

Techno India NJR Institute of Technology



Course File

Solid And Hazardous Waste Management

(Subject Code: 6CE5-12)

Bhupendra Purohit
(Assistant Professor)
Department of CE

For Techno India NJR Institute of Technology
पंकज पौरवाल
Dr. Pankaj Kumar Porwal
(Principal)



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

3rd Year - VI Semester: B.Tech. (Civil Engineering)

6CE5-12: SOLID AND HAZARDOUS WASTE MANAGEMENT

Credit: 2
2L+0T+0P

Max. Marks: 100(IA:20, ETE:80)
End Term Exam: 2 Hours

SN	CONTENTS	Hours
1	Introduction: Objective, scope and outcome of the course.	1
2	Introduction to SWM: Definition of waste and solid waste, classification solid waste, sources of solid waste, its composition, factors affecting waste generation, traditional methods of waste collection and disposal	4
3	Waste Collection: Components of waste collection, waste collection containers, their characteristics, types, waste collection vehicles, collection frequency, collection route, transfer stations	4
4	Solid Waste Characterization: Physical characteristics, chemical characteristics and biological characteristics of solid wastes Waste Processing: Size reduction, factors affecting size reduction, size reducing equipment, volume reduction, equipment for volume reduction, waste minimization, waste hierarchy, 3 R principle	5
5	Hazardous Waste: Definition, sources, classification, collection, segregation, treatment and disposal methods Radioactive Waste, E-Waste, Biomedical Waste: Definition, sources, classification, segregation, management and disposal methods	6
6	Treatment and Disposal of Solid Waste: Composting, vermicomposting, biogas production, thermal treatment, incineration, pyrolysis, gasification, biological treatment, Sanitary land filling, land fill leachate and gas management Latest Advances and Rules related to SWM, Hazardous Waste, Plastic Waste and E-Waste Management	5 3
	TOTAL	28

For Techno India NJR Institute of Technology
पंकज पौरवाल
Dr. Pankaj Kumar Porwal
(Principal)

Course Overview:

- a) Student will learn basics of SWM from this 30 hours course. They will be able to reducing and eliminating adverse impacts of waste materials on human health and the environment to support economic development and superior quality of life. Municipal solid waste generation in large quantities on daily basis constitutes serious environmental problems. ... The need to encourage the increasing recycling of municipal solid waste to facilitate a global sustainable environment as well as boosting the circular economy and green cities is recommended.

This is to be done in the most efficient manner possible, to keep costs low and prevent waste build-up. Proper solid-waste collection is important for the protection of public health, safety, and environmental quality. It is a labour-intensive activity, accounting for approximately three-quarters of the total cost of solid-waste management

Course Outcomes:

CO. NO.	Cognitive Level	Course Outcome
1	Application	To list the solid waste management and disposal techniques.
2	Synthesis	To define the waste management rules to generators of solid waste and its generation rate.
3	Application	To state what biomedical waste management and hazardous solid waste management are.
4	Synthesis	To understand the environment and health impacts of solid waste mismanagement.
5	Application	Understand the engineering, financial and technical options for waste management.

Prerequisites:

- 1 To know about the solid waste management and disposal techniques.
- 2: To know the waste management rules to generators of solid waste and its generation rate.
- 3: To know about the biomedical waste management and hazardous solid waste.

For Techno India NJR Institute of Technology
पंकज पोरवाल
Dr. Pankaj Kumar Porwal
(Principal)

4. Outline the design, operation, and maintenance of different methods of treatment

5. Explain the operation, and maintenance of sanitary landfill

Course Outcome Mapping with Program Outcome:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO366.1	3	1	2	1	1	2	2	1	1	1	1	1	1	2	3
CO366.2	3	2	2	1	1	1	1	1	1	1	1	2	1	2	2
CO366.3	3	1	2	1	1	2	2	1	1	1	1	1	1	2	3
CO366.4	1	2	2	1	1	2	2	1	2	2	2	2	2	2	1
CO366.5	1	1	2	2	1	2	1	1	2	2	2	2	2	2	1
CO366 (AVG)	2.2	1.4	2	1.2	1	1.8	1.6	1	1.4	1.4	1.4	1.6	1.4	2	2

Course Coverage Module Wise:

Lecture No.	Unit	Topic
	1	INTRODUCTION: Objective, scope and outcome of the course
2	2	INTRODUCTION TO SWM: Definition of waste and solid waste, classificationsolid waste.
3	2	Sources of solid waste, its composition.
4	2	Factors affecting waste generation
5	2	Traditional methods of waste collection and disposal
6	3	WASTE COLLECTION: Components of waste collection.
7	3	Waste collection containers, their characteristics, types.
8	3	Waste collection vehicles, collection frequency, collection route, transfer stations
9	3	Waste collection vehicles, collection frequency, collection route, transfer stations
10	4	SOLID WASTE CHARACTERIZATION: Physical characteristics.
11	4	Solid Waste Characterization: Chemical characteristics.

For Techno India NJR Institute of Technology
 पंकज पौरवाल
 Dr. Pankaj Kumar Porwal
 (Principal)

12	4	Solid Waste Characterization: Biological characteristics.
13	4	Waste Processing: Size reduction, factors affecting size reduction
14	4	Size reducing equipment, volume reduction, equipment for volume reduction, waste minimization, waste hierarchy, 3 R principle
15	5	HAZARDOUS WASTE: Definition, sources, classification, collection, segregation, treatment and disposal methods
16	5	Classification, collection, Segregation, treatment and disposal methods
17	5	Segregation, treatment and disposal methods
18	5	Radioactive Waste, E-Waste, Biomedical Waste: Definition, sources
19	5	Classification, segregation
20	5	Management and disposal Methods
21	6	TREATMENT AND DISPOSAL OF SOLID WASTE: Composting, vermicomposting.
22	6	Composting, vermicomposting.
23	6	Biogas production, thermal treatment, incineration, pyrolysis, gasification.
24	6	Biological treatment, Sanitary land filling
25	6	Land fill leachate and gas management
26	6	Latest Advances and Rules related to SWM, Hazardous Waste, Plastic Waste and E- Waste Management
27	6	(Contd.) Latest Advances and Rules related to SWM
28	6	(Contd.) Latest Advances and Rules related to SWM
29		Revision of course work
30		Revision of course work

TEXT/REFERENCE BOOKS

1. Tchobanoglous G, Theisen H and Vigil SA 'Integrated Solid Waste Management, Engineering Principles and Management Issues' McGraw- Hill, 1993.
2. Vesilind PA, Worrell W and Reinhart D, 'Solid Waste Engineering' Brooks/Cole Thomson Learning Inc., 2002.
3. Peavy, H.S, Rowe, D.R., and G. Tchobanoglous, 'Environmental Engineering'.

For Techno India NJR Institute of Technology
 पंकज पोरवाल
 Dr. Pankaj Kumar Porwal
 (Principal)

Course Level Problems (Test Items):

CO.NO.	Problem description
1	Write about Solid waste Management Write about Classification of Solid waste Write about Composition of Solid Waste Write a short note on Factor Affecting of Solid waste Generation Write about different types of Traditional method of Collection and Disposal of Solid Waste
2	Write a note on Components of Waste Collection Explain in detail about Waste Collection Centenars Write a note on Waste Collection Vehicle Explain in detail Process of Waste collection Explain in detail about Collection Routs
3	Explain in detail about Physical Characteristics of solid waste Write a note on Chemical and biological Characteristics of solid waste How can we Size Reduce of Solid waste Explain in detail about Volume Reduction Equipment Write a note on Waste minimization
4	What is E waste and Biomedical waste? Explain in Detail Sanitary land Filling Explain in detail about Vermicomposting Write about Biogas production Write a note on Radioactive Waste in detail

Assessment Methodology

1. Assignments one from each unit.
2. Midterm subjective paper where they have to write on the subject (Twice during the semester)
3. Final paper at the end of the semester subjective.

For Techno India NJR Institute of Technology
पंकज पौरवाल
Dr. Pankaj Kumar Porwal
(Principal)

Teaching and Learning resources unit-wise:

Unit-1

Introduction to SWM

Video Tutorials: <https://www.youtube.com/watch?v=k0ktJRoRcOA>

Theory concepts: http://www.uap-bd.edu/cc/nehreen/Lecture%201_431.pdf

Sample Quiz: <https://quizizz.com/admin/quiz/5c4f0285accae2001aed8bbf/solid-waste>

Unit-2

Waste Collection

Video Tutorials: <https://www.youtube.com/watch?v=CME8ym5WbcY>

Theory concepts: http://homepages.hs-bremen.de/~office-ikrw/invent/e-learning_Dateien/Handbook_chapters/chapter_4.pdf

Sample Quiz: <https://quizizz.com/admin/quiz/5c9d1f18d9c4cc001b6cf1bc/waste-management>

Unit-3

Solid Waste Characterization

Video Tutorials: <https://www.youtube.com/watch?v=at5NuSbIiW8>

Theory concepts: https://www.jica.go.jp/jica-ri/IFIC_and_JBICI-Studies/english/publications/reports/study/topical/waste/pdf/waste_02.pdf

For Techno India NJR Institute of Technology
पंकज पोरवाल
Dr. Pankaj Kumar Porwal
(Principal)

Sample Quiz: <https://quizizz.com/admin/quiz/5c9d1f18d9c4cc001b6cf1bc/waste-management>

Unit4

Hazardous waste

Video Tutorials: <https://www.youtube.com/watch?v=e2NCMulhMN0>

Theory concepts:
<https://www.bbau.ac.in/Docs/FoundationCourse/TM/Lecture%209%20Hazardous%20waste.pdf>

Sample Quiz: <https://study.com/academy/exam/topic/solid-and-hazardous-waste.html>

Unit-5

Treatment and Disposal

Video Tutorials: <https://www.youtube.com/watch?v=cNiy1kR-W74>

Theory concepts:
https://www.researchgate.net/publication/344519543_Solid_Waste_Treatment_Technologies_and_Environmental_Sustainability

Sample Quiz: <https://testbook.com/objective-questions/mcq-on-solid-waste-management--5eea6a0839140f30f369d6e9>

For Techno India NJR Institute of Technology
पंकज पौरवाल
Dr. Pankaj Kumar Porwal
(Principal)

5E5068	Roll No. <u>15ECTC049</u>	[Total No. of Pages : <u>2</u>]
	5E5068 B.Tech. V Semester (Main/Back) Examination, Nov./Dec. - 2017 Civil Engineering SCE6.3A Solid Waste Management	

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 26

Instructions to Candidates :

Attempt any five questions, selecting one question from each unit. All Questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitable be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.

Unit - I

1. a) What are the main problems associated with solid waste disposal? (8)
- b) Explain the classification of solid waste. (8)

OR

1. a) What are the goals and objectives of solid waste management? (8)
- b) Describe the important characteristics of solid waste. Also discuss the factors influencing generation of solid waste. (8)

Unit - II

2. a) What do you mean by onsite handling of solid waste? How is the aspect of public health and aesthetics related to it? (8)
- b) What are the different types and materials used for storage containers? Explain with suitable sketches. (8)

OR

2. a) Explain the onsite processing methods used for solid waste. (8)
- b) How do we decide the location of containers? Write down the precautions and guidelines for this purpose. (8)

5E5068/2017

(1)

[Contd....

For Techno India NJR Institute of Technology
पंकज पौरवाल
Dr. Pankaj Kumar Porwal
(Principal)

Unit - III

3. a) What are the important steps in collection and transfer system design? (8)
b) Explain the equipment and labour requirement in reference to solid waste management. (8)

OR

3. a) Explain various methods of collection system with flow diagrams. (8)
b) What are the different types of vehicles being used in for collection systems?(8)

Unit - IV

4. What do you understand by sanitary land filling? How is it different from a normal land filling? How is it practiced? Explain the filling process with a neat sketch. (16)

OR

4. Describe in detail the different processing techniques and methods of solid waste disposal with neat sketches. (16)

Unit - V

5. a) Explain the special techniques of treatment for industrial solid waste. (8)
b) Describe the reuse and recycling of solid waste materials. (8)

OR

5. a) How is the nature, treatment and disposal of industrial solid waste different than the municipal solid waste? (8)
b) Explain various methods of energy recovery from solid waste. (8)



For Techno India NJR Institute of Technology
पंकज पोरवाल
Dr. Pankaj Kumar Porwal
(Principal)