



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Branch: Environmental Engineering

Subject Code: BE03013011

Course / Subject Name: Water Supply and Sewerage System

w.e.f. Academic Year:	2024-25
Semester:	3
Category of the Course:	Professional Core Course

<b>Prerequisite:</b>	Knowledge of hydrological cycle and its components
<b>Rationale:</b>	Water supply and sewerage system is essential for developing sustainable and effective solutions for community.

## Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
01	Identify the sources of water considering the quantity and quality.
02	Explain the components of water supply scheme including intakes, pipes, pumping systems, distribution system, valves and fittings.
03	Design construction and maintenance of the sewers considering the quantity of storm water and sewage.
04	Describe the concept of sewers, sewer systems, sewer appurtenances, drains and plumbing.

## Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH		Theory		Tutorial / Practical			
						ESE (E)	PA (M)	PA/ (I)	PBL (I)	ESE (V)	
45	0	30	45	120	04	70	30	20	30	50	200

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, ESE = End-Semester Examination, PA = Progressive Assessment

\* Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.



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## Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	<b>Water supply scheme:</b> Importance & necessity of water supply scheme, Importance and reliability of water works, essentials of water supply engineering	02	5
2	<b>Sources of water:</b> Surface water sources, ground water sources and terminology related to ground water, comparison of different sources based on quality and quantity.	02	5
3	<b>Demand of water quantity:</b> Types of demand, Per capita demand, design period, fluctuation in demand of water, factors affecting demand of water	02	5
4	<b>Pumps and Pumping stations:</b> Need of pumping, classification of pumps, different type of pumps used in water supply, power of pumping, total lift of pump, H.P of pump, location of pumping station, site selection.	04	08
5	<b>Collection and conveyance:</b> Intakes, type of intake, conveyance of water, different type of pipes used in water supply, pipe-joints, laying of pipe, hydrostatic test.	02	5
6	<b>Distribution system:</b> Type of distribution system, different layout of distribution system, methods of supplying water, pressures in distribution system, distribution resources and its capacity, type of reservoirs & accessories	04	08
7	<b>Valves and Fittings:</b> Different type of valves, hydrants, meters, stop cock & water tap, pipe fittings, leakage & waste of water factors, affecting losses & wastes.	04	10
8	<b>Sanitary works:</b> Definitions, sanitary works, objectives of sewage disposal	02	5
9	<b>Systems of sanitation:</b> Methods of collection, conservancy systems, collection system, water carriage system, sewerage system	02	5



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10	<b>Quantity of sanitary and storm sewage:</b> Sources of sanitary sewage, factors affecting and determination of quantity of sanitary sewage, factor affecting storm sewage and determination of quantity of storm sewage	04	10
11	<b>Design of sewers:</b> Design period, per capita sewage flow, ground water infiltration, estimation of storm runoff, flow assumption, determination of velocity of flow	04	10
12	<b>Drains and sewers:</b> Drains, sewers: sections, sewer material, sewer drawings, corrosion prevention in sewers	02	5
13	<b>Sewers appurtenances:</b> Manhole, street inlet, flushing tanks, catch basins, inverted siphon, ventilation of sewers	05	10
14	<b>Construction and maintenance of sewers:</b> Laying of sewers, jointing of sewers, and hydraulic testing of pipe sewers, maintenance of sewers, sewer cleaning equipments and devices.	03	5
15	<b>House plumbing:</b> Terms, Plumbing tools, traps and system of plumbing	03	4
	<b>Total</b>	<b>45</b>	<b>100</b>

## Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	20	15	15	-	-

Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)

## References/Suggested Learning Resources:

### (a) Books:

1. Water supply and sewage system – G. S. Birdie
2. Water Supply & Sewage Systems - K.N. Duggal
3. Water Supply & Sewage Systems – S. K. Garg
4. Water Supply and Sanitary Engineering – Rangwala
5. Water Supply and Sewerage – T. J. McGhee and E. W. Steel

### (b) Open sources of software and website: Virtual Lab, NPTEL, CPHEEO Manual on Water



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## Supply and Sewerage System

**Suggested Course Practical List:** Students will have to perform following experiments in laboratory and prepare the laboratory manual.

Following activities shall be performed during laboratory hours: (minimum 10 need to be carried out)

1. Compare Water Quality of Ground and Surface Water Sources (Total Hardness and Total dissolved Solids)
2. Determination of Residual Chlorine of various locations (Tap water, Water Treatment Plant, Pumping Station)
3. Estimation of Daily/Seasonal Water Demand for an Institute/Society/Hostel
4. Survey of Leakages from Pipelines and Water Taps
5. Quantification of Stormwater in a Village/City
6. Assessment of Water Distribution System and Report Preparation.
7. Inspection and Report on City Water Treatment Plant/Intake Structure/Water Pumping Station.
8. Solve Examples based on Pumps
9. Solve Examples based on Quantity of Storm Water and Sewage
10. Solve Examples based on Design of Sewers
11. Leak Detection in water Distribution Network of given area by EPANET Software.
12. Sewer Pipe designs based on given data using SewerGEMS Software.

**Suggested Activity:** To visit pumping station and different type of intake work.

### • List of suggested activities for Problem Based Learning:

Sl. No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Laboratory Visit- pollution parameters analysis laboratory of State Government/Central Government/Gujarat Pollution Control Board/Water Supply Board	Visit = 5hrs, Report preparation = 3hrs Total = 8hrs	Based on the report submitted. The report should contain observations and calculations of laboratory data.
2.	Technical Video based learning related to subjects offered during semester	Duration of video : 5hrs Report preparation : 5hrs Total = 10hrs	Multiple choice questions based Assessment
3.	Explore applications of Water GeM, Sewer GeM, EPANET Software	Duration=5 hrs	Based on report preparation using Software input data.



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4.	Secondary data compilation and its analysis related to pollution/environment attributes from International/Central/State Government Websites	Duration=5 hrs	Technical Presentation of data using statistical methods in form of report/presentation
5.	Preparation of working/Nonworking model for flow measuring devices	Duration=10 hrs	Based on project display considering technical aspects
6.	Poster presentation on laboratory practices, firefighting systems, water supply systems, sewerage systems	Duration=5 hrs	Based on poster/chart preparation and presentation skills
7.	Survey related to water demand of residential area/ institutional area/commercial area/hospitals, survey on water distribution system	Duration=5 hrs Report preparation = 5hrs Total=10 hrs	Based on data collection and its report presentation
8.	Mock-drill for chemistry laboratory safety using Institute firefighting facilities	Duration=5 hrs	Based on Active participation student
9.	Participation in Workshop/seminar related to environmental engineering	Duration = 6 hrs	Based on participation certificate
10.	Preparation of technical report from reference book on given topic	Duration=5 hrs	Based on Report preparation
11.	Assignments/numericals related to subject	Duration=10 hrs	Based on submission of given assignments
12.	Self-learning through online courses related to subjects	Duration=10 hrs	Multiple choice questions-based Assessment

Note:

- All the suggested activities should be related to the subject.
- The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity.
- Rubrics for the evaluation can be prepared by the faculty.
- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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