



# INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

## CIVIL ENGINEERING

### TUTORIAL QUESTION BANK

<b>Course Title</b>	INDUSTRIAL WASTE WATER TREATMENT				
<b>Course Code</b>	ACE526				
<b>Programme</b>	B. Tech				
<b>Semester</b>	VI	CE			
<b>Course Type</b>	Elective				
<b>Regulation</b>	IARE-R16				
<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>
	4	-	4	-	-
<b>Chief Coordinator</b>	Mr.Ch. Balakrishna, Assistant Professor, Civil Engineering Department				
<b>Course Faculty</b>	Mr.Ch. Balakrishna, Assistant Professor, Civil Engineering Department				

#### COURSE OBJECTIVES:

The course should enable the students to:	
I	Enrich the knowledge on sources and characteristics of industrial wastewater.
II	Discuss the different methods of waste water treatment such as de-nitrification, membrane separation, air stripping, etc.
III	Understand the characteristics and composition of wastewater generated from industrial processes.
IV	Design and operate effluent treatment plants for joint treatment of raw industrial wastewater and domestic sewerage.

#### COURSE OUTCOMES (COs):

CO 1	Distinguish between the quality of domestic and industrial water requirements and Wastewater quantity generation.
CO 2	Understand the industrial process, water utilization and waste water generation.
CO 3	Acquire the knowledge on operational problems of common effluent treatment plants.
CO 4	Impart knowledge on selection of treatment methods for industrial wastewater.
CO 5	Specify design criteria for physical, chemical, and biological unit operations.

## COURSE LEARNING OUTCOMES:

ACE526.01	Identification of sources of pollutants from different industries.
ACE526.02	Analyse the Physical, Chemical, organic and Biological properties of Industrial Wastes.
ACE526.03	Differentiate between industrial and municipal waste water.
ACE526.04	Understand the effects of industrial effluents on sewers and natural water bodies.
ACE526.05	Explain Pre and Primary Treatment processes.
ACE526.06	Specify design criteria for physical, chemical, and biological unit operations
ACE526.07	Develop an overall treatment strategy for an industrial waste water.
ACE526.08	Analyse the operational problems of common effluent treatment plants.
ACE526.09	Define about the fundamental concepts of waste water treatment.
ACE526.10	Analyse the Industrial waste water quality and its Parameters.
ACE526.11	Analyse the process to meet desired needs and reduce water pollution.
ACE526.12	Identify the suitability of the use of treated Industrial wastewater for irrigation.
ACE526.13	Evaluate the optimal method for the management of Industrial wastewater.
ACE526.14	Select the most appropriate technique to control and treat industrial pollution
ACE526.15	Design a component system or process to meet desired needs and reduce waste water pollution
ACE526.16	Apply Environmental Management Systems (EMS) to an industrial activity.
ACE526.17	Estimate capital and operating costs for industrial waste treatment systems.
ACE526.18	Identify environmental standards that apply to both direct and indirect industrial discharges.
ACE526.19	Manufacturing processes of industries like sugar, steel, petroleum refineries.
ACE526.20	Understand the Characteristics of Industries like Petroleum Refineries.
ACE526.21	Characteristics and composition of industries like textiles, tanneries, atomic energy plants and other mineral processing industries.
ACE526.22	Joint treatment of raw industrial waste water and domestic sewage.
ACE526.23	Common effluent treatment plants location, design, and operation and maintenance problems.

<b>UNIT-I</b>				
<b>CHARACTERISTICS OF INDUSTRIAL WASTE WATER</b>				
<b>Part - A (Short Answer Questions)</b>				
S.No.	Questions	Bloom's Taxonomy Level	Course Outcomes	Course Learning Outcomes (CLOs)
1	Define wastewater.	Remember	CO 1	ACE526.01
2	Define wastewater treatment.	Remember	CO 1	ACE526.01
3	Write a short note on effluent and Influent of a Industry.	Understand	CO 1	ACE526.01
4	What are different sources of pollution?	Understand	CO 1	ACE526.02
5	Write the physical properties of Industrial Waste Water.	Understand	CO 1	ACE526.04
6	Write the Chemical properties of Industrial Waste Water	Remember	CO 1	ACE526.02
7	Write the Organic properties of Industrial Waste Water.	Remember	CO 1	ACE526.03
8	Write the Biological properties of Industrial Waste Water.	Remember	CO 1	ACE526.02
9	Write a short note on Domestic waste water.	Remember	CO 1	ACE526.01
10	Write a short note on Industrial waste water.	Remember	CO 1	ACE526.02
11	On what factors the selection of particular process for treating the effluent of Industrial Waste Water? Write three alternatives for the disposal of the industrial wastes.	Understand	CO 1	ACE526.02
12	What are the Characteristics of Industrial Wastes? Give short note on Inorganic Salts and Acids or Alkalis.	Remember	CO 1	ACE526.04
13	What are the Characteristics of Industrial Wastes? Give short note on organic Matter and Suspended Solids	Remember	CO 1	ACE526.01
14	Write a short note on Floating Solids and Liquids.	Remember	CO 1	ACE526.04
15	Give a note on Heated Water in view of Industrial waste.	Understand	CO 1	ACE526.04
16	What are the effects of industrial effluents on sewers?	Understand	CO 1	ACE526.04
17	What are the effects of industrial effluents on Natural water bodies?	Understand	CO 1	ACE526.02
18	Write short note on BOD and COD.	Understand	CO 1	ACE526.02
19	Write short note on Total organic carbon (TOC) and Theoretical oxygen (ThOD).	Understand	CO 1	ACE526.04
20	List the Steps involved in Primary treatment of waste water.	Understand	CO 1	ACE526.02
<b>Part - B (Long Answer Questions)</b>				
1	Explain in detail about the different sources of Industrial waste waters.	Remember	CO 1	ACE526.02
2	Discuss in detail about the Physical properties of Industrial wastewater.	Understand	CO 1	ACE526.03
3	Discuss in detail about the Chemical properties of Industrial wastewater.	Understand	CO 1	ACE526.01
4	Discuss in detail about the Organic properties of Industrial wastewater.	Remember	CO 1	ACE526.02
5	Discuss in detail about the Biological properties of	Understand	CO 1	ACE526.01

	Industrial wastewater.			
6	Explain the difference between Industrial and Municipal wastewaters.	Remember	CO 1	ACE526.02
7	Explain in detail the effects of Industrial effluents on sewers.	Understand	CO 1	ACE526.01
8	Explain in detail the effects of Industrial effluents on Natural water bodies.	Understand	CO 1	ACE526.01
9	Give the detailed information with respect to Waste water sources and its characteristics.	Understand	CO 1	ACE526.02
10	Give the detailed information with respect to manufacturing process.	Remember	CO 1	ACE526.02
11	Describe the following characteristics of waste water in detail of the following 1. pH, 2. Solids, 3. BOD, 4. COD, 5. Heavy Metals.	Understand	CO 1	ACE526.04
12	State the various types of benefits of water pollution control by doing treatment of industrial waste.	Understand	CO 1	ACE526.02
13	State the importance of Industrial waste treatment.	Understand	CO 1	ACE526.02
14	What are the factors affecting self purification of polluted streams? Give suggestions to control.	Understand	CO 1	ACE526.02
15	Explain briefly the methods of removal of suspended solids from industrial waste water.	Remember	CO 1	ACE526.04
16	Define Industrial waste water and explain how it is different from Domestic sewage?	Understand	CO 1	ACE526.02

## UNIT-II

### COMMON TYPES OF TREATMENT PROCESS

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

1	List the different stages of waste water treatment.	Remember	CO 2	ACE526.05
2	Draw the neat sketch of different stages of wastewater treatment plant.	Remember	CO 2	ACE526.05
3	Write a short note on Pre-treatment of waste water treatment.	Remember	CO 2	ACE526.05
4	Write a short note on Primary-treatment of waste water treatment	Understand	CO 2	ACE526.05
5	Write the different ways involved in Strength Reduction of Industrial waste water	Understand	CO 2	ACE526.06
6	Write a short on Volume Reduction of Industrial waste water	Remember	CO 2	ACE526.06
7	Write a short on Neutralization of Industrial waste water	Understand	CO 2	ACE526.05
8	Write a short on Equalization of Industrial waste water	Remember	CO 2	ACE526.05
9	Write a short on Proportioning of Industrial waste water	Understand	CO 2	ACE526.06
10	Give a short note on Oil Separation	Understand	CO 2	ACE526.05
11	What is the process involved in Oil Separation by Floatation	Remember	CO 2	ACE526.05
12	How solids are removed from industrial effluent	Remember	CO 2	ACE526.06

13	How Oils and grease removal are removed in Industrial in Industrial effluent	Understand	CO 2	ACE526.06
14	How biodegradable organic material are removed from Industrial effluent	Understand	CO 2	ACE526.06
15	Give the different Methods for treating Organic matter	Understand	CO 2	ACE526.06
16	How acids and alkalis are treated. List methods	Understand	CO 2	ACE526.05
17	Write the process involved in treating toxic materials	Remember	CO 2	ACE526.05
18	What are the different physical treatment methods of Industrial wastewater	Understand	CO 2	ACE526.05
19	What are the different Chemical treatment methods of Industrial wastewater	Remember	CO 2	ACE526.05
20	What are the different Biological treatment methods of Industrial wastewater	Understand	CO 2	ACE526.05
<b>Part - B (Long Answer Questions)</b>				
1	Explain the necessity of equalization and proportioning for industrial waste water treatment	Understand	CO 2	ACE526.05
2	Enumerate the basic theories of Industrial wastewater management and Explain the strength reduction.	Understand	CO 2	ACE526.05
3	What is volume reduction? List and explain any four methods of the volume reduction in industrial wastewater	Remember	CO 2	ACE526.06
4	What is the necessity of Neutralization in Industrial waste treatment? Explain the working of the same with suitable examples.	Understand	CO 2	ACE526.05
5	Explain the process of Oil Separation by floatation method	Understand	CO 2	ACE526.05
6	Explain about the flow equalization process	Understand	CO 2	ACE526.05
7	Explain the Neutralization process	Remember	CO 2	ACE526.05
8	Discuss the phenomenon of discrete sitting of particles in Primary treatment process.	Remember	CO 2	ACE526.06
9	Explain the various methods of volume and strength reduction adopted for the industrial waste	Remember	CO 2	ACE526.06
10	Write a short on theory of sedimentation, grit chamber and its importance	Understand	CO 2	ACE526.05
11	Explain the process of coagulation and sedimentation	Remember	CO 2	ACE526.05
12	Write a short on solids separation, filtration in Industrial wastewater treatment	Understand	CO 2	ACE526.06
13	Brief the various aerobic and anaerobic treatment methods conventionally used in industrial wastewater treatment.	Understand	CO 2	ACE526.06
14	Draw the sketches of following and explain the mechanism of the treatment 1).Stabilization ponds, 2).Oxidation ditch	Understand	CO 2	ACE526.05
15	Differentiate the equalization and neutralization of industrial waste water	Remember	CO 2	ACE526.06

16	Explain the methods used to reduce the volume of the industrial waste water	Understand	CO 2	ACE526.05
17	Write short notes on On-line and Off-line equalization?	Remember	CO 2	ACE526.05
18	In what different ways the neutralization of industrial wastes is achieved? Explain	Understand	CO 2	ACE526.05
19	Explain in detail the process of Pre-Treatment of industrial waste water	Understand	CO 2	ACE526.05
20	Explain in detail the process of Primary Treatment of industrial waste water	Remember	CO 2	ACE526.05

### UNIT – III

#### DESCRIPTION OF MAIN TREATMENT METHODS

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

1	List the different treatment methods of Wastewater	Remember	CO 3	ACE526.07
2	Write a short on Nitrification of Industrial waste water	Understand	CO 3	ACE526.07
3	Write a short on Denitrification of Industrial waste water	Understand	CO 3	ACE526.07
4	Write the flow sheet of Separate Nitrification System	Remember	CO 3	ACE526.07
5	Write a short note Biological Denitrification	Understand	CO 3	ACE526.07
6	Write the flow sheet of Separate Denitrification System	Remember	CO 3	ACE526.07
7	Give the importance of Phosphorous removal from industrial effluent	Remember	CO 3	ACE526.09
8	List the different processes involved in removal of Phosphorous removal from industrial effluent	Remember	CO 3	ACE526.09
9	Write a short on Membrane technologies in Phosphorous removal	Understand	CO 3	ACE526.09
10	What is the process involved in chemical treatment in Phosphorous removal	Remember	CO 3	ACE526.09

11	What is Assimilation in Industrial waste water treatment	Understand	CO 3	ACE526.08
12	What is EBPR in Industrial waste water treatment	Understand	CO 3	ACE526.07
13	Write a short note on Absorption process in IWWT	Remember	CO 3	ACE526.08
14	What is Air Stripping in IWWT?	Understand	CO 3	ACE526.10
15	List the different methods of wastewater disposal methods	Remember	CO 3	ACE526.10
16	What do you understand by the term “Dilution” in wastewater disposal	Remember	CO 3	ACE526.10
17	Write a short note self-purification of streams	Remember	CO 3	ACE526.08
18	What is Eutrophication	Remember	CO 3	ACE526.08
19	Give the standards required for the disposal of wastewater by dilution process	Remember	CO 3	ACE526.08
20	List the different types of wastewater receiving waters for dilution.	Remember	CO 3	ACE526.08

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

1	Write an essay on heavy metal poisoning and their	Understand	CO 3	ACE526.07
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	prevention with a suitable example			
2	Express the need for the effluent standards and stream standards in waste water treatment	Remember	CO 3	ACE526.10
3	Write a short notes on disposal of industrial wastewater after the treatment	Remember	CO 3	ACE526.10
4	What do you understand by equalization, neutralization and proportioning? Give examples from industry	Understand	CO 3	ACE526.08
5	Why are solvents, grease, cyanide, phenol and sulphates considered undesirable for discharge into public sewers? Explain	Remember	CO 3	ACE526.09
6	Explain briefly the nitrogen removal by biological nitrification and denitrification.	Understand	CO 3	ACE526.10
7	Enlist & Explain the Factors Affecting Adsorption.	Understand	CO 3	ACE526.10
8	Give the ISI Standards of Industrial waste water to be discharged on land for irrigation for pH, Oil and Grease, Suspended Solids, BOD <sub>5</sub> and Cyanide	Remember	CO 3	ACE526.08
11	Explain the Applications of membrane Technologies in Wastewater treatment	Remember	CO 3	ACE526.07
12	List various effects of discharging raw industrial waste to the streams. Briefly explain any four	Understand	CO 3	ACE526.07
13	Explain briefly the process of removal of phosphorous in industrial waste water treatment	Understand	CO 3	ACE526.07
14	Explain briefly the process of removal of Heavy Metal in industrial waste water treatment	Understand	CO 3	ACE526.07
15	Discuss briefly on Air stripping and Absorption processes with respect to Industrial waste water treatment.	Remember	CO 3	ACE526.09
16	Discuss any two special treatment methods for treating industrial waste water	Understand	CO 3	ACE526.10
17	Elaborate any two disposal methods of treated industrial waste water	Understand	CO 3	ACE526.09
18	Nothing is a waste – discuss the statement with respect to industrial waste disposal	Remember	CO 3	ACE526.08
19	Give the tolerance limits for Industrial effluents to be discharged into inland surface water sources, as ISI standards for BOD <sub>5</sub> , Temperature, Total Residual Chlorine and Zinc	Understand	CO 3	ACE526.09
<b>UNIT-IV</b>				
<b>WASTE WATER FROM DIFFERENT INDUSTRIES</b>				
<b>Part - A (Short Answer Questions)</b>				
1	Give a brief note on sources of wastewater from sugar industry	Remember	CO 4	ACE526.12
2	What are the different characteristics of sugar industry effluent	Remember	CO 4	ACE526.12
3	Draw a neat sketch of the process of Sugar Industry	Understand	CO 4	ACE526.13
4	Give the values of different characteristics of sugar mill waste	Remember	CO 4	ACE526.12

5	What is the effect of waste from sugar mill on receiving streams	Understand	CO 4	ACE526.12
6	Give a brief note on sources of wastewater from Food Processing Industries	Remember	CO 4	ACE526.15
7	What are the different characteristics of Food Processing Industries effluent	Understand	CO 4	ACE526.13
8	Draw a neat sketch of the process of Food Processing Industries	Remember	CO 4	ACE526.14
9	Give the values of different characteristics of Food Processing Industrial waste	Understand	CO 4	ACE526.15
10	What is the effect of waste from Food Processing Industries on receiving streams	Understand	CO 4	ACE526.15
11	Give a brief note on sources of wastewater from Steel industry	Remember	CO 4	ACE526.15
12	What are the different characteristics of Steel industry effluent	Understand	CO 4	ACE526.14
13	Draw a neat sketch of the process of Steel Industry	Understand	CO 4	ACE526.14
14	Give the values of different characteristics of Steel industry waste	Remember	CO 4	ACE526.13
15	What is the effect of waste from sugar industry on receiving streams	Remember	CO 4	ACE526.13
16	Give a brief note on sources of wastewater from Petroleum Refineries	Remember	CO 4	ACE526.13
17	What are the different characteristics of Petroleum Refineries effluent	Remember	CO 4	ACE526.14
18	Draw a neat sketch of the process of Petroleum Refineries	Understand	CO 4	ACE526.15
19	Give the values of different characteristics of Petroleum Refineries waste	Remember	CO 4	ACE526.15
20	What is the effect of waste from Petroleum Refineries on receiving streams	Understand	CO 4	ACE526.15
<b>Part - B (Long Answer Questions)</b>				
1	Characterize the various treatment processes for food and beverage industry waste water. What are the prospects of waste utilization from food industry	Understand	CO 4	ACE526.15
2	Describe the impacts of petroleum exploration and its production on the environment	Remember	CO 4	ACE526.15
3	Describe in detail some methods for controlling the pollution from food and beverage Industries	Remember	CO 4	ACE526.15
4	a) Between BOD and COD, which one usually assumes higher value for a food plant? Justify your answer. b) Name two food plants having high value of BOD mentioning the approx. range of the values. c) What is the prescribed safe disposal limit of BOD?	Understand	CO 4	ACE526.15



5	Discuss the characteristics of petrochemical Industrial wastewater	Remember	CO 4	ACE526.15
6	Discuss the characteristics of Sugar mill waste water	Understand	CO 4	ACE526.12
7	What are the various polluting effluents generated by integrated steel plants?	Remember	CO 4	ACE526.13
8	Give the characteristics and treatment of the wastes from sugar industry	Understand	CO 4	ACE526.13

#### UNIT-V

#### COMPOSITION OF WASTE WATER AND COMMON EFFLUENT TREATMENT PLANTS

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

1	Give a brief note on sources of wastewater from Textiles Industry	Remember	CO 5	ACE526.16
2	What are the different characteristics of Textiles Industry effluent	Remember	CO 5	ACE526.16
3	Draw a neat sketch of the process of Textiles Industry	Remember	CO 5	ACE526.16
4	Give the values of different characteristics of Textiles Industry waste	Understand	CO 5	ACE526.16
5	What is the effect of waste from Textiles Industry on receiving streams	Understand	CO 5	ACE526.16
6	Give a brief note on sources of wastewater from Tanneries Industry	Remember	CO 5	ACE526.17
7	What are the different characteristics of Tanneries Industry effluent	Understand	CO 5	ACE526.17
8	Draw a neat sketch of the process of Tanneries Industry	Remember	CO 5	ACE526.17
9	Give the values of different characteristics of Tanneries Industry waste	Understand	CO 5	ACE526.17
10	What is the effect of waste from Tanneries Industry on receiving streams	Understand	CO 5	ACE526.18
11	Give a brief note on sources of wastewater from Atomic Energy Plants	Remember	CO 5	ACE526.18
12	What are the different characteristics of Atomic Energy Plants effluent	Remember	CO 5	ACE526.19
13	Draw a neat sketch of the process Atomic Energy Plants	Understand	CO 5	ACE526.19
14	Give the values of different characteristics of Atomic Energy Plants waste	Understand	CO 5	ACE526.20
15	What is the effect of waste from Atomic Energy Plants on receiving streams	Understand	CO 5	ACE526.20
16	Give a brief note on sources of wastewater from Mineral Processing Industries	Understand	CO 5	ACE526.21
17	What are the different characteristics of Mineral Processing Industries effluent	Remember	CO 5	ACE526.22
18	Draw a neat sketch of the process of Petroleum Refineries	Understand	CO 5	ACE526.22
19	Give the values of different characteristics of Mineral Processing Industries waste	Remember	CO 5	ACE526.23
20	What is the effect of waste from Mineral Processing Industries on receiving streams	Understand	CO 5	ACE526.23

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

1	With the neat process flow sheet, highlight the origin and characterization of wastewater generated in typical tannery industry	Understand	CO 5	ACE526.16
2	With the neat process flow sheet, highlight the origin and	Remember	CO 5	ACE526.16

	characterization of wastewater generated in textile industry			
3	Discuss the characteristics of tannery waste	Remember	CO 5	ACE526.16
4	Explain the advantaged and limitations of combined treatment of industrial waste and municipal waste water.	Understand	CO 5	ACE526.16
5	What are the sources of various pollution in an integrated cotton Textile mill? Give a plan for the control of this pollution.	Remember	CO 5	ACE526.16
6	What are the advantages of combined treatment of industrial waste water with domestic waste water.	Understand	CO 5	ACE526.17
7	Explain the Neat flow diagram a working of a CEPT. What are the situations in which it is used.	Remember	CO 5	ACE526.16
8	Describe the characteristics of Atomic Energy plants effluents.	Understand	CO 5	ACE526.17
9	Describe the characteristics of Mineral processing Industrial effluents.	Understand	CO 5	ACE526.18
10	Explain the process involved in Joint treatment of Raw Industrial wastewater and Domestic Sewage	Remember	CO 5	ACE526.19
11	What are the factors to be considered while selecting the location for Common Effluent Treatment Plants (CEPT)	Remember	CO 5	ACE526.20
12	Explain the design procedure of Common Effluent Treatment Plants (CEPT)	Understand	CO 5	ACE526.21
13	Explain in detail the operation procedure of Common Effluent Treatment Plants (CEPT)	Understand	CO 5	ACE526.22
14	Discuss the various maintenance problems of Common Effluent Treatment Plants (CEPT)	Remember	CO 5	ACE526.23

**Prepared by**

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