GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Environmental Engineering (13), Environmental Science & Engineering (37)
SUBJECT NAME: Industrial Water Pollution & Control
SUBJECT CODE: 2171303
B.E. 7TH SEMESTER

Type of course: Applied science

Prerequisite: Knowledge of wastewater treatment technologies

Rationale: This course provides knowledge of industrial waste water treatment options.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	2	0	6	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment; OEP-Open Ended problem; AL-Active learning;

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Water Quality Standards for industrial use:** Relevant Indian Standards for use of water in Textiles, Paper industry, chemical, Pharmaceutical, soft drink, boiler feed water, cooling tower, problems of silica, scaling & corrosion, caustic embitterment.	04	7
2	**Oil Pollution:** Sources of oil pollution in industries. Effects of oil pollution, Treatment and removal techniques.	06	11
3	**Standards for disposal into different Sinks:** Difference between criteria & standards, Stream standards, effluent standards, relevant Indian standards for disposal in to different sinks, costs of pollution control	04	7
4	**Volume & Strength reduction in industrial wastewater:** Measures for volume reduction & Strength Reduction	04	7
5	**Pre and Primary treatment for industrial wastewater:**	06	11

	Equalization & proportioning, Neutralization, Heavy metals removal.		
6	**Common Effluent Treatment plants:** Need, concept and treatment technologies	**06**	11
7	**Pollution Control in Industries:** Manufacturing process, Identification & characterization of sources of wastewater, treatment of wastewater including recycling & reuse concepts in Textile industry, pharmaceutical industry, Diary industry, sugar industry, starch industry, fertilize industry, tannery, distillery, pulp & paper industry, petrochemical industry, dye & dye intermediate.	**12**	22
8	**Treatment for strong industrial waste:** Incineration, Evaporation: Natural & forced evaporation.	**06**	11
9	**Concepts of disposal of wastewater into different sinks:** Disposal into river, lake, oceans	**08**	13

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
15	**25**	**30**	**15**	**15**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Revised Bloom's 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.

Reference Books:

1. Industrial Water pollution by Nelson L. Nemerow
2. Industrial water pollution by W. Wesley Eckenfelder –Mcgraw-Hill International edition
3. Wastewater Engineering, Treatment & Reuse by Metcalf & edition Tata – Mcraw –Hill edition.
4. Handbook of Industrial Pollution & Control Vol. I & II by S.C. Bhatiya CBS , Published & distributions
5. Wastewater Treatment by M.N. Rao & A.K. Datta.
6. Relevant Indian Standards.

Course Outcome:

After learning the course the students should be able to:

1. Infer the standards for disposal of effluent in to different environmental sinks..
2. Justify the benefits of pollution control to the industry.
3. Categorize the strength and volume reduction techniques in industrial wastewater.

4. Devise the methods for pre and primary treatment of industrial wastewater.
5. Appraise the concept of Common Effluent Treatment Plant.
6. Exhibit the understanding of pollution control in major polluting industries.
7. Predict the fate and transport of pollutants discharged into various environmental sinks by using environmental modeling.

List of Experiments and Tutorials

1. Characterization of wastewater from different industries.
2. Determinations of lime dose for neutralization of acidic waste.
3. Determination of Optimum Coagulant dose.
4. Color removal by using Adsorption.
5. Treatment of high COD waste using advanced oxidation processes.
6. Assignments on Water quality Standards for different industries, standards for disposal in to different sinks.
7. Assignments on Oil pollution.
8. Assignments on Volume reduction and strength reduction.
9. Assignments on Pre and Primary treatment for industrial wastewater.

Design based Problems (DP)/Open Ended Problem:

1. Term paper on Industries including manufacturing process, identification and characterization of sources of waste water/ air pollution, treatment of waste water including waste minimization with flow diagram.

Major Equipment:

1. Hot air oven.
2. COD apparatus.
3. pH meter.
4. Electronic balance.
5. UV- Vis Spectrophotometer
6. B.O.D Incubator

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.