GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL SCIENCE AND TECHNOLOGY (35)
LIQUID EFFLUENT TREATMENT-I
SUBJECT CODE: 2153509
B.E. 5thSEMESTER

Type of course: Environmental Science & Technology

Prerequisite: A good fundamental knowledge of water and wastewater chemistry along with basic treatment methods and disposal

Rationale: This subject is intended to make students aware about various types ofliquid effluentgenerated by households and industries and their treatments to reducewater pollution.

Teaching andExamination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1.	Introduction of effluent:industrial effluent, domestic effluent and other related terms,Sources of effluent& sewage,Characterization of sewage and industrial effluent,Brief outline of important water quality standards, Standards for waste water discharge, Health issues related to liquid effluents.	8	20
2.	Overview oftreatment plant: Sewage Treatment Plant, Effluent Treatment Plant, Fundamentals of various physical and chemical units & processes for wastewater treatment:Screen,Grit chamber, Equalization tank, Coagulation&Flocculation,Neutralization tank,Sedimentation tank.	12	30
3.	Fundamentals of various biological and advance treatment methods for industrial effluent: Aerobic treatment - ASP, RBC, Trickling Filter,Anaerobic treatment: ASBR, UASB, FBR, AEBR, ABR, AMBR,Suspended Growth treatment,Attached Growth treatment.Advance treatment: Carbon adsorption process, Ion exchange process, Membrane process: Microfiltration, Nanofiltration, Ultrafiltration, Reverse osmosis	14	25
4	Fundamentals of water treatment : Importance & Necessity for planned water supplies, Water Demand, population forecasting methods, source of water , collection of surface water, treatment units & processes and distribution system.	12	25

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
22	**24**	**20**	**20**	**14**	**-**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create 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.

ReferenceBooks:

1. Wastewater Engineering: Treatment and Reuse, Metcalf & eddy; McGraw Hill Book Company, 4th Ed, 2002.
2. Environmental Pollution and Control engineering, Rao C. S. - Wiley Eastern Limited,India,1993.
3. Water Treatment Plants: Planning, Design & Control, S R Qasim, Technomic Pub. Co., 1999.
4. Industrial Water Pollution Control, Eckenfelder W.W.; McGraw Hill Book Company, 3rd Ed, 2000.
5. Environmental Engineering, Kiely G.; McGraw Hill Book Company, 1998.
6. Pollution control in process industries, S.P. Mahajan TMH., 1985.
7. Waste water treatment, M.Narayana Rao and A.K.Datta, Oxford and IHB publ. New Delhi.
8. Industrial Pollution Control and Engineering, Swamy AVN, Galgotia publications, 2005.
9. Environmental Engineering (Vol. II)- Sewage disposal and Air pollution, S.K Garg&RajeshwariGarg, Khanna Publishers, 27th Edition, 2013.
10. Environmental Engineering and Sanitation: Joseph A. Salvato, John Wiley & Sons,4th Ed. 2003
11. Water Supply and Sanitary Engineering, Birdie and Birdie, Dhanpatrai and Sons, 1996.
12. Environmental engineering (Vol. I)- Water Supply Engineering S.K Garg&RajeshwariGarg, Khanna Publishers, 23rd Edition, 2013
13. Elements of Water Resources Engineering, Duggal K.N and J P Soni, New Age International Publishers, 2005

CourseOutcome: Afterlearning thiscoursethe studentswould have:

1. Proper understanding about industrial and domestic effluent, their sources, characteristics, discharge limits
2. Information about Sewage treatment and effluent treatment.
3. Understanding about physical, chemical, biological and advance treatment methods for industrial effluent
4. Hands on experience on sampling and measurements of water Pollutants

List of Experiments:

Minimum**5**practicalstobeperformedandremaining time should be allotted to open-endedprojects/study reports/latest outcomes in technologystudy**:-**

PRACTICALS (ANYFIVE):

1 Intoduction to liquid effluent treatment lab

2 To determine the pH of given sample using digital pH meter
3 Determination of Conductivity in given wastewater sample
4 Determination of Total Suspended Solid of wastewater sample
5 Determination of Total Dissolved Solid in given wastewater sample
6 Determination of Dissolve Oxygen of wastewater sample
7 Determination of the BODin given wastewater sample
8 Determination of COD of given wastewater sample
9 Determination of the Acidity & Alkalinity in given wastewater sample
10 Determination of Total Hardness of given wastewater sample
11 Determination of Chloride Content of wastewater sample

Design based Problems (DP)/Open Ended Problem:

1. Surveying the characteristics of the river water body
2. Surveying the characteristics of the ground water
3. Surveying the characteristics of the drinking water in villages
4. Surveying the characteristics of the drinking water in city
5. Find out the treatment efficiency of the ETPs
6. Find out the treatment efficiency of the CETP
7. Comparison of various treatment option for a waste
8. Find out the treatability study for a waste.
9. Waste and wastewater analysis
10. Case study: water & wastewater.

Major Equipment: Glass wares, Weighing balance, pH meter, conductivity meter, Hot Air Oven, BOD incubator, COD digester, vacuum pumpetc

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.