Marwadi University
Marwadi Chandarana Group

Bachelor of Technology

Civil Engineering

Environmental Engineering

01CI1504

Objective of the Course:

- To design the water supply schemes and wastewater treatment systems.

Credit Earned: 04

Prerequisite: Basic understanding of environmental sciences

Student's learning outcomes:

After successful completion of the course, it is expected that students will be able to,

1. Understand 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. Understand the relevance of various sludge management alternatives

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Term Work (TW)	
3	0	2	4	50	30	20	25	25	150

Detailed Syllabus

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.	08

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	10
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	12
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	**46**

List of Experiments

Sr. No.	Experiment	No. of turns
1	Overview of lab equipment, apparatus, and utilities of environmental engineering lab	1
2	Physical Characterization of water: pH, Turbidity, Conductivity	1
3	Analysis of solids content of water: Dissolved, suspended, total, volatile, fixed etc.	2
4	Determination of Alkalinity of water sample	1
5	Determination of Acidity of water sample	1
6	Determination of Hardness: total hardness, calcium and magnesium hardness	1
7	Determination of Chlorides in water	1

8	Determination of optimum coagulant dose: Jar Test	1
9	Determination of chemical oxygen demand of wastewater sample	1
10	Dissolved Oxygen determination of water sample	1
11	Determination of biochemical oxygen demand	2
12	Determination of residual chlorine in water	1
13	Determination of Sulphate in water sample	1
14	Bacteriological quality measurement: MPN	2

Suggested Theory Distribution

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

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
15%	15%	30%	30%	10%	-

Instructional Method and Pedagogy:

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.
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.

Recommended Study Material

Text Books

1. Garg, S. K., & Garg, R. (2010). Water supply engineering. New Delhi: Khanna publishers.
2. Punmia, B. C., Jain, A., & Jain, A. K. (1998). Environmental Engineering-2. Water Supply Engineering.
3. Rethaliya, D. R. (2021). Environmental engineering. Atul prakashan.
4. Birdie, G. S., & Birdie, J. S. (2013). Water supply and sanitary engineering (including Environmental Engineering and Pollution control Acts).

Reference Books

1. Peavy, H. S., Rowe, D. R., & Tchobanoglous, G. (1985). Environmental engineering (Vol. 2985). New York: McGraw-Hill.
2. Davis, M. L. (2010). Water and wastewater engineering: design principles and practice. McGraw-Hill Education.
3. Ghangrekar, M. M. (2022). Wastewater to Water: Principles, Technologies and Engineering Design. Springer Nature.
4. Varandani, N. S. (2017). Environmental Engineering Principles and Practices. Pearson.