

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: WATER SUPPLY & SANITARY ENGINEERING
(COURSE CODE: 3350603)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	5 th Semester

1. RATIONALE:

Water is very important element in civilization. Social life from the ancient times developed on the bank of water-sources. If society wants to make remarkable growth, the mental as well as social health play vital role. For that purpose and to maintain the hygiene Pure, potable and palatable water needs to be supplied to the society. Water must be collected and disposed off in nature by giving proper treatment, so the natural flora and fauna will not get affected by sewage disposal.

This course focuses on students' acquisition of knowledge, skills & practices in water supply and sanitary engineering .Knowledge about domestic water supply & sanitation system (external & internal) and house drainage& disposal facilities is imparted. The technician must know about the quality of domestic water to be supplied to the society and treatment of waste water. The knowledge and application of such aspects is essential in developing a good technician who should be conversant with the collection, conveyance, treatment, maintenance and disposal of waste water.

2. LIST OF COMPETENCIES:

The course content should be taught and the curriculum should be implemented with the aim to develop required skills so that students are able to acquire following competencies:

- Design, construct, operate and maintain water conveyance system
- Design, construct, operate and maintain sanitation system
- Maintain the treatment and recycle system of waste water, sewerage and solid waste

3. COURSE OUTCOMES:

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

- i. Select appropriate treatment to raw water useful for domestic as well as construction purpose.
- ii. Maintain the pipe-network for water supply and Sewage disposal effectively.
- iii. Calculate and Estimate the impurities present in water used for domestic as well as construction works.
- iv. Prepare lay out plan and maintain water distribution and sewer-networks.
- v. Test raw water as per the standard practices
- vi. Plan and implement house plumbing work effectively.

4. SCHEME OF STUDIES AND EXAMINATIONS:

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
L	T	P	5	Theory Marks		Practical Marks		Total Marks
3	0	2		ESE	PA	ESE	PA	
					70	30	20	30

Legends: L - Lecture; T - Tutorial/Teacher Guided Student Activity; P - Practical; C - Credit; ESE - End Semester Examination; PA - Progressive Assessment

5. COURSE CONTENT DETAILS:

Unit	Major Learning outcomes (In Cognitive Domain)	Topics and Sub Topics
Unit-I Sources, Quality and Demand of water	1a. Explain Importance of water supply engineering 1b. Identify sources of water for potable use 1c. Calculate water demand for future population 1d. Enlist factor affecting water demand 1e. Determine various impurities found in water source 1f. List Standards of quality of water with their permissible limits	1.1 Importance and necessity of water supply Engineering 1.2 Sources of water 1.3 Suitability of water 1.4 Choice of source 1.5 Types of demand 1.6 Population forecast 1.7 Computation of quantity of water 1.8 Fluctuation in demand 1.9 Factors affecting demand 1.10 Impurities in water 1.11 Collection of water sample 1.12 Physical Chemical and Biological tests 1.13 Standards of quality of water
Unit-II Treatment of Water	2a. State objectives of water Treatment 2b. Describe principles used in water treatment. 2c. Explain function of various stages of treatment of influent water	2.1 Objectives of water treatment 2.2 Location of water treatment plant 2.3 Layout of water treatment plant 2.4 Basic principles of working of treatment plant 2.5 Various stages of treatment of influent water <ol style="list-style-type: none"> i. Functioning of Coagulation treatment plant ii. Sedimentation iii. Filtration iv. Disinfection

		v. Water Softening
Unit-III Conveyance of Water	3a. List various materials used for pipe 3b. Explain various pipe joints in Distribution system 3c. List different valves and fittings used in pipe network 3d. Describe working principle of Laying of Pipes for Conveyance of Water 3e. Explain necessity of maintenance of water supply mains 3f. Describe Measures for conservation of water	3.1 Types of pipes used for conveyance 3.2 Pipe joints 3.3 Laying of Pipes 3.4 Distribution system 3.5 Types of valves 3.6 Types of Meters 3.7 Pipe fittings and fixtures 3.8 Necessity 3.9 Methods to prevent leaks 3.10 Measures for conservation of water
Unit-IV Sanitation System	4a. State objectives of sewage disposal 4b. Discuss methods of sewage collection 4c. Describe Conservancy system & Water carriage system 4d. Describe sewer appurtenances 4e. Explain Testing and maintenance of sewer 4f. Explain requirement and procedure for maintenance of sewerage system 4g. Explain functions of maintenance equipments and tools 4h. Describe Safety measures for sewer-men & Explosives in sewers	4.1 Sanitation System 4.2 Objective of sewage disposal 4.3 Methods of sewage collection 4.4 Conservancy system 4.5 Water carriage system 4.6 Classification of Drains 4.7 Sewer section 4.8 Sewer joint 4.9 Manhole 4.10 Flushing tank 4.11 Catch basin 4.12 Laying of sewer 4.13 Appurtenances and its locations 4.14 Hydraulic testing of sewer pipe 4.15 Maintenance of sewer 4.16 Procedure for maintenance of sewerage system 4.17 Causes of trouble and odor 4.18 Sewer cleaning operations 4.19 Requirements of maintenance 4.20 Functions of each maintenance equipments and tool 4.21 Selection of equipment for given maintenance job. 4.22 Explosives in sewers. 4.23 Safety measures for sewer-men
Unit-V Sewage Treatment and Disposal	5a. List the Characteristics of sewage 5b. Explain sewage treatment process & testing – sampling, B.O.D. Test, C.O.D. test 5c. Explain methods of sewage disposal	5.1 Characteristics of sewage 5.2 Sampling of sewage 5.3 Treatment of sewage 5.4 B.O.D. Test, C.O.D. test 5.5 Methods of sewage disposal
Unit-VI House Plumbing	6a. Explain house plumbing system 6b. Describe plumbing practice and safety precautions 6c. list sanitary fittings used in house plumbing & tools used	6.1 Plumbing terms 6.2 Plumbing tools 6.3 Pipes and pipe fittings 6.4 Fixing and jointing pipes and

		accessories 6.5 Traps 6.6 House drainage plant 6.7 Plumbing practice and operations 6.8 Safety and precautions 6.9 Sanitary fittings
Unit-VII Recycling of Waste Water and Solid Waste	7.a Explain different methods of recycling waste water 7.b Explain management and utilization of solid waste generated from society	7.1 Different recycling method with respect to quality of waste water 7.2 Utilization and management of solid waste 7.3

6. SUGGESTED SPECIFICATION TABLE WITH HOURS & MARKS (THEORY)

Unit	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Sources, Quality and Demand of water	6	3	4	3	10
II	Treatment of Water	7	3	2	6	11
III	Conveyance of Water	7	2	4	5	11
IV	Sanitation System	9	4	5	6	15
V	Sewage Disposal	6	2	4	4	10
VI	House Plumbing	3	0	2	3	5
VII	Recycling of Waste Water and Solid Waste	4	3	2	3	8
	Total:	42	17	23	30	70

Legends: R = Remember; U = Understand; A = Apply and above levels (Bloom's revised 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

7. SUGGESTED LIST OF EXERCISES/PRACTICAL

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

Note: Here only course outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of **Programme Outcomes/Course Outcomes in affective domain** as given in a common list at the beginning of curriculum document for this programme.

Faculty should refer to that common list and should ensure that students also acquire those programme outcomes/course outcomes related to affective domain.

No	Unit No	Practical/Exercise (Outcomes in psychomotor Domain)	Approx Hours
1.		Numerical Example	Home Assignment
	II	Predict Population for given situation by various methods	
	II	Calculate hardness of water for data of given sample	

2.	Prepare Sketches of following	Home Assignment
	1 Layout of Water treatment plant 2 Layout of Sewage treatment plant 3 Sedimentation tank 4 Filters 5 Pipe Joint 6 Distribution System 7 Pipe Fittings 8 Manholes 9 Flushing Tank 10 Catch basin 11 Sanitary fittings 12 Water sampler 13 Aeration tank 14 Activated sludge process 15 Trickling Filter 16 House Drainage Plan	
3.	Design:	02
	1 Design 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.)	
4.	Laboratory Experiments	14
	1. Determine pH value 2. Determine Hardness of potable water 3. Determine Residual chlorine from given sample of water 4. Determine Turbidity of water sample 5. Determine B.O.D. of wastewater sample 6. Determine C.O.D. of wastewater sample 7. Determine S.V.I.&S.D.I. using Imhoff cone for wastewater	
5.	Visit following and prepare a detailed report	06
	1. Water Treatment Plant 2. Sewage Treatment Plant 3. Maintenance work of water supply mains and sewage system	
6.	Present Seminar on a relevant topic:	06
	The topic for the seminar should be given to the group of three students and they shall be asked to defend the seminar in presence of teacher and other students.	
Total Hours		28

8. SUGGESTED STUDENT'S ACTIVITIES

- i. Prepare a model of septic tank for given number of residents.
- ii. Prepare model/chart of Water/ wastewater treatment plant for given residential society/village

9. SPECIAL INSTRUCTIONAL STRATEGIES (If Any)

- i. Arrange visit to local/nearby Influent treatment, Effluent treatment, Sewage Treatment plants.
- ii. Demonstrate water distribution system, sanitation systems and solid waste disposal systems by arranging visit or showing video films, NPTEL lectures.

10. SUGGESTED LEARNING RESOURCES

(A) List of Books:

No	Name of book	Author	Publisher
1	Text book of water supply & Sanitary Engg.	S.K.Hussain	Oxford & IBH
2	Elements of Public Health Engineering	K.N.Duggal	S.Chand & Co.
3	Water supply & Sanitary Engg.	Vazirani & Chandola	Khanna Publishers
4	A Text book of water supply & Sanitary Engg.	S.K.Garg	Khanna Publishers
5	Water supply & Sanitary Engineering	Birdie G.S.	Dhanpatrai & Sons
6	A Text book of water supply engineering	V.N. Gharpure	Allied Book Stall, Baroda
7	A Text book of sanitary engineering	V.N. Gharpure	Allied Book Stall, Baroda
8	Water pollution & Disposal of Waste Water on Land	U.N.Mahida	Tata McGraw Hill
9	Municipal and Rural Sanitation	Ehlers & Steel	Mc Graw hill book
10	Water and Waste water Engineering	Gorden, Fair & Gayer Okun	John Willey & Sons

(B) List of Major Equipment/Materials:

- i. Spectrophotometer
- ii. Water Analysis Kit
- iii. B.O.D. Incubator
- iv. Reflux apparatus
- v. Various model of Fitting and Fixtures

(C) List of Software/Learning Websites

See NPTEL website

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE

Faculty members of Polytechnic

- **Prof. S. M. Mistry**, H.O.D.Civil Engg., Dr. S. & S. S. Ghandhy College of Engg and Tech., Surat
- **Prof. R.M. Patel**, Sr. Lecturer Civil Engg. Government Polytechnic , Dahod
- **Prof. A.K. Popat**, Sr. Lecturer Civil Engg. Government Polytechnic , Dahod

Coordinator and Faculty Members from NITTTR Bhopal

- **Prof. M. C. Paliwal**, Associate Professor, Department of Civil and Environmental Engineering
- **Dr. J. P. Tegar**, Prof & Head, Department of Civil and Environmental Engineering