ENE-302: Water Treatment and Supply Network Design

CREDIT HOURS: Theory = 3   Practical= 1   Total= 4
CONTACT HOURS: Theory = 48   Practical= 48   Total= 96
PREREQUISITE: Introduction to Environmental Engineering
MODE OF TEACHING: Three hours of lecture and three hours lab per week (75+25) %

COURSE DESCRIPTION:

Enhance your knowledge of water treatment processes and detailed technical know-how of the technologies required for water supply and treatment for drinking purposes. Learn about the different sources of water, and type of treatment necessary based upon the water quality. Gain an understanding of the regulations related to drinking water quality.

RELEVANT PROGRAM LEARNING OUTCOMES (PLOs):

The course is designed so that students will achieve the PLOs:

1	Engineering Knowledge:	☑	7	Environment and Sustainability:	☐
2	Problem Analysis:	☐	8	Ethics:	☐
3	Design/Development of Solutions:	☑	9	Individual and Teamwork:	☐
4	Investigation:	☑	10	Communication:	☐
5	Modern Tool Usage:	☐	11	Project Management:	☐
6	The Engineer and Society:	☑	12	Lifelong Learning:	☐

COURSE LEARNING OUTCOMES (CLOs):

Upon successful completion of the course, the student will demonstrate competency by being able to:

S. No	CLOs	Domain	Taxonomy Level	PLOs
1	**UNDERSTAND** fundamentals of water treatme	Cognitive	2	1
2	**ANALYZE** water treatment unit operations and processes	Cognitive	4	3
3	**ORGANIZE** water supply network for community	Cognitive	4	6
4	**PERFORM** water quality analyses	Psychomotor	3	4
5	**Maintain** ethical conduct in lab and adhere lab safety procedures while contributing effectively towards individual and/ or group goals.	Affective	5	8

Open Ended Lab

6	**ASSESS** the surface or ground water quality and propose physico-chemical water treatment technolog ensuring safe provision of drinking water as per Wo Health Organization (WHO) guidelines.	Psychomotor	4	6

TOPICS COVERED WITH THEIR CONTRIBUTION TO PLOs:

Theory:

Week	Topic
1	Preliminary Unit Operations and Processes: Water and Wastewater Treatment
2	Preliminary Unit Operations and Processes: Water and Wastewater Treatment
3	Coagulation and Flocculation: Theory
4	Coagulation and Flocculation: Theory
5	Coagulation and Flocculation: Design
6	Sedimentation: Theory
7-8	Sedimentation: Design
Mid Semester Exam	
9	Filtration: Theory
10	Filtration: Theory
11	Filtration: Design
11-12	Disinfection
13	Solids Handling
14	Solids Handling
15	Water Supply Network
16	Water Supply Network Design AI powered Smart water grids/ Smart water supply network
End Semester Exam	

Practical:

Week	Title
1-2	Determination of Total Suspended Solids in Water
3-4	Determination of Optimum Coagulant Dosage using Jar Test to remove Suspended solids
5-6	Determination of Calcium, Magnesium & Total Hardness in Water Sample
7	Removal of Hardness by Soda Lime Treatment
8	Estimation of Population & Water Consumption for designing Water Distribution System
9-10	Different types of Water Distribution Systems
11-12	Understanding different components of Water Distribution System
13-14	Layout of Water Distribution Network on Map
15-16	Water Distribution Network on EPANET

TEXT AND MATERIAL:

Textbook

"*Unit Operations and Processes in Environmental Engineering*" by Tom D. Reynolds and Paul A. Richards (Second Edition, 1996)

References Material:

"MWH's Water Treatment: Principles and Design" by John C. Crittenden, R. Rhodes Trussell, David W. Hand, Kerry J. Howe, George Tchobanoglous (Third Edition, 2012)

ASSESMENT SYSTEM:

Theoretical		75 %
Assignments	10%	
Quizzes	15%	
Midterm Exams	25%	
End Semester Exam	50%	

Practical		25 %
Lab Reports	40%	
Quizzes	30%	
Rubrics	30%	

Total		100%