GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Civil Engineering

Subject Code : DI05006021

Subject Name : Water Supply & Sanitary Engineering

w. e. f. Academic Year:	2026-27
Semester:	5th
Category of the Course:	PCC

Prerequisite:	**Students know Surveying, Building Materials & Construction, Fluid mechanics, design principles, Applied & Structural Mechanics at a basic level, Soil Mechanics.**
Rationale:	Water is very important element in civilization. Social life developed on the bank of Water-source. The mental as well as social health plays vital role for remarkable growth of society. For that purpose, Pure, potable and palatable water to be supplied to the society and to maintain the hygiene of it, the waste water must be collected and treated properly before disposed of in nature, so the natural flora and fauna will not get affected by sewage disposal. In present time, solid waste also wants more attention. The technician must know about the quality as well as quantity of domestic water to be supplied to the society. Similarly, technician should be conversant with the collection, conveyance, treatment and disposal of waste water.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Understand the importance of Water Supply and Sanitary Engineering.	R, U
02	Calculate and Estimate the impurities present in water used for Domestic as well as Civil Engineering project works.	R, U & A
03	Lay and perform maintenance of water distribution system and sewer-networks.	A
04	Decide the requirement of treatment to make water potable and the treatment require for sewage to safely disposed off.	R, U & A
05	implement house plumbing work effectively.	R, U & A

**Revised Bloom's Taxonomy (RBT)*

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Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial / Practical		
L	T	PR	C	ESE (E)	PA (M)	PA (I)	ESE (V)	
3	0	2	4	70	30	20	30	150

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to Water Supply Engineering** 1.1 Importance and necessity of water supply Engineering 1.2 Sources of water 1.3 Suitability of water 1.4 Selection of source	2	05
2.	**Quantity and Quality of Water** 2.1 Population forecast 2.2 Types of demand 2.3 Computation of quantity of water 2.4 Fluctuation in demand 2.5 Factors affecting demand 2.6 Impurities in water 2.7 Collection of water sample 2.8 Physical, Chemical and Biological tests 2.9 Standards of quality of water	5	10
3.	**Treatment of Water** 3.1 Objects of water treatment 3.2 Location of water treatment plant 3.3 Layout of water treatment plant 3.4 Basic principles of working of treatment units 3.5 Coagulation 3.6 Sedimentation 3.7 Filtration 3.8 Disinfection 3.9 Water Softening 3.10 Miscellaneous Treatment 3.10.1 Removal of iron and manganese 3.10.2 Taste, odour and colour- principles and methods	7	18

	3.10.3 de-fluoridation 3.10.4 Dissolved solids removal by Reverse Osmosis		
4.	**Conveyance of water** 4.1 Types of pipes used for conveyance 4.2 Pipe joints 4.3 Laying of Pipes 4.4 Distribution system 4.4.1 Methods of Water distribution systems 4.4.2 System of Supplying Water 4.5 Types of valves 4.6 Types of Meters 4.7 Pipe fittings and fixtures	5	12
5.	**Maintenance of Water Supply Mains** 5.1 Necessity 5.2 Methods to prevent leaks 5.3 Measures for conservation of water	2	05
6.	**Sanitation System** 6.1 Related terms 6.2 Objective of sewage disposal 6.4 Methods of sewage collection 6.4 Conservancy system 6.5 Water carriage system	3	06
7.	**Drains and Sewers** 7.1 Classification of Drains 7.2 Sewer section 7.3 Sewer joint 7.4 Manhole 7.5 Flushing tank 7.6 Catch basin 7.7 Laying of sewer 7.8 Appurtenances and its locations 7.9 Hydraulic testing of sewer pipe 7.10 Maintenance of sewer	5	10
8.	**Sewage Treatment and Disposal** 8.1 Characteristics of sewage 8.2 Sampling of sewage 8.3 Treatment of sewage 8.3.1 Screens 8.3.2 Grit Chamber 8.3.3 Skimming Tank	8	18

	8.3.4 Sedimentation 8.3.5 Aeration 8.3.6 Trickling Filter 8.3.7 Activated Sludge Process 8.3.8 Sludge Digestor 8.4 B.O.D. Test, C.O.D. test 8.5 Methods of sewage disposal 8.6 Low-Cost Sanitation 8.6.1 Soak pit 8.6.2 Septic tank 8.6.3 Treatment and disposal of septic tank effluent 8.6.4 Design of septic tank		
9.	**House Plumbing** 9.1 Related terms 9.2 Plumbing tools 9.3 Pipes and pipe fittings 9.4 Fixing and jointing pipes and accessories 9.5 Traps 9.6 House drainage plan 9.7 Plumbing practice and operations 9.8 Safety and precautions 9.9 Sanitary fittings	3	06
10.	**Maintenance of Sewage System** 10.1 Procedure for maintenance of sewerage system 10.2 Causes of trouble and odour 10.3 Sewer cleaning operations 10.4 Requirements of maintenance 10.5 Functions of each maintenance equipment and tool 10.6 Selection of equipment for given maintenance job 10.7 Explosives in sewers 10.8 Safety measures for sewer-men	2	04
11.	**Recycling of wastewater and Solid Waste** 11.1 Different method with respect to quality of waste water 11.2 Utilization and management of solid waste	3	06
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
25	**35**	**40**	**--**	**--**	**--**

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:

Sr. No.	Title of Book	Author	Publication with place, year, and ISBN
1.	Water Supply & Sanitary Engg.	S. K. Hussain	Oxford & IBH
2.	Elements of Public Health Engg.	K. N. Duggal	S. Chand & Co.
3.	Water supply & Sanitary Engg.	Vazirani & Chandola	Khanna Publishers
4.	Water supply Engineering	Dr. P. N. Modi	Standard Book House, New Delhi
5.	A Text book of water supply & Sanitary Engg.	S. K. Garg	Khanna Publishers
6.	Water supply & Sanitary Engineering	Birdie G.S.	Dhanpatrai &Sons
7.	A Text book of water supply engineering	V. N. Gharpure	Allied Book Stall, Baroda
8.	A Text book of sanitary engg.	V. N. Gharpure	Allied Book Stall, Baroda
9.	Sewage Treatment & Disposal and Waste Water Engineering	Dr. P. N. Modi	Standard Book House, New Delhi
10.	Water pollution & Disposal of Waste Water on Land	U. N. Mahida	Tata McGraw Hill
11.	Municipal and Rural Sanitation	Ehlers & Steel	Mc Graw Hill book
12.	Water and Wastewater Engineering	Gorden, Fair & Gayer Okun	John Willey& Sons
13.	Manual on Water Supply and Treatment	Central Public Health & Environmental Engineering Organisation (CPHEEO)	Ministry of urban development, Government of India
14.	Manual on Sewerage and Sewage Treatment	Central Public Health & Environmental Engineering Organisation (CPHEEO)	Ministry of urban development, Government of India

(b) Open source software and website:

1. WaterTAP
2. EPANET
3. FREEWAT
4. WWTP Design Generator
5. https://www.youtube.com/watch?v=zVZ9c6EXfTA&list=PL1BFC82F3A63B4172 (NPTEL Course Lecture series)
6. www.iwwa.info

Suggested Course Practical List:

The practical/exercises should be properly designed and implemented with an attempt to develop different types of skills (outcomes in psychomotor and affective domain) so that students are able to acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

S. No.	Unit No.	Practical Exercise (Outcomes in Psychomotor Domain)	Approx. Hours Required
1	2	**Examples** of prediction of future population by various methods.	Home Assignment
2	8	**Design** of septic tank (Student will be given data, I.S. 2470(II) and handouts on septic tank, and should be asked to design the septic tank.)	Home Assignment
3	3,4,7,8,9	**Sketches** 1. Layout of Water treatment plant 2. Layout of Sewage treatment plant 3. Pipe Joints 4. Distribution Systems 5. Valves 6. Pipe fittings & sanitary fittings. 7. Filters for water treatment 8. Sedimentation Tanks 9. Activated Sludge Process 10. Trickling Filter 11. House Drainage Plan	Home Assignment
4	2	Determine pH value of given water sample.	2
5	2	Determine turbidity of given water sample.	2
6	2	Determine Residual chlorine from given sample of water	2
7	2	Determine hardness of given water sample.	2

8	2	Determine optimum dosage of coagulant (Alum) by Jar test.	2
9	2	Determine total dissolved solids in given water sample.	2
10	8	Determine B.O.D. of wastewater sample.	2
11	8	Determine C.O.D. of wastewater sample.	2
12	3	Visit to nearby water treatment plant and submit visit report.	4
13	8	Visit to nearby wastewater treatment plant and submit visit report.	4
14	ALL	Seminar: The topic for the seminar should be given to the group of three to five students and they shall be asked to defend the seminar in presence of teacher and other students**.** Detailed report of seminar should be submitted at the end.	6

List of Laboratory/Learning Resources Required:

1. Spectrophotometer
2. Water Analysis Kit
3. Jar Test apparatus
4. B.O.D. Incubator
5. Reflux apparatus
6. Various model of Fitting and Fixtures

Suggested Project List:

(a) Water quality analysis of given sample
(b) Design of water treatment plant
(c) sanitation survey of given building
(d) Evaluation of present water distribution system of given area.
(e) Evaluation of factory/industry sample with respect to dispose off in environment.
(f) Study of water borne diseases in your area in last 20 years.
(h) Solid waste management required for given site.

Suggested Activities for Students:

Students will carry out activities such as:

i. Study different codes related to water quality analysis and treatment required by the National as well as international agencies or authorities.

ii. Visit nearby site carryout maintenance work of water-supply mains or drainage lines and prepare detailed report.
iii. Prepare models of Water Treatment plant/ Wastewater treatment plant/ Septic Tank.
iv. Prepare displays for Pipe fittings/ Sanitary fittings.

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