GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL AND INFRASTRUCTURE ENGINEERING

WATER AND WASTE WATER TREATMENT TECHNOLOGIES

SUBJECT CODE:2164010

B.E. 6th Semester

Type of course: Elective

Prerequisite: No prerequisite

Rationale: Water and Waste Water Treatment Technologies is providing conceptual understanding and applications of water supply system and waste water system for infrastructure projects. With the help of this knowledge students may be able:

1. To understand and analyze the characteristics of water and wastewater
2. To estimat the quantity of drinking water and domestic wastewater generated
3. To understand the unit operations involved in the water supply systems and sewerage system
4. To know the design process of water and waste water unit operations & system

Teaching and Examination Scheme:

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

Contents:

Sr. No	Topics	Hrs.	% Weightage
1	**Water Characteristics** Indian standard for drinking water, Water Quality Parameters: pH, Alkalinity, Electrical conductivity, Taste, Odor, Colour, Solids, Turbidity, Hardness, Plate counts and Most probable number (MPN).	4	9%
2	**Water Treatment and Distribution System:** Quantity and Source of water, intakes, unit operations for water treatment, plain sedimentation, aeration, sedimentation tank and its design**,** flocculation**,** coagulation, filtration, disinfection, softening, ion exchange and adsorption. Water storage and distribution system**.**	10	24%
3	**Waste Water Characteristics & Treatment:** Pollution of Natural Waters Emission and receiving body standards. Stream pollution, Ocean disposal. Waste Water Characteristics: Chemical oxygen demand (COD), Dissolved oxygen (DO), Biochemical oxygen demand (BOD), Ions like chloride, fluoride, sulphate, Nutrients i.e. nitrogen and phosphorous. Treatment Fundamentals: Flow-sheets, physico-chemical and biological processes for water quality control.	6	14%
4	**Physico-Chemical Treatment:**	4	9%

	Process dynamics and reaction, Screens comminutors. Grit chambers, sedimentation, equalization, floatation and chemical treatment.		
5	**Biological Treatment Processes** Aerobic and anaerobic, suspended – growth and attached – growth treatments. Types, modifications. Activated – sludge unit trickling filters, Aerated lagoons, stabilization ponds, oxidation ditches. Aerators. Theory of sludge Handling and disposal. Low cost sanitation system: septic tanks, soak pit, stabilization ponds.	**10**	**24%**
6	**Sewerage system** **Collection and estimation of sewage:** Different types of sewers, design period, variations in sewage flow, estimation of waste water discharge and Storm water discharge. **Hydraulic design of sewer:** Hydraulic formulae, maximum and minimum velocities in sewer, hydraulic characteristics of circular sewer in running full and partial full conditions, laying and testing of sewer, sewer appurtenances and network.	**8**	**20%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**25**	**20**	**15**	**15**	**0**

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

Text Books:

1. S.K.Garg, Environmental Engineering (Vol.I & II), Khanna Publishers.
2. B.S.N Raju, Water Supply and Waste Water Engineering, Tat-McGraw Hill, New Delhi.
3. G.S.Birdie and J.S.Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai Publishing Co.- New Delhi.
4. Metcalf & Eddy, "Waste water engineering Disposal & Reuse", McGraw Hill.
5. Schroeder, "Water and Waste Water Treatment", McGraw Hill.
6. Fair, Geyer & Okun, "Water & Waste Water Engineering II", John Wiley.

Course Outcome:

After learning the course the students should be able to:

1. To understand the quality and characteristics of water
2. To understand the quality and characteristics of waste water
3. To determine various water quality parameters
4. To understand the treatment process of water and waste water
5. Design the water supply and wastewater treatment systems.
6. Determine the treatment efficiency of treatment units

List of Experiments:

1. Introduction to Standards, Sampling, Collection and Preservation of samples
2. MPN Test

3. Determination of pH and conductivity for water and wastewater
4. Determination of Solids (suspended, dissolved and settle able)
5. Determination of Acidity and Alkalinty
6. Determination of hardness and residual chlorine
7. Determination of fluoride and nitrate
8. Determination of chloride and residual chlorine of water samples
9. Ambient air quality measurement using High Volume sampler
10. Exhaust gas analysis for air pollutants
11. Determination of DO, BOD and COD of waste water
12. Sewage Collection and Hydraulic design of Sewer
13. Design of water and waste water treatment plant

List of Open Source Software/learning website: **www.nptel.iitm.ac.in/courses/**

Active learning Assignments (AL) : 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.