INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (CIVIL ENGINEERING)**
SEMESTER	**5**
COURSE TITLE	**ENVIRONMENTAL ENGINEERING**
COURSE CODE	**01CI1504**
COURSE CREDITS	**4**

Objective:

1. To understand the design of water supply system and gain knowledge of the various components involved in designing water supply schemes.
2. To make students able to perform various tests related to water and wastewater treatment.
3. To understand the design of water supply system and gain knowledge of the various components involved in designing water supply schemes
4. To understand the design criteria and considerations for primary, secondary, and tertiary treatment units.
5. To make students understand about the advantages, limitations, and sustainability aspects of various treatment processes.
6. To make students able to perform various test related to water and wastewater treatment.

Course Outcomes: After completion of this course, student will be able to:

1. Classify the various sources of water, standards, and criteria for designated uses.
2. Design the water distribution systems in terms of their applicability
3. Design the core treatment units for water treatment plants
4. Analyze the primary, secondary, and tertiary units of sewage treatment plants
5. Indicate the relevance of various sludge management alternatives

Pre-requisite of course: Basic understanding of environmental sciences

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Introduction** Sources of water: Surface and sub-surface water sources, their quality and suitability; Methods of analysis of water: physical, chemical and bacteriological tests and their significance, National and International standards of drinking water; Brief description of water supply system; Water requirement, Rate of demand and variation in rate of demand; Population forecasting methods.	8

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Contents : Unit	Topics	Contact Hours
2	**Water Supply and Distribution** Collection and conveyance of water; Components and layout of water supply scheme; Methods of supplying water; Water Distribution system,, Type of reservoirs & accessories, Determination of capacity of elevated reservoirs, Different types of pipes used in water supply; Different types of pumps used in water supply	8
3	**Water Treatment Approaches** Water treatment: conventional and non-conventional water treatment; Treatment processes: aeration, coagulation, flocculation, sedimentation;, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes	8
4	**Fundamentals of Wastewater Treatment** Objectives of Sewage Collection, Treatment and Disposal; Commonly Used Terminologies and Definitions; Types of sewerage system, Sewer Appurtenances; Estimation Sewage Generation; Wastewater treatment units: Screens, Grit chamber, Oil & Grease Traps; Equalization tank, Sedimentation Tanks, Biological treatment methods; Chlorination	10
5	**Sludge Management** Importance of Sludge Treatment and Disposal; Sources and Characteristics of Sludge; Sludge Treatment: Preliminary operations, Sludge Thickening; Sludge Stabilization; Sludge Conditioning; Sludge Dewatering; Sludge Disposal	8
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment-1** Overview of lab equipment, apparatus, and utilities of environmental engineering lab	2
2	**Experiment-2** Physical Characterization of water: pH, Turbidity, Conductivity	2
3	**Experiment-3** Analysis of solids content of water: Dissolved, suspended, total, volatile & fixed	2
4	**Experiment-4** Determination of Alkalinity of water sample	2
5	**Experiment-5** Determination of Acidity of water sample	2
6	**Experiment-6** Determination of Hardness: total hardness, calcium and magnesium hardness	2
7	**Experiment-7** Determination of Chlorides in water	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
8	**Experiment-8** Determination of optimum coagulant dose: Jar Test	2
9	**Experiment-9** Determination of Chemical Oxygen Demand of wastewater sample	2
10	**Experiment-10** Dissolved Oxygen determination of water sample	2
11	**Experiment-11** Determination of Biochemical Oxygen Demand	2
12	**Experiment-12** Determination of residual chlorine in water	2
13	**Experiment-13** Determination of Sulphate in water sample	2
14	**Experiment-14** Bacteriological quality measurement: MPN	2
Total Hours		**28**

Textbook :

1 Water supply engineering, Garg, S. K., & Garg, R, New Delhi: Khanna publishers., 2010

2 Water supply and sanitary engineering (including Environmental Engineering and Pollution control Acts), Birdie, G. S., & Birdie, J. S., Laxmi Publication, 2013

3 Environmental engineering (Vol. 2985), Peavy, H. S., Rowe, D. R., & Tchobanoglous, G., New York: McGraw-Hill, 1985

References:

1 Water and wastewater engineering: design principles and practice., Water and wastewater engineering: design principles and practice., Davis, M. L. , McGraw-Hill Education. , 2010

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
15.00	15.00	30.00	30.00	10.00	0.00

Instructional Method:

1 Presence in all academic sessions is mandatory which shall carry 5% marks of the total internal evaluation.

2 Prerequisite of the course and its pattern shall be discussed on the commencement of the course.

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Instructional Method:

3 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board, may also use any of tools such as collaborative learning, demonstration, role play, Quiz, brainstorming, MOOCs, Active Learning Assignments etc.

4 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.

5 At the end of each unit/topic an assignment based on the course content shall be given to the students which shall carry 5% weightage for timely completion and submission of the assigned work.

6 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

7 Students will use supplementary resources such as online videos, Virtual Laboratory, NPTEL videos, e-courses.

Supplementary Resources:

1 https://onlinecourses.nptel.ac.in/noc19_ce32/preview

2 https://onlinecourses.nptel.ac.in/noc20_ce23/preview

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