



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)  
Dundigal, Hyderabad-500043

## MECHANICAL ENGINEERING

### TUTORIAL QUESTION BANK

<b>Course Title</b>	<b>ENERGY FROM WASTE</b>				
<b>Course Code</b>	<b>AEE551</b>				
<b>Programme</b>	B.Tech				
<b>Semester</b>	VII	ME			
<b>Course Type</b>	Elective				
<b>Regulation</b>	<b>IARE - R16</b>				
<b>Course Structure</b>	<b>Theory</b>			<b>Practical</b>	
	<b>Lectures</b>	<b>Tutorials</b>	<b>Credits</b>	<b>Laboratory</b>	<b>Credits</b>
	3	-	3	-	-
<b>Chief Coordinator</b>	Mr. Ch. Balakrishna, Assistant Professor				
<b>Course Faculty</b>	Mr. B D Y Sunil, Assistant Professor				

#### COURSE OBJECTIVES:

<b>The course should enable the students to:</b>	
I	Understand the principles associated with effective energy management and to apply these principles in the day to day life.
II	Develop insight into the collection, transfer and transport of municipal solid waste
III	Explain the design and operation of a municipal solid waste landfill.
IV	Devise key processes involved in recovering energy from wastes, systematically evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities.

#### COURSE OUTCOMES (COs):

CO 1	Identify different sources of solid waste and characteristics of municipal solid waste.
CO 2	Classify the methods in disposal of solid waste and the emission of gases, leachate from landfills.
CO 3	Understand Biochemical conversion of biomass for energy application, Bioenergy systems and process integration.
CO 4	Illustrate sources of thermo chemical energy generation and understand Biochemical conversion of biomass for energy application.
CO 5	Understand the global scenario of environmental concerns and health hazards by the generation of E-waste.

**COURSE LEARNING OUTCOMES (CLOs):**

AEE551.01	Apply the knowledge about the operations of Waste to Energy Plants.
AEE551.02	Understand physical and chemical analysis of municipal solid wastes and apply them for a management system that will be set up.
AEE551.03	Analyze the various aspects of Waste to Energy management Systems.
AEE551.04	Design a compost facility, incineration facility and make site selection for a landfill.
AEE551.05	Explain the hierarchical structure in solid waste management and a requirement for an integrated solution.
AEE551.06	Use Geographical Information System for landfill site selection that takes place in Solid Waste Management Plan.
AEE551.07	Collect required data for a Solid Waste management Plan and edit the collected dataset up Solid Waste management Plan.
AEE551.08	Summarize the properties and characteristics of landfills.
AEE551.09	Understand Biochemical conversion of biomass for energy application, Bioenergy systems and process integration.
AEE551.10	Discuss Thermo chemical conversion of biomass for energy application.
AEE551.11	Understand the concept of bio-mass briquetting and its advantages.
AEE551.12	Evaluate the subject from the technical, legal and economical points by learning of all terms related to general solid waste management.
AEE551.13	Apply the knowledge in planning and operations of Waste to Energy plants.
AEE551.14	Analyze the importance of shotcreting and guniting Technology.
AEE551.15	Examine the technical points that are required to set up a solid waste management system.
AEE551.16	Apply the legal legislation related to solid waste management.
AEE551.17	Encourage students to organize recycling events and waste audit.
AEE551.18	Discuss the growth of electrical and electronics in waste to energy industry in India.
AEE551.19	Discuss impact of hazardous e-waste in India
AEE551.20	Understand need for stringent health safeguards and environmental protection laws of India.

## TUTORIAL QUESTION BANK

UNIT-I				
INTRODUCTION TO WASTE AND WASTE PROCESSING				
Part - A (Short Answer Questions)				
S No	QUESTIONS	Blooms Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
1	What is meant by solid waste Management?	Remember	CO 1	AEE551.01
2	Give the composition of Municipal solid waste.	Remember	CO 1	AEE551.02
3	Define municipal solid waste	Remember	CO 1	AEE551.02
4	State the prerequisites of an effective system of solid waste management.	Understand	CO 1	AEE551.02
5	What are the functional elements in a typical solid waste management system?	Understand	CO 1	AEE551.02
6	What is integrated solid waste management?	Remember	CO 1	AEE551.02
7	Define hazardous waste?	Remember	CO 1	AEE551.03
8	Define "solid waste". state its types?	Remember	CO 1	AEE551.04
9	How will you determine the moisture content of the solid waste?	Remember	CO 1	AEE551.02
10	List out various solid waste in the community.	Remember	CO 1	AEE551.02
11	List the various advantages of waste segregation?	Understand	CO 1	AEE551.03
12	Define waste minimization.	Understand	CO 1	AEE551.03
13	What is the purpose of transfer station in solid waste management?	Understand	CO 1	AEE551.05
14	What is transfer station and haul distance?	Understand	CO 1	AEE551.05
15	Define waste minimization and recycling of MSW	Understand	CO 1	AEE551.05
16	Write down the methods of collection of solid waste?	Remember	CO 1	AEE551.05
17	What is the objective of using transfer station?	Remember	CO 1	AEE551.01
18	Write the merits and demerits of Incineration.	Remember	CO 1	AEE551.06
19	Define solid waste composting?	Understand	CO 1	AEE551.06
20	List out various solid waste treatment methods?	Understand	CO 1	AEE551.06
Part - B (Long Answer Questions)				
1	Explain various types of solid waste in detail.	Remember	CO 1	AEE551.02
2	Explain physical and chemical characteristics of municipal solid waste?	Understand	CO 1	AEE551.02
3	Explain the factors influencing the solid waste generation rate.	Understand	CO 1	AEE551.03
4	Explain the need of public awareness and role of NGOs in solid waste management.	Understand	CO 1	AEE551.03
5	Write a note on Environmental and Health risk scenarios of solid waste.	Remember	CO 1	AEE551.05
6.	Explain the Principle of solid waste management.	Remember	CO 1	AEE551.05
7.	Describe the various methods of sorting the solid waste.	Remember	CO 1	AEE551.05
8	What are the types of containers and collection vehicles used for the collection of solid waste? Discuss.	Remember	CO 1	AEE551.05
9.	Explain briefly on recycling of paper, glass, plastic and aluminum	Remember	CO 1	AEE551.01
10	Describe the incineration Technologies and air emissions and its Control in detail	Understand	CO 1	AEE551.06
11	Write briefly about the composting facilities and various types of composting Techniques.	Understand	CO 1	AEE551.06
12	Explain the classification of composting technologies and discuss briefly the basic steps involved in the composting practice.	Understand	CO 1	AEE551.06
13	Explain the sources and types of solid wastes in detail.	Understand	CO 1	AEE551.06
14	Explain the solid waste characteristics in detail.	Understand	CO 1	AEE551.06
15	What is composting? Discuss various processes and phases of composting.	Remember	CO 1	AEE551.07
16	Write briefly about the techniques used in conversion of biomedical waste to useful energy?	Understand	CO 1	AEE551.02
17	Define furnace and explain its importance waste incineration process	Understand	CO 1	AEE551.02
18	What are the consequences of improper management and handling of wastes?	Understand	CO 1	AEE551.03
19	Explain the concept of waste to energy conversion	Remember	CO 1	AEE551.07

20	Give the different types of composting in use. Write about various factors which affect composting.	Remember	CO 1	AEE551.07
<b>UNIT- II</b>				
<b>WASTE TREATMENT AND DISPOSAL</b>				
<b>Part-A(ShortAnswerQuestions)</b>				
1	Define the term landfill	Remember	CO 2	AEE551.08
2	What are the factors which affect production of leachate and landfill gas in Landfill?	Remember	CO 2	AEE551.08
3	What is designate sanitary landfill?	Remember	CO 2	AEE551.08
4	What is Variation in gas production with time?	Remember	CO 2	AEE551.08
5	Define -Leachate. What is meant by pyrolysis?	Understand	CO 2	AEE551.08
6	Brief the treatment mechanism of a sanitary land filling?	Remember	CO 2	AEE551.06
7	What is the advantage of segregated solid waste disposal by sanitary land filling?	Understand	CO 2	AEE551.09
8	Describe the various guidelines for selection of a landfill site.	Understand	CO 2	AEE551.09
9	How are landfills classified?	Remember	CO 2	AEE551.09
10	What are the environmental factors in sanitary landfill sites?	Understand	CO 2	AEE551.09
11	Outline, how to minimize leachate generation in a sanitary landfill?	Remember	CO 2	AEE551.08
12	Discuss the factors which affect production of leachate & landfill gas.	Remember	CO 2	AEE551.09
13	List the various gases generated in sanitary landfill?	Remember	CO 2	AEE551.09
14	Write the typical composition of municipal solid waste leachate.	Understand	CO 2	AEE551.10
15	How do you perform leachate movement from land filling?	Understand	CO 2	AEE551.10
16	List out methods of land filling	Understand	CO 2	AEE551.11
17	What are the types of land fill?	Remember	CO 2	AEE551.11
18	Discuss the layout and preliminary design f landfill.	Understand	CO 2	AEE551.11
19	Explain the composition and characteristics of Landfill?	Understand	CO 2	AEE551.11
20	Write a short note on environmental monitoring system for Landfill gases.	Remember	CO 2	AEE551.11
<b>Part-B(LongAnswerQuestions)</b>				
1	What is leachate? Mention the various methods of treatment of leachate and disposal.	Remember	CO 2	AEE551.12
2	Describe in detail the different methods of landfilling and the operations involve with neat Sketches.	Understand	CO 2	AEE551.11
3	What are the requirements of a landfill layout? Write a note on sanitary land filling.	Understand	CO 2	AEE551.11
4	Explain the various phases of municipal solid waste decomposition in a closed landfill?	Understand	CO 2	AEE551.11
5	Identify the adverse effects of landfill leachate and list out appropriate measures to control.	Remember	CO 2	AEE551.11
6.	What are the various phases of operation of landfill? Draw the neat sketch of a landfill.	Understand	CO 2	AEE551.11
7.	What do you understand by the term leachate? What problem are posed by leachate and how would you overcome?	Understand	CO 2	AEE551.11
8	Illustrate the step by step procedure involved in site selection for sanitary landfills.	Understand	CO 2	AEE551.11
9.	Write the adverse effects of a landfill leachate and list appropriate control measures.	Understand	CO 2	AEE551.11
10	With the help of a neat sketch explain the essential components of a sanitary landfill and their functions. Also explain its advantages and disadvantages of sanitary landfill.	Understand	CO 2	AEE551.11
11	Explain the various phases of municipal solid waste decomposition in a closed landfill cell.	Understand	CO 2	AEE551.11
12	What is the importance of liner in landfill list out various types and explain	Understand	CO 2	AEE551.12

13	What are the design aspects of geo-membranes? What are the design aspects of geo-synthetic clay liners?	Understand	CO 2	AEE551.12
14	Explain various methods of land filling.	Remember	CO 2	AEE551.14
15	Give composition of landfill gas emission and hazards due to land fill gas.	Understand	CO 2	AEE551.14
16	Briefly explain types and methods of Landfill.	Understand	CO 2	AEE551.14
17	Discuss the site selection of Landfill.	Remember	CO 2	AEE551.14
18	Explain the operating requirements for solid waste landfill.	Understand	CO 2	AEE551.14
19	Explain the essential components of landfill with a neat sketch	Understand	CO 2	AEE551.14
20	How to control the landfill leach ate and gases?	Remember	CO 2	AEE551.11

### UNIT-III

#### BIO-CHEMICAL CONVERSION

##### Part-A(ShortAnswerQuestions)

1	Discuss the processes and stages involved in composting, and use appropriatecomposting technologies;	Understand	CO 3	AEE551.11
2	List out various composting technologies	Understand	CO 3	AEE551.11
3	Define bio gasification	Understand	CO 3	AEE551.11
4	Benefits of bio gasification	Understand	CO 3	AEE551.11
5	Discuss effect of toxins on biogas	Understand	CO 3	AEE551.11
6	Define anaerobic digestion	Understand	CO 3	AEE551.11
7	Give types of digesters	Understand	CO 3	AEE551.11
8	Give biogas plants in India	Understand	CO 3	AEE551.12
9	List out components of biogas plant	Understand	CO 3	AEE551.12
10	Discuss about environmental impact of bio gasification	Understand	CO 3	AEE551.11

11	Define biomass densification or briquetting	Understand	CO 3	AEE551.11
12	What is ethanol gel	Understand	CO 3	AEE551.11
13	What is bio-char	Understand	CO 3	AEE551.11
14	Define hydrolysis	Understand	CO 3	AEE551.11
15	Define process of fermentation	Understand	CO 3	AEE551.11
16	Define trans esterification.	Remember	CO 3	AEE551.12
17	What is anaerobic digestion	Remember	CO 3	AEE551.12
18	Define agro-residues and examples of agro residues	Remember	CO 3	AEE551.11
19	Explain process of anaerobic digestion of sewage and municipal waste	Remember	CO 3	AEE551.11
20	Explain process of anaerobic digestion in industrial and agricultural waste	Remember	CO 3	AEE551.11

##### Part-B(LongAnswerQuestions)

1	Explain the anaerobic methods for materials recovery and treatment.	Understand	CO 3	AEE551.11
2	Discuss about factors affecting anaerobic degradation of organic matter.	Understand	CO 3	AEE551.11
3	Briefly explain the process of backyard composting.	Understand	CO 3	AEE551.11
4	Explain in-detail about phases can be distinguished in the overall conversion process of organic matter to biogas?	Remember	CO 3	AEE551.12
5	How to check compost quality.	Understand	CO 3	AEE551.12
6	Briefly explain biomass Energy Conversion Overview with block diagram	Understand	CO 3	AEE551.11
7	Discuss briefly about Biomass densification or briquetting.	Understand	CO 3	AEE551.11
8	Explain the process for production of bio-char with a neat diagram	Understand	CO 3	AEE551.11
9	Explain in-detail step by step procedure of bio-chemical conversion	Understand	CO 3	AEE551.11
10	Explain briefly about bio gasification	Understand	CO 3	AEE551.11

11	Illustrate standard rate single-stage digester with a neat sketch.	Understand	CO 3	AEE551.11
12	Illustrate High rate single-stage digester.	Understand	CO 3	AEE551.12
13	Illustrate two-stage digester with a neat sketch.	Understand	CO 3	AEE551.12
14	What are the consequences of direct disposal of MSW.	Understand	CO 3	AEE551.11
15	Explain the process of anaerobic digestion of industrial waste..	Understand	CO 3	AEE551.11
16	Explain the process of anaerobic digestion of agro residues.	Understand	CO 3	AEE551.11
17	Discuss briefly about direct combustion of MSW.	Understand	CO 3	AEE551.09
18	What are the Main composting agents, explain them briefly.	Remember	CO 3	AEE551.10

19	Discuss the steps that are performing for Bio-chemical conversion.	Understand	CO 3	AEE551.08
20	Explain the control parameters of Bio-chemical conversion.	Understand	CO 3	AEE551.08

#### UNIT-IV

#### THERMO-CHEMICAL CONVERSION

##### Part – A (Short Answer Questions)

1	Define the term biogas	Understand	CO 4	AEE551.11
2	What is bio-mass feedstock	Understand	CO 4	AEE551.12
3	List out various thermo chemical conversion processes	Understand	CO 4	AEE551.12
4	Define the term Black Liquor	Understand	CO 4	AEE551.11
5	Give schematic diagram of thermal conversion	Understand	CO 4	AEE551.11
6	What are different stages of combustion	Understand	CO 4	AEE551.11
7	Explain process of thermo chemical conversion?	Understand	CO 4	AEE551.11
8	What is landfill gas utilization?	Understand	CO 4	AEE551.11
9	Discuss how landfill gases are collected?	Understand	CO 4	AEE551.11
10	Summarize the difference between pyrolysis and gasification?	Understand	CO 4	AEE551.11
11	Define biomass briquettes and why do we use them?	Understand	CO 4	AEE551.12
12	Discuss the major raw materials used in biomass briquettes	Understand	CO 4	AEE551.13
13	Explain the techniques used to make biomass briquettes.	Understand	CO 4	AEE551.13
14	List out the biomass briquetting machines available?	Understand	CO 4	AEE551.13
15	What are the advantages of biomass briquetting?	Understand	CO 4	AEE551.13
16	Explain the types of Thermo-chemical conversion with the help of a flowchart.	Remember	CO 4	AEE551.12
17	Define the term Combustion.	Understand	CO 4	AEE551.08
18	What are the reactions involved in gasification.	Understand	CO 4	AEE551.14
19	Discuss the environmental benefits of thermo-chemical conversion.	Understand	CO 4	AEE551.16
20	Write short notes on utilization of Briquetting.	Remember	CO 4	AEE551.12

##### Part – B (Long Answer Questions)

1	Explain the process of biogas production?	Understand	CO 4	AEE551.12
2	Discuss in-detail about land fill gas generation	Understand	CO 4	AEE551.12
3	Write about utilization of land fill gas?	Understand	CO 4	AEE551.13
4	Define the terms combustion, pyrolysis and gasification	Understand	CO 4	AEE551.12
5	Explain the various thermo-chemical conversion process	Understand	CO 4	AEE551.12
6	Explain pyrolysis process in-detail	Understand	CO 4	AEE551.12
7	Explain about gasification process in-detail	Understand	CO 4	AEE551.12
8	Discuss about land fill gas generation and utilization	Understand	CO 4	AEE551.13
9	Explain in-detail about gasification of waste	Understand	CO 4	AEE551.13
10	Discuss briefly about the concept of gas briquetting (or) densification,	Understand	CO 4	AEE551.13
11	Explain the utilization of briquetting	Understand	CO 4	AEE551.12
12	Explain the advantages of briquetting,	Understand	CO 4	AEE551.12
13	Discuss briefly on environmental benefits of bio-chemical.	Understand	CO 4	AEE551.12
14	Discuss briefly on thermo- chemical conversion	Understand	CO 4	AEE551.13
15	Differentiate between producer gas and syngas?	Understand	CO 4	AEE551.12
16	Explain the Classification of Gasifiers.	Remember	CO 4	AEE551.08
17	Briefly explain the advantages of Gasification.	Understand	CO 4	AEE551.14
18	Discuss the process of Bio-mass briquetting.	Understand	CO 4	AEE551.16
19	What are the benefits of briquetting?	Remember	CO 4	AEE551.12
20	Explain the disadvantages of gasification.	Understand	CO 4	AEE551.13

#### UNIT-V

#### E-WASTE MANAGEMENT

##### Part - A (Short Answer Questions)

1	What is E-waste in global context?	Understand	CO 5	AEE551.13
2	Discuss different sources of E-waste.	Understand	CO 5	AEE551.13
3	List out types of treats from E-waste.	Understand	CO 5	AEE551.13
4	What are the environmental concerns of E-waste?	Understand	CO 5	AEE551.13
5	What are the health hazards of E-waste?	Understand	CO 5	AEE551.13



6	Discuss the current status of E-waste management.	Understand	CO 5	AEE551.13
7	List out the reusable components in E-waste.	Understand	CO 5	AEE551.14
8	Discuss current challenges in electronic recycling industries.	Understand	CO 5	AEE551.13
9	Discuss the process for recycling electronic waste	Understand	CO 5	AEE551.13
10	Discuss about E-Waste legislations.	Understand	CO 5	AEE551.14
11	List out the E-Waste management and handling rules.	Understand	CO 5	AEE551.13
12	What is global trade in hazardous waste?	Understand	CO 5	AEE551.14
13	List out any five environmental protection laws.	Understand	CO 5	AEE551.13
14	What is the impact of hazardous E-waste on environment?	Understand	CO 5	AEE551.14
15	List out measures to reduce E-waste.	Understand	CO 5	AEE551.13
16	Write a short note on growth of E-waste in India.	Remember	CO 5	AEE551.17
17	How do we recycle the E-waste?	Remember	CO 5	AEE551.18
18	What are the E-waste legislations?	Understand	CO 5	AEE551.17
19	What are the environmental protection laws of India?	Understand	CO 5	AEE551.20
20	Write a short notes on growth of electrical and electronics industry in India.	Remember	CO 5	AEE551.19
<b>Part - B (Long Answer Questions)</b>				
1	Write short notes on E-waste and E-waste in India.	Understand	CO 5	AEE551.13
2	Explain in-detail about growth of electrical and electronics industry in India	Understand	CO 5	AEE551.13
3	Discuss in-detail about environmental concerns due to e-waste	Understand	CO 5	AEE551.16
4	Discuss in-detail about health hazards and safety hazards related to e-waste	Understand	CO 5	AEE551.13
5	Discuss on the given statement as “Recycling e-waste: A thriving economy of the unorganized sector”.	Understand	CO 5	AEE551.14
6	Discuss about global trade in hazardous waste.	Understand	CO 5	AEE551.16
7	Explain the impact of hazardous e-waste in India.	Understand	CO 5	AEE551.17
8	Write a brief note on Management of E-waste and E-waste legislation.	Understand	CO 5	AEE551.16
9	Discuss government regulations on e-waste management	Understand	CO 5	AEE551.17
10	Discuss international experience about E-waste.	Understand	CO 5	AEE551.14
11	Explain what the need for stringent health safeguards is.	Understand	CO 5	AEE551.17
12	Discuss various environmental protection laws of India.	Understand	CO 5	AEE551.19
13	Explain the salient features on E-waste rules.	Understand	CO 5	AEE551.18
14	Discuss the global trade in hazardous waste.	Understand	CO 5	AEE551.17
15	Explain the environmental concerns and health hazards of E-waste management.	Understand	CO 5	AEE551.18
16	Explain the recycling process of E-waste.	Understand	CO 5	AEE551.20
17	Discuss the composition of E-waste.	Understand	CO 5	AEE551.17
18	How the E-waste is health hazard to the global context.	Remember	CO 5	AEE551.19
19	Explain the causes of E-waste that are affecting the India.	Understand	CO 5	AEE551.18
20	How to diminish the E-waste hazard from the world, explain it briefly.	Remember	CO 5	AEE551.17

**Prepared by:**

Mr. B D Y Sunil, Assistant Professor

**HOD, ME**