

Solid Waste Management

Course Learning Objectives	<ul style="list-style-type: none">• To facilitate the learners to understand fundamentals of key elements in solid waste management and governance.• To impart knowledge to arrive strategies for waste management and selection of technologies for processing, treatment, and disposal.• To examine and plan designs for material recovery facility, micro composting units, incinerators, biodigester, and landfills
Course Outcomes	<ul style="list-style-type: none">• Comprehend the elements of solid waste management and categorize the waste based on physical, chemical, and biological characteristics.• Design a waste collection system for onsite collection, storage and demonstrate waste transfer and transport operations.• Evaluate and develop waste processing and treatment methods for solid and hazardous waste with sustainable practices.• Select appropriate disposal methods such as landfills, waste to energy plants and its handling in an efficient way.• Develop reduce, reuse, recycling methods for special waste and prepare smart solutions for solid waste management.

Course Duration: 45 Hours

Unit 1: Introduction

Solid Waste classification, Need for solid waste management – Indian and Global perspective of SWM, Key elements of SWM – Concept of 3R's, Integrated SWM, Role of stake holders. Legislative framework – Evolution of Solid waste management policies, Solid waste Management Rules 2016, Government initiatives on solid waste management.

Unit 2: Solid waste characterization and Collection

Solid Waste Characteristics – Need for waste characterization, Types of Waste characterization – Physical, Chemical and Biological waste characterization methods. Waste collection system – Types of waste collection system – Hauled container system, Stationary container system, Advanced collection systems. Storage containers – Materials and Types, Onsite storage and processing methods.

Unit 3: Waste collection and Transportation

Vehicle routing and Case studies, Transfer station – Need for transfer station, Types of transfer station, Vehicles and technologies for transfer station, Feasibility and economic analysis of transfer station.

Unit 4: Waste treatment

Need for waste processing, Physical methods of waste processing – Material recovery facilities – Unit process and design. Thermal treatment – Incineration – Flue gas and residue management, Pyrolysis, Gasification and Energy from waste. Biological treatment method – Aerated treatment – Composting, Anaerobic treatment – Anaerobic digestion – Types, Process, Co-digestion, Biogas production.

Unit 5: Waste Disposal

Landfill – Landfill anatomy, methods of landfilling, Planning and design of landfill. Construction of landfill – Lining and cover for landfill, leachate and landfill gas collection and treatment. Landfill closure and reclamation.

Test Projects:

Use Cases:

S.No.	PROJECT TITLE
1	Develop waste management plan for residential building.
2	Develop waste management plan for commercial building.
3	Develop waste management plan for institutional building.
4	Develop waste management plan for a community that has residential buildings.
5	Develop waste management plan for a hotel that has lodging as well.
6	Develop a waste management for a community hall.
7	Develop a waste management plan for the college mess and canteen that generate more amount of biodegradable waste.
8	Develop a waste management plan for an apartment.
9	Develop a waste management plan for a mall that has different shops and food stalls.
10	Develop a waste management plan for a multiplex screening complex.
11	Develop a waste management plan for a hotel that has an attached restaurant.
12	Develop a waste management plan for an office building that has pantry in each floor.
13	Develop a waste management plan for a railway station.

14	Develop a waste management plan for a nursing home.
15	Develop a waste management plan for a prayer hall.
16	Develop a waste management plan for a garage.
17	Develop a waste management plan for a boarding school.
18	Develop a waste management plan for a tech park that has food court.
19	Develop a waste management plan for a multi storey parking building.
20	Develop a waste management plan for a metro train station that has parking and a food court.

Task for Projects:

Task 1:

Identify and categorize the waste collected and quantify it.

Task 2:

Analyze and design a proper waste collection system appropriate for the given location.

Task 3:

Provide solutions for effective and economic vehicle routing for waste collection for the locality where the building is located.

Task 4:

Identify and provide the required waste processing and treatment method as per the waste collected.

Task 5:

Provide solutions for proper disposal of waste based on its characteristics.

Project 1:

A residential gated community having 10 apartments of G+7 each is in Erode. Create a proper waste management plan for building by providing proper information on quantity of waste generated, types of waste generated, type of waste treatment that can be adopted based on the generated waste and proper disposal of it. Provide solutions for economical vehicle routing as well inside the community. Considering each floor have 6 individual houses, an average occupancy of 4 people in each house can be assumed.

Task for Project:

Task 1:

Analyze the waste that is collected from the building and record the waste characteristics such as plastics, biodegradable, glass, recyclables, etc. Collect the data for waste generated over a week's time to understand the waste generation pattern. Record the method of segregation that is adopted in the process and the waste collection pattern that is being practiced. The objective is to gather comprehensive data essential for informed decision-making and the implementation of effective waste management strategies.

Task 2:

Analyze the waste characteristics such as moisture content and magnetic property and record it. The task involves assessing the waste generation patterns that are recorded by understanding the local demographics and considering environmental and logistical factors. Based on the analysis the type of waste collection system that is required for the place is to be selected and justified.

Task 3:

Waste collection route analysis has to be done for the locality where your building is located. Segment the area based on waste generation patterns, implement real-time updates, and strategically place waste bins for easy access. Provide the economical routing for the waste collection truck in a proper drawing mentioning the route and location of bins.

Task 4:

Based on the waste generated data provide which is the most feasible method of treatment that can be provided starting from physical, thermal, and biological processing of waste. Explain the method of treatment that you are providing and justify the reason for selecting the treatment method,

Task 5:

Provide solutions for proper disposal of waste based on its characteristics. Design the landfill and the requirements that are to be provided for safe and sustainable disposal such as lining for leachate management and covers. Provide data on waste that is recycled and waste that is biologically degraded.

Student Assessment Plan:

Each of the above-mentioned test projects will be divided into tasks by the training partner for each specific institution. Such tasks will be jointly evaluated by the faculty and the training partner and the following weightage is to be followed.

- 70% weightage to the external practical assessment.
- 30% weightage to the internal assessment.

Final Test Project/External Assessment Plan:

The Final Test Project will be chosen from the list given above, jointly by the college faculty and the Training Partner. The Final Test Project will be assessed on the following tasks, for 70%

Details	Marks
Task: 1	20
Task: 2	20
Task: 3	20
Task: 4	20
Task: 5	20

Employment Potential:

This course shall enable mechanical, automobile and allied domain Engineers to get employment in sectors like Chemical industries, Manufacturing, Production, etc.