

**GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT****COURSE CURRICULUM  
COURSE TITLE: INDUSTRIAL WATER POLLUTION****(COURSE CODE: 3351303)**

<b>Diploma Programme in which this course is offered</b>	<b>Semester in which offered</b>
Environmental Engineering	5 <sup>th</sup> Semester

**1. RATIONALE:**

The amount of water being discharged into nature from industrial sources is increasing day by day, which most of the times are hazardous to human life, flora & fauna. The course aims to prepare students to develop better understanding of pollution due to waste water from industries and methods of their proper treatment and disposal to keep the environment and community healthy & safe. This course on 'industrial water pollution' is an important course for diploma programme in Environmental Engineering. As environmental technicians/engineers they should develop understanding of various issues & standards for treatment and disposal of waste water from industry sources. Technical and legal aspects of disposal of waste water into different sinks, sources of waste water generation, its treatment, etc. included in the subject of Industrial Water Pollution.

**2. LIST OF COMPETENCY:**

The course content should be taught and with the aim to develop required skills in the students so that they are able to acquire following competencies.

**Supervise operation and maintenance of industrial effluent water treatment plant to reduce the discharge water pollution levels well below the permissible limits.**

**3. COURSE OUTCOMES**

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning outcomes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. State parameters of effluent standards and stream standards
- ii. Describe the process for removing heavy metals and radioactive material from effluent.
- iii. Explain important principles of water pollution control
- iv. Neutralizes and Equalizes polluted water
- v. Treat waste water from various industries

#### 4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Schedule				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	100
2	3	0	5	70	30	0	0	

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

#### 5. COURSE CONTENT DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics And Subtopics
<b>UNIT-I Indian Standards for Discharge of Wastewater</b>	1a. State standards and criteria for treated water discharge into various sinks 1b. Explain cost of pollution control 1c. Describe parameters of effluent standards and stream standards	1.1 Criteria and standards. 1.2 Effluent standards and stream standards. 1.3 Standards for discharge of wastewater in to river, sea, for irrigation & important considerations for it, etc. 1.4 Cost of pollution control.
<b>UNIT-II Quality of Waters for Industries</b>	2a. State the limits of parameters for quality of water for industrial uses - boiler feed, cooling water system, different manufacturing processes.	2.1 Quality of water for boiler feed, cooling water system, different manufacturing processes.
<b>UNIT-III Principles of Water Pollution Control</b>	3a. Explain the methods used for strength and volume reduction of industrial effluents 3b. Describe Neutralization and Equalization	<b>Water Pollution Control:</b> 3.1 Reduction of strength and volume 3.2 Neutralization and Equalization
<b>UNIT-IV Removal of Heavy Metals and Radioactive Materials</b>	4a. State the heavy metals and radioactive materials 4b. Describe various methods used for removal of heavy metals and radioactive materials	<b>Heavy Metals and Radioactive Materials removals:</b> Introduction and methods
<b>UNIT-V Major Industrial Wastes</b>	5a Describe the Characteristics of wastewater of each stream for following industries: • Textile Industry • Dairy Industry • Pharmaceutical Industry • Chemical Industry – Dye & Dye	<b>Major Industrial Wastes:</b> Manufacturing process, Sources of wastewater from process, Characteristics of wastewater of each stream and Treatment of wastewater for following industries: • Textile Industry

	intermediates • Food- processing Industry • Fertilizer Industry • Sugar industries • Petrochemical industries 5b Describe in brief Manufacturing process of above listed Industries 5c Explain treatment process of wastewater from the above listed industries	<ul style="list-style-type: none"> <li>• Dairy Industry</li> <li>• Pharmaceutical Industry</li> <li>• Chemical Industry – Dye &amp;Dye intermediates</li> <li>• Food- processing Industry</li> <li>• Fertilizer Industry</li> <li>• Sugar industries</li> <li>• Petrochemical industries</li> </ul>
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## 6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS ( Theory)

Unit	Unit Title	Teaching Hours	Distribution Of Theory Marks			
			R Level	U Level	A Level	Total Mark
I	Indian Standards for Discharge of Wastewater	06	05	05	05	15
II	Quality of Waters for Industries	04	03	03	04	10
III	Principles of Water Pollution Control	04	03	03	04	10
IV	Removal of Heavy Metals and Radioactive Materials	04	03	03	04	10
V	Major Industrial Wastes	10	08	09	08	21
	<b>TOTAL</b>	<b>28</b>	<b>23</b>	<b>23</b>	<b>24</b>	<b>70</b>

**Legends:** R = Remember; U = Understand; A = Apply and above levels (Bloom's revised taxonomy)

**Note:** This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

## 7. SUGGESTED LIST OF EXERCISES/PRACTICAL:

**Note:** There are no practical in this course. However there are tutorial sessions, in which following exercises needs to be done.

S No.	Unit No.	List of Tutorials	Approx. Hrs. Required
1	I	Determine quantity of wastewater discharge into sinks from various types of industries-Numerical Problems/Cases	06
2	II	Determine quality parameters of waters/waste water for different industries	06
3	III	Exercises based on principles of prevention & pollution control due to industrial operations	06
4	V	Tutorials based on different Industrial waste like, Pharmaceutical industry, Dairy industry with their sources & treatment	16
5	ALL	Industrial visit - Dairy industry/Fertilizer industry, Textile industry, etc.-Detailed report preparation highlighting specific features of pollution, compliance, control measures, & treatment etc,	08
<b>Total</b>			<b>42</b>

## 8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Surf the internet for the advancements in the field of industrial water pollution control methods and prepare a presentation
- ii. Develop (in groups) models/charts for treatment of industrially polluted water

## 9. SPECIAL INSTRUCTIONAL STRATEGIES (if any):

- i. Arrange expert lectures from field / industry Engineers,
- ii. Arrange field visit to water and waste water treatment facilities.
- iii. Show video films/photographs/animations/charts of different water treatment procedures.

## 10. SUGGESTED LEARNING RESOURCES

### A. List of Books

Sr. No	Title	Author	Publication
1	Hand book of industrial pollution and control VOI-& II,	S.C. Bhatia	
2	Industrial water pollution: Origin, characteristics and treatment.	Nelson Nemerow	

### B. List of Software or Learning Website:

- i. [www.gpcb.gov.in](http://www.gpcb.gov.in)
- ii. [www.gwssb.org](http://www.gwssb.org)
- iii. [www.cpcb.nic.in](http://www.cpcb.nic.in)
- iv. [www.neeri.res.in](http://www.neeri.res.in)

**11. COURSE CURRICULAM DEVELOPMENT COMMITTEE:****Faculty Members from Polytechnics**

- **Prof .M.C. Sanandiya**, Lecturer in Environmental Engineering, K. J. Polytechnic, Bharuch,

**Coordinator and Faculty Members from NITTTR Bhopal**

- **Prof. V.H. Radhakrishnan**, Professor, Department of Civil and Environmental Engineering.
- **Prof. Shashi Kant Gupta**. Professor and Coordinator for State of Gujarat.