

COURSE NAME : Civil Engineering Group
COURSE CODE : CE/CR/CS/CV
SEMESTER / YEAR : Sixth
SUBJECT TITLE : Solid Waste Management (elective)
SUBJECT CODE :

Teaching & Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
3	-	2	3	100	-	-	25@	125

@ - Internal Assessment # - External Assessment * - On line Examination

Note :

- Two tests each of 25 marks to be conducted as per the schedule given by MSBTE
- Total of tests for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work (SW)

Rationale:

Industrialization and Urbanization is increasing day by day. As a result of this the generation of solid waste is a major problem all over the country within the urban as well as rural area. In view of this the management of solid waste produced is of prime need to keep the environment safe and clean.

Information on classification and characteristics of solid waste will enable to decide appropriate decision about the collection and transportation of waste produced. Various disposal methods of solid waste will enable to recommend suitable method of disposal of solid waste with economy and acceptable environmental constraints including reuse and recycle wherever applicable.

Content on other types of solid waste such as biomedical waste, Construction waste ,E-waste and plastic waste will useful in deciding appropriate method for collection, transportation and disposal of these wastes.

Thus, the knowledge of solid waste management with the concept like recycling, recovering and reuse will lead to proper disposal with acceptability. This will further lead to keeping the natural resources condemnation free.

General Objectives:

Students will able to

1. Understand various types of solid waste produced with their characteristics
2. Understand different methods of collection, transportation and disposal of solid waste.
3. Apply different method of disposal of solid waste for safe disposal.
4. Understand concept of Bio medical waste, E-waste and Industrial waste.
5. Understand recycling and reuse of solid waste.
6. Understand different transportation equipments with their limitations.

Theory

Topic and Content	Hrs.	Marks
<p>Topic 1 : Introduction</p> <p>Specific objectives :</p> <ul style="list-style-type: none"> ➤ State meaning of solid waste ➤ List types of solid waste ➤ Write the impact of solid waste ➤ List characteristics of solid waste ➤ List waste management techniques <p>Content :</p> <ul style="list-style-type: none"> • Definition of solid waste • Meaning of different solid waste – Domestic waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc. • Sources of solid waste • Classification of solid waste – hazardous and non-hazardous waste. • Physical and Chemical characteristics. • Impact of solid waste on environment. • Solid waste management techniques – solid waste management Hierarchy, waste prevention and waste reduction. • Factors affecting on solid waste generation. 	10	16
<p>Topic 2 : Storage, collection and Transportation Of Municipal solid waste.</p> <p>Specific objectives :</p> <ul style="list-style-type: none"> ➤ State methods of storage of municipal solid waste. ➤ List methods of collection of municipal solid waste. 	07	16

<ul style="list-style-type: none"> ➤ List various transportation equipment ➤ Draw the organization pattern of solid waste management. <p>Content :</p> <ul style="list-style-type: none"> • Storage of municipal waste. • Collection methods of municipal waste. • Tools and Equipments-Litter Bin, Broom, Shovels, Handcarts, Mechanical road sweepers, Community Bin like movable and stationary Bin. • Transportation of municipal waste. • Transportation vehicles with their capacity and working-Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumper, Compactor vehicles. <p>Transfer station- meaning, necessity, location</p> <ul style="list-style-type: none"> • organization pattern of solid waste management. 		
<p>Topic 3 : Disposal of Solid Waste</p> <p>Specific objectives :</p> <ul style="list-style-type: none"> ➤ List the types of disposal of solid waste ➤ Describe the process of composting. ➤ Describe the process of land filling. ➤ Describe the process of incineration. <p>Content :</p> <p>3.1 Composting of waste 08</p> <ul style="list-style-type: none"> • Principles of composting process • Factors affecting on composting process • Methods of composting – <ul style="list-style-type: none"> A) Manual Composting – Bangalore method, Indore Method B) Mechanical Composting – Dano Process C) Vermicomposting- Concept <p>3.2. Land filling technique 08</p>	10	24

<ul style="list-style-type: none"> • Factors for site Selection • Land filling methods-Area method, Trench method and Ramp method • Leachate and its control • Biogas from landfill • Advantages and Disadvantages of landfill method <p>3.3 Incineration of waste 08</p> <ul style="list-style-type: none"> • Introduction of incineration process. • Types of incinerators-Multiple chamber incinerators and Municipal incinerators • Products of incineration process with their use • Pyrolysis of waste –Definition, methods Advantages and Disadvantages of incineration process 		
<p>Topic 4: Special types of solid wastes.</p> <p>Specific objectives :</p> <ul style="list-style-type: none"> ➤ List various types of special waste. ➤ Describe method of collection and disposal of biomedical waste, E-waste and industrial waste. <p>Content :</p> <p>4.1 Biomedical Waste 08</p> <ul style="list-style-type: none"> • Definition of Biomedical Waste • Sources and generation of Biomedical Waste • Classification of Biomedical Waste Management technologies. <p>4.2 E-waste08</p> <ul style="list-style-type: none"> • Definition of E- waste • Varieties of E- waste • Dangers of E- waste • Disposal of E- waste • Recycling of E- waste <p>4.3 Industrial waste08</p>	08	24

<ul style="list-style-type: none"> • Variety of industrial waste • Collection of disposal of industrial waste • Control measures of industrial waste. • Recycling of industrial waste. 		
<p>Topic 5 : Health aspect and public Involvement in solid waste management</p> <p>Specific objectives :</p> <ul style="list-style-type: none"> ➤ Know health aspect during handling and processing. ➤ State stages for public involvement <p>Content :</p> <ul style="list-style-type: none"> • Health aspect during handling and processing • Health problem during time of segregation, reuse, recovery, recycling of solid waste. • Public Involvement and participation in Solid waste management. 	04	10
<p>Topic 6: Recycling of solid waste</p> <p>Specific objectives :</p> <ul style="list-style-type: none"> ➤ Describe the process of recycling ➤ State marketing strategies for recyclables. ➤ Planning, Designing and implementation of recycling program. ➤ State benefits of recycling. <p>Content :</p> <ul style="list-style-type: none"> • Introduction, purpose of recycling • Benefits of recycling. • Methods of collecting recyclables. • Solid waste recycling in India. 	04	10

Practicals:

Skills to be developed:

Intellectual Skills:

- Understand various types of solid waste.
- Understand various methods of disposal of solid waste with their suitability.
- Understand rules and regulation during handling and disposal.

Motor Skills:

- Observe methods of disposal of solid waste.
- Prepare PowerPoint presentation of disposal of special waste.
- Collect information of solid waste management in local area.

Term work will be prepared by each student in the form of assignments as below.

List of Assignments:

- 1) Visit report on solid waste disposal plant nearby city.
- 2) Visit report on composting plant.
- 3) Visit report on Biogas plant.
- 4) Visit report on vermicomposting plant.
- 5) Visit report on biomedical waste treatment plant.
- 6) Visit report on Industrial solid waste treatment plant.
- 7) Collect information of various machinery used for collection and transportation of Solid waste.

- 8) Understand health aspect during handling and transportation of solid waste.
- 9) Visit report on transfer station.
- 10) Study organization pattern of solid waste management.

*Student should prepare visit report by considering following points

(For sr. no.1 to 6 above)

1. Name and Location of Site
2. Sketch showing elements of plant
3. Raw material
4. Process
5. Production and capacity of plant
6. Advantages and Disadvantages
7. Financial assistance by govt. or any other statutory body.
8. Any other information.
9. Minimum two photograph of each visit attached to visit report.

(Size of photo 10cmx12cm)

(For sr. no.7 above)

1. List of machinery
2. Working of machinery
3. Capacity of machinery
4. Feasibility of machinery.
5. Any other information.

Learning Resources:

1. Books:

Sr. No.	Author	Title	Publisher
1.	Dr. A.D.Bhide	Solid Waste Management	--
2.	Gorge Techobanoglous	Solid Waste	McGraw Hill
3.	D.L. Manjunath	Environmental Studies	PEARSON Publication
4.	Gottas	Composting	--
5	K.Sasikumar	Solid Waste Management	PHI learning
6	Khopkar S.M.	Environmental Pollution	New Age International limited
7	Edwards and Lofty	Earthworm Biology	
8	Anindita Basak	Environmental Studies	PEARSON Publication
9	Rao C.S.	Environmental Pollution Control Engineering	Wiley Eastern Limited
10	B.B. Hosetti	Prospect and Perspectives of Solid Waste Management	NEW AGE International limited

2. Websites:

1. www.hsagolden.com

2. www.almitrapatel.com

3. www.yousee.in

4. www.skgsangha.org

5. www.epa.gov/epaoswer/non-hw/municipal/index.htm

6. En.wikipedia.org/waste-managment