considering real-world limitations like funding and infrastructure constraints.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
03	00	00	03	50	30	20	25	25	150

Detailed Syllabus

Sr. No	Topic name	Hours
1	**Introduction: Solid Waste Management**	**06**
	1.1 Introduction to solid waste, Functional elements, Types, and sources of solid waste,	3
	1.2 Sampling and characteristics, Estimation of solid waste quantity, Factors affecting solid waste generation rate	3
2	**Waste Handling and Analysis of Solid Waste Collection System and Types of Transfer Station**	**09**
	2.1 Handling, separation and storage at source, Processing at source,	3
	2.2 Primary collection, Types of collection system	2
	2.3 Analysis of collection system	2
	2.4 Need and types of transfer station	2
3	**Waste Handling, Separation, storage, and Processing (Chemical Transformation)**	**09**
	3.1 Transport methods, Unit operation for component separation	2
	3.2 Material recovery facilities (MRF), Recycling of dry waste components	2
	3.3 Waste as a fuel, Incineration/Combustion, Flue gas characteristics and treatment	2
	3.4 Solid residue generation, characterization and treatment, Waste-to-energy (WtE) plants (case studies) pyrolysis and gasification	3
4	**Biological Treatment and Landfill**	**09**
	4.1 Definition and phases of composting, Factors affecting composting process, Types of composting,	3
	4.2 Compost quality, Vermicomposting, Anaerobic Digestion; Definition, stages and factors affecting anaerobic digestion	3
	4.3 Landfill gas collection and treatment, Design of landfill & Bio-mining of old dumpsite	3
5	**Special Waste and Integrated Solid Waste Management**	**09**
	5.1 Construction and demolition waste, Management of bio-medical, e-waste and inert waste	3
	5.2 Integrated solid waste management (ISWM), Municipal solid waste management rules	3
	5.3 Financing in MSWM projects, Public-Private-Partnership (PPP), Public-Private-Partnership (PPP) in MSWM projects	3
	TOTAL	**42**

Suggested Theory Distribution

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve an effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	10%	30%	30%	15%	10%

Instructional Method and Pedagogy:

1 Prerequisite of the course and its pattern shall be discussed on the commencement of the course.
2 Lectures shall be conducted in the classroom using various teaching aids.
3 Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.
4 At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.

Recommended Study Material

1. Christensen, H. T., Solid Waste Technology & Management, Wiley, 2010, Volume 1 & 2
2. Haug, T. R., The Practical Handbook of COMPOST ENGINEERING, Lewis Publishers, 1993
3. Reinhart, R. D. and Townsend, G. T., Landfill Bioreactor Design & Operation, CRC Press, 1997, 1st Edition
4. Tchobanoglous, G. and Kreith, F., HANDBOOK OF SOLID WASTE MANAGEMENT, McGraw Hill, 2002, 2nd Edition
5. Tchobanoglous, G., Theisen and Vigil, Integrated Solid Waste Management: Engineering Principles and Management Issues, McGraw Hill, 1993.

Web Links

https://onlinecourses.nptel.ac.in/noc23_ce66/course

https://cpheeo.gov.in//cms/manual-on-municipal-solid-waste-management-2016.php