

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD, GUJARAT

COURSE CURRICULUM

COURSE TITLE: WATER AND WASTE WATER MANAGEMENT
(COURSE CODE: 3360612)

Diploma Programme in which this course is offered	Semester in which offered
Civil Engineering	SIXTH

1. RATIONALE

Water is used by living organisms for survival. Mankind uses the water in better-way for benefits. Man can use the water directly for the drinking purpose. But at present the scenario is not like that. Lots-off pollutants are disposed in water-bodies and make unfit the source for direct use. Now the aim is how much impurities should be removed and how much the size of treatment units.

Same way, as treated water is supplied, more and more wastewater is generated from household, also from commercial areas and industrial zones. So treatment to wastewater is required before disposing the wastewater to nature for the benefit of aquatic life and flora and fauna. For this, topics like various treatment units, processes are discussed in detail to cope-up the devastating effect of wastewater and managing the same.

2. COMPETENCY

As this course is in the study, student has the following competency in him, like

1. They can be able to Design the treatment unit for water and wastewater treatment.
2. Maintain the outflow level of impurities from water and wastewater treatment plant
3. Manage sewage disposal

3. TEACHING AND EXAMINATION SCHEME

Teaching Scheme (In Hours)			Total Credits (L+T+P)	Examination Scheme				Total Marks
L	T	P		Theory Marks		Practical Marks		
			C	ESE	PA	ESE	PA	
3	0	2	5	70	30	20	30	150

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

Note: It is the responsibility of the institute heads that marks for **PA of theory & ESE and PA of practical** for each student are entered online into the GTU Portal at the end of each semester within the dates specified by GTU.

4. COURSE DETAILS

Unit	Major Learning Outcomes (Course Outcomes in Cognitive Domain according to NBA terminology)	Topics and Sub-topics
Unit-I Introduction	1a Enlist necessity of water treatment. 1b Explain the requirement of wastewater treatment. 1c Describe the roll of Industrial wastewater in pollution.	1.1 Water Treatment & distribution of treated water 1.2 Sewage Treatment 1.3 Industrial Wastewater Treatment
Unit-II Design of Water Treatment Plant & Distribution System	2a Analyze various impurities present in Raw-water. 2b Explain the treatment required to raw-water to make fit for potable use. 2c Design various unit operations and processes for water treatment. 2d Calculate Reservoir capacity to store treated water.	2.1 Collection of water sample 2.2 Water analysis: Physical, Chemical and Bacteriological 2.3 Treatment plant a. Location b. Unit/Process to be adopted 2.4 Design of water treatment plant for given data a. Detention period b. Size of Units c. Requirement of chemicals for treatment process d. Efficiency of Treatment Unit/Process e. Requirement of Disinfectant 2.5 Types of reservoirs for treated water 2.6 Determination of storage capacity of reservoir 2.7 Types of distribution system
Unit-III Design of Sewer	3a Enlist factors affecting sewer design. 3b Design a sewer for given condition.	3.1 Sources of sewage 3.2 Factors affecting sanitary sewer 3.3 Storm water calculation (Rational method/Empirical method) 3.4 Velocity of flow from sewer 3.5 Method of design of sewer

<p align="center">Unit-IV</p> <p>Sewage Treatment Process & Design</p>	<p>4a Enlist characteristics of sewage.</p> <p>4b Explain design procedure for wastewater treatment plant.</p>	<p>4.1 Necessity of Sewage Treatment</p> <p>4.2 Sample collection</p> <p>4.3 Properties of sewage</p> <p>4.4 Location of Treatment Plant</p> <p>4.5 Design period</p> <p>4.6 Layout of Treatment Plant</p> <p>4.7 Miscellaneous treatment methods</p> <p>4.8 Design of sewage treatment plant for given data</p> <p>4.9 Advance Treatment of wastewater</p>
<p align="center">Unit-V</p> <p>Industrial Wastewater Treatment</p>	<p>5a Explain the characteristics of industrial wastewater.</p> <p>5b Describe and design the treatment units required to treat industrial wastewater.</p>	<p>5.1 Water pollution by industrial waste</p> <p>5.2 Industrial effluent Characteristics</p> <p>5.3 Industrial effluent standards for disposal into stream and on land</p> <p>5.4 Industrial wastewater treatments</p> <p>a. Dairy</p> <p>b. Pulp and Paper mill</p> <p>c. Dyeing Industry</p> <p>d. Pharmaceutical Industry</p>
<p align="center">Unit-VI</p> <p>Wastewater Reuse</p>	<p>6a Explain the methods of reuse the wastewater.</p>	<p>6.1 Wastewater-A growing resource</p> <p>6.2 Economic characteristics of recycled wastewater</p> <p>6.3 Key-Drivers in wastewater recycling</p> <p>6.4 Government/Institutional Role in wastewater recycling</p> <p>6.5 Social Aspect of wastewater recycling</p> <p>6.6 Wastewater reuse in India</p>
<p align="center">Unit-VII</p> <p>Sludge and Septage : Treatment and Disposal</p>	<p>7a Explain the procedure for removal of sludge and sewage generated from wastewater treatment.</p>	<p>7.1 Define: Septage, Sludge</p> <p>7.2 Use of stabilization Lagoons for the Treatment of Seepage</p> <p>7.3 Site Selection for Stabilization Lagoons</p> <p>7.4 Design Criteria for Stabilization Lagoons</p> <p>7.5 Treatment of Seepage</p> <p>a. Land Disposal</p> <p>b. co-treatment of Seepage and sewage</p> <p>c. Independent treatment of Septage</p> <p>7.6 Treatment of Sewage sludge</p> <p>a. Stabilization</p> <p>b. Composting</p> <p>c. anaerobic digestion</p> <p>d. other methods</p> <p>7.7 Disposal of sludge</p> <p>a. Disposal in water</p> <p>b. Disposal on land</p>

Unit-VIII Wastewater Disposal	8a Explain the procedure for disposal of treated wastewater.	8.1 Requirement of Disposal wastewater 8.2 Discharge of treated wastewater a. in surface water b. on Land c. injection in ground
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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	Introduction	2	1	1	0	3
II	Design of Water Treatment Plant & Distribution System	12	3	3	6	20
III	Design of Sewer	2	1	0	1	3
IV	Sewage Treatment Process & Design	10	4	4	4	18
V	Industrial Wastewater Treatment	9	2	2	5	15
VI	Wastewater Reuse	2	1	0	1	3
VII	Sludge and Septage : Treatment and Disposal	3	1	1	1	5
VIII	Wastewater Disposal	2	1	0	1	3
		42	14	11	19	70

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

Note: This specification table shall be treated as only general guideline for students and teachers. The actual distribution of marks in the question paper may vary 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 skills so that students are able to acquire the competency. Following is the list of experiments for guidance.

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required	Apprx. Hrs. Required for Project
1	I & II	Find-out various characteristics of Water, like a. Turbidity b. Alkalinity c. pH d. MPN	6	
2	II	Design Water Treatment plant for given data.	4	
4	III	Design of Sewer for given data	2	
5	IV & V	Find Various characteristics of wastewater like a. BOD b. COD	6	

S. No.	Unit No.	Practical/Exercise	Apprx. Hrs. Required	Apprx. Hrs. Required for Project
		c. SVI		
6	IV	Design a wastewater treatment plant according to given data.	4	
7	V	Assignment: Draw flow chart for different Industrial Process	2	
8	VII & VIII	Assignment: Write short note on a. Septage disposal method b. Sewage-sludge disposal method c. Wastewater disposal method	2	
			28	

8. SUGGESTED STUDENT ACTIVITIES

1. Visit nearby Water treatment plant for design point of view.
2. Visit nearby wastewater treatment plant for design point of view.
3. Visit nearby industries and understand the process and point of wastewater generation.

9 SUGGESTED LEARNING RESOURCES

(A) List of Books:

S. No.	Title of Books	Author	Publication
1.	Water Supply Engineering	S. K. Garg	Khanna Publishers, New Delhi
2.	Wastewater Treatment: Concept and Design Approach	Karia and Christian	PHI Learning PVT Ltd., New Delhi
3.	Alternate Water Source and wastewater management	E.W. Bob Boulware	TMH, New Delhi
4.	Water, Waste water and Storm water infrastructure management	Grigg	Int Water Association
5.	Water and Wastewater Technology	Hammer and Hammer	PHI Learning PVT Ltd., New Delhi
6.	Water Supply and sanitary Engineering	Birdie, G. S.	Jain Book Depot, New Delhi
7.	Wastewater Engineering: Treatment Disposal Reuse	Metcalf and Eddy	TMH, New Delhi
8.	Septage management Guide for Local Governments	David M. Robbins	
9.	Septage management in Urban India (NSUP)	Ministry Of Urban Development, GOI	Govt Of India

(B) List of Major Equipment/Materials:

1. BOD incubator
2. Reflux apparatus for COD

(C) List of Software/Learning Websites

1. https://www.rti.org/pubs/septage_management_guide_1.pdf
2. www.cseindia.org/userfiles/document_sm.pdf
3. water.epa.gov › [Pollution Prevention & Control](#)
4. www.unwater.org/activities/task-forces/wastewater-management/en/
5. www.fao.org/docrep/t0551e/t0551e05.htm

10. COURSE CURRICULUM DEVELOPMENT COMMITTEE**Faculty Members from Polytechnics**

1. Prof. S. M. Mistry, H.O.D.(Civil),
Dr. S. & S.S.Ghandhy College of Engg and Tech., Surat
2. Prof. B. V. Modi, Principal, BVPIT, Umrakh
3. Prof. Arti Pamanani, B & B Institute of technology, Vallabh vidyanagar

Coordinator and Faculty Members from NITTTR Bhopal