

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMADABAD, GUJARAT

COURSE CURRICULUM
COURSE TITLE: WATER SUPPLY AND SEWERAGE SYSTEM
(Code: 3341301)

Diploma Programmes in which this course is offered	Semester in which offered
Environmental Engineering	4 th Semester

1. RATIONALE

Water supply and Sewerage system is an integral part of any civil engineering projects. However, if they are not well designed and maintained then it may lead to water contamination and other type of pollution. Therefore, knowledge and understanding of water supply and sewer system and to ensure quality in their construction is very important for engineers working at site to avoid water contamination and pollution in future. This course attempts to develop knowledge and skills for designing and execution of water and sewerage system and also imparts knowledge about water and sewerage treatment and rural sanitation. Every environmental engineer should try to develop mastery over this course.

2. COMPETENCY

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

- **Design and execute water and sewerage system including their treatment plants for a medium size residential or commercial scheme.**

3. COURSE OUTCOMES (COs)

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.

- Evaluate various sources of water in terms of quantity and quality.
- Estimate the water demand considering future projection of population.
- Explain the components of water supply scheme including pipe network, distribution systems, valves and fitting.
- Estimate the quantity of sanitary and storm sewage.
- Explain essential features of various types of sewers and sewer appurtenances.

4. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				
				Theory Marks		Practical Marks		Total Marks
L	T	P	C	ESE	PA	ESE	PA	
4	0	2	6	70	30	20	30	150

Legends: L-Lecture; T – Tutorial/Teacher Guided Theory Practice; P - Practical; C – Credit ESE - End Semester Examination; PA - Progressive Assessment.

5. COURSE DETAILS

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit – I Sources Of Water and its Demand	1a. Explain importance and necessity of water supply scheme 1a.1 Define hydrology 1b. Discuss hydrology and generation of runoff 1c. Discuss various types of water demand 1d. Determine future population	1.1 Introduction 1.2 Sources of surface water (river streams, lakes, ponds) 1.3 Sources of sub surface (Springs, wells) 1.4 Ground water yield and its measurements 1.5 Define hydrology, it's importance in generation of runoff. 1.6 Various types of water demand 1.7 Factor affecting per capital water demand. 1.8 Standard methods of the forecasting population 1.8.1 Arithmetical increase method 1.8.2 Geometrical increase method 1.8.3 Incremental increase method 1.8.4 Decrease rate of growth method 1.8.5 Graphical Method
Unit-II Collection and Conveyance	2a. Describe various types of intakes 2b. Explain various Joints in pipe network 2c. Explain hydraulic design of pressure pipe 2d. Discuss methods of laying of pipes and sewer line	2.1 Types of intakes 2.2 Design of intakes 2.3 Conveyance of water 2.4 Different types of Joints in pipe network 2.5 Use of hydraulic design of pressure pipe 2.6 Compute losses of head in pipe 2.7 Methods of laying of pipes and sewer line, its tests for straightness, water tightness and smoke test.
Unit-III Water Distribution System	3a. Explain various types of Distribution System 3b. Describe layout of Distribution System 3c. Discuss various types of distribution reservoir	3.1 Types of Distribution system 3.1.1 Gravity system. 3.1.2 Pumping system 3.1.3 Dual system 3.2 Layout of Distribution system 3.3 Requirement of a Distribution system 3.4 Method of supplying water. 3.5 Types of Distribution Reservoirs.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
Unit-IV Sewer System and Quantity of Sewage	4a. Explain the sewer disposal system 4b. Describe methods of sewage collection 4c. Describe sources of sanitary sewage 4d. Determine quantity of sanitary sewage and storm water sewage	4.1 Aims and objectives of sewer disposal system 4.2 Types and Characteristics of Sewer Materials 4.3 State and classify systems of sanitation. 4.4 Methods of sewage collection with their merits and demerits 4.5 Sewage conveyance system 4.6 Patterns of collection of sewage. 4.7 Evaluate sources of sanitary sewage 4.8 Roll of infiltration in addition of sanitary sewage 4.9 State and explain subtraction allowances 4.10 Methods of determination of quantity of sanitary sewage. 4.11 Variation in quantity of sewage 4.12 Methods of determination of quantity of storm water
Unit-V Constructio ns And Maintenance Of Sewers	5a. Explain the method of laying of sewers 5b. Describe the necessity of maintenance of sewer	5.1 Importance of making centerline of sewers and position of Sewer appurtenances. 5.2 Excavation, bracing and dewatering of trenches. 5.3 Method of laying of sewers 5.4 Jointing of sewers. 5.5 Methods of Hydraulic Testing of pipes and sewers, with specifications. 5.6 Necessity of maintenance of sewers. 5.7 Causes of damage to Sewers 5.8 Problems in sewer maintenance
Unit-VI Sewer Appurtenan ces	6.a Describe the various Appurtenances in a Distribution system 6.b. Comprehend design of Overflows and Regulators. 1.c. Explain the Ventilation Pipes. 6.d list type of valves and their functions	6.1 Define “Appurtenances” and its necessity 6.2 For the operation and maintenance of sewerage system various devices : 6.2.1 Manholes and Inspection Chambers 6.2.2 Hazards of Manhole Work 6.2.3 Drop manholes. 6.2.4 Lamp holes. 6.2.5 Street Inlets. 6.2.6 Flushing tanks. 6.2.7 Inverted siphon. 6.2.8 Storm water relief work 6.3 Design of Overflows and Regulators.

Unit	Major Learning Outcomes (in cognitive domain)	Topics and Sub-topics
		6.4 Ventilation Pipes. 6.5 Service diagram for Residential / industrial building. Plumbing 6.5.1 Drainage 6.5.2 Water supply 6.5.3 Electrical 1.6 Type of valves and their functions 6.7 Utility of service diagram w.r.t. maintenance.
Unit- VII Rural (Village House) Sanitation.	7a. Discuss various types of toilets	7.1 Types of Toilet 7.2 Low cost sanitation/toilet. 7.3 Small bore sewage system.

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

Unit No.	Unit Title	Teaching Hours	Distribution of Theory Marks			
			R Level	U Level	A Level	Total Marks
I	Sources of Water and its Demand	06	2	4	2	08
II	Collection And Conveyance	06	2	4	2	08
III	Water Distribution System	07	3	3	3	09
IV	Sewer System and Quantity of Sewage	12	3	5	7	15
V	Constructions And Maintenance of Sewers	10	3	5	4	12
VI	Sewer Appurtenances	12	3	5	7	15
VII	Rural (Village House) Sanitation.	03	0	3	0	03
	Total	56	16	29	25	70

Legends: R = Remembrance; U = Understanding; A = Application 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.

7. SUGGESTED LIST OF EXERCISES/PRACTICALS

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.

*Note: Here only outcomes in psychomotor domain are listed as practical/exercises. However, if these practical/exercises are completed appropriately, they would also lead to development of certain outcomes in affective domain which would in turn lead to development of **Course Outcomes** related to affective domain. Thus over all development of **Programme Outcomes** (as given in a common list at the beginning of curriculum document for this programme) would be assured.*

Faculty should refer to that common list and should ensure that students also acquire outcomes in affective domain which are required for overall achievement of Programme Outcomes/Course Outcomes.

S. No.	Unit No.	Practical Exercises (Outcomes' in Psychomotor Domain)	Approx Hrs. required
1	I	Study of sources of water and w/w and problem based on this topic	02
2	I	Study the factors affecting quantity of water. Solve problems based on population forecasts and average precipitation run off	04
3	II	Study based on collection and conveyance of water and problems based on this	02
4	III	Solve problems based on water distribution system	04
5	III	Design water supply system in multi story building	06
6	III	Design water supply system for a small housing society	06
7	IV	Solve problem based on estimation of sewage quantity.	02
8	V	Study of construction and maintenance of Sewers	02
9	VI	Study and drawing of sewer appurtenance Technical Site Visit	04
10	V and VI	Design sewer system for a small housing society	06
11	IV	Design a drainage system for storm water	04
12	VII	Design a low cost toilet for rural area	04
Total Hours (Do exercises worth 28 hours so that most units are covered)			46

8. SUGGESTED LIST OF STUDENT ACTIVITIES

- i. Study water supply scheme of a multistory complex or a small housing society. Prepare a report on it and discuss its merits and shortcomings.
- ii. Study sewer system of a multistory complex or a small housing society and prepare a report on it and discuss its merits and shortcomings.
- iii. Visit a nearby water treatment plant and prepare a report indicating the methods adopted, its capacity, amount of different chemicals and energy used and the quality of water produced for domestic use.
- iv. Visit a nearby affluent treatment plant and prepare a report indicating the methods adopted, its capacity, amount of different chemicals and energy used and the quality of water discharged in the environment.

9. SPECIAL INSTRUCTIONAL STRATEGIES (if any)

Present the real life case studies of water and sewer system of nearby towns including treatment plants and discuss their merits and shortcomings and also discuss what could be done to improve them further. Use video/animation films, PPTs and actual drawings/blue prints of the schemes to make presentations more effective.

10. SUGGESTED LEARNING RESOURCES**A. List of Books**

S. No.	Title of Book	Author	Publication
1.	Water supply and sanitary engineering	S.C. Rangwala	Charotar
2.	Water supply and sanitary engineering	G.S. Birdie	Dhanpat rai publication
3.	Water Supply Engineering	S.K.Garg	
4.	SP-35(Handbook on Water Supply and Drainage (With Special Emphasis on Plumbing)		BIS

B. List of Major Equipment/Instruments etc.

Not Applicable

C. List of Software/Learning Websites

- i. www.gwssb.org
- ii. www.neeri.res.in

11. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics and other educational Institutes**

- **Prof. H. L. Purohit**, H.O.D. Civil Engineering, L.E. College, Morbi
- **Prof. M. C. Sanandiya**, Lecturer in Environmental Engineering, Shri K. J. Polytechnic, Bharuch
- **Prof Dipsha Shah**, Assistant Professor, CEPT University, Ahmedabad

Coordinator and Faculty Members from NITTTR, Bhopal

- **Dr. Subrat Roy**, Professor, Department of Civil & Environmental Engineering
- **Dr. V.H. Radhakrishnan**, Professor, Deptt. of Civil & Environmental Engineering