



# GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3160611

**SUBJECT NAME: ENVIRONMENTAL ENGINEERING  
SEMESTER-VI**

**Type of course: Professional Core course**

**Prerequisite: Mandatory course of Environmental Science**

### Rationale:

1. Drinking water is one of the basic needs of the human being; this subject helps the civil engineer in planning of a water supply scheme that can provide potable water to the community.
2. To maintain the general hygiene in the habitation, proper handling and disposal of sewage and solid waste is important. This subject helps the civil engineer in dealing with the issues related to collection, treatment and disposal of sewage and solid waste.
3. To understand effect of noise and air pollution and its control measures

### Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

### Content:

Sr. No.	Content	Total Hrs	% Weightage
1	<b>Water Supply scheme/System</b> Components and layout of water supply scheme, Sources of water, Types of water demand, Estimation of quantity of water required, Collection and conveyance of water, Quality characteristic of drinking water, Drinking water standard, Water borne diseases Water, Treatment processes: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes, Water Distribution system: components, type of layouts, determination of capacity of elevated reservoirs, The Water (prevention and control of pollution) Act-1974	12	30
2	<b>Sewage : Characteristics, Treatment and Disposal</b> Physical, chemical and biological characteristics of sewage, Methods of sewage disposal, Indian standards for disposal of sewage, Self purification capacity of river, Sewage farming, Unit operations and unit processes in sewage treatment, Layout of sewage treatment plant, Preliminary, Primary treatment of sewage, Aerobic and anaerobic biological treatment: attached growth and suspended growth processes, Low cost sanitation: septic tank and soak pit.	11	25
3.	<b>Collection of sewage</b> Type of sewerage systems: combined and separate, Quantity of Sewage, Sewage flow variations. Conveyance of sewage: Sewers, shapes design parameters, laying and testing of sewer, Sewer appurtenances.	5	10



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4	<b>House Drainage</b> Principles of house drainage, Pipes and traps, Classification of traps: nahni trap, gully trap, interception trap, grease trap, Sanitary fitting, System of plumbing, House drainage plan for building.	2	10
5	<b>Solid Waste Management</b> Quantity, composition and characteristics of solid wastes, Classification of solid wastes. Hazardous solid wastes, Biomedical solid wastes, Typical generation rate for solid wastes, Factors affecting the generation rate. Estimation of quantity of solid waste, Onsite handling, storage and processing, Collection services, Types of collection systems, Transfer stations, Solid waste processing techniques, Disposal of solid waste.	5	10
6	<b>Air and noise pollution</b> Classification and sources of air pollutants. Air quality standards, Effects of air pollution on human, plant and material, Basic Air pollution control methods, Salient features of the Air (Prevention and control of pollution) Act – 1981 Noise pollution: definition, measurement, standards, sources, effect and control measure.	4	10
7	<b>Environment Impact Assessment(EIA)</b> Environment Protection Act, Need of EIA, Steps for EIA, Role of EIA is sustainable develop met	3	5

### Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10%	25%	30%	15%	10%	10%

**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.

### Reference Books:

1. H.S. Peavy, D.R. Rowe and G. Tchobanoglous, Environmental Engineering, McGraw Hill International Edition
2. M. L. Davis, Water and waste water Engineering, Mc Graw Hill education (India).
3. Metcalf and Eddy, Wastewater Engineering: Treatment, disposal Reuse, Tata-McGraw Hill education (India).
4. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil, McGraw Hill Publication
5. S.K. Garg, Environmental engineering Vol. I & II, Khanna Publication
6. Manual on Water Supply and Treatment, Ministry of Urban Development, New Delhi
7. Manual on Sewerage and Sewage Treatment Systems, Part A, B and C. Central Public Health and
8. Environmental Engineering Organization, Ministry of Urban Development.



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## Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	Determine the quantity and quality of water required for public water supply	20%
CO-2	Interpret the effect of wastewater characteristics on human health and environment	15%
CO-3	Design different units of water and sewage treatment plant	40%
CO-4	Classify solid waste and interpret the components of solid waste management system	10%
CO-5	Analyze the effects of air and noise pollution on human and environment and develop its remedial measures.	15%

## List of Experiments:

1. Physical Characterization of water: Turbidity, Conductivity, pH
2. Analysis of solids content of water: Dissolved, Settleable, suspended, total, volatile, inorganic etc.
3. Determination of Alkalinity and acidity
4. Determination of Hardness: total hardness, calcium and magnesium hardness
5. Determination of Chlorides
6. Determination of Optimum coagulant dose: Jar Test
7. Chemical Oxygen Demand (COD)
8. Dissolved Oxygen (D.O) and Biochemical Oxygen Demand (BOD)
9. Determination of residual chlorine in water
10. Bacteriological quality measurement: MPN,
11. Ambient Air quality monitoring (SPM, SO<sub>x</sub>, NO<sub>x</sub>)
12. Ambient noise measurement

## Assignments:

1. Design of various units of a conventional water treatment plant
2. Design of Trickling filter and Activated sludge unit.

## Major Equipment:

1. BOD incubator
2. COD digester
3. Hot air oven
4. Muffle furnace
5. Electronic Balance (Accuracy: 1mg)
6. Jar Test Apparatus
7. pH, Turbidity, TDS and Conductivity meter
8. Sound level meter
9. High volume sampler
10. 3/5 Gas Analyzer
11. Microbial Incubator

## List of Open Source Software/learning website:

1. <http://nptel.ac.in/courses>



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2. <http://moef.gov.in>
3. <http://jalshakti-ddws.gov.in>
4. <http://cpcb.nic.in>
5. EPANET