Environmental Engineering

Course Code	Credit Hours
CE-423	2-1

Course Description

This course will introduce the concept of environmental pollution, contaminants, and its sources, particularly in the context of water. The course will elaborate on principles of water treatment applied to the design and implementation of water supply schemes.

Text Book:

1. Mark J. Hammers, Jr. Viessman et al. Water Supply and Pollution Control" (8th Edition, 2015)
2. Sajjad Haider, Sheikh Javed et al. Water Supply and Sewerage (Theory and Applications), 1st Edition, 2022)
3. Tom D, Reynold and Paul. Unit Operations and Processes in Environmental Engineering. 2nd Edition, 1996)
4. John C. Crittenden etal "MWH's Water Treatment Principle and Design". 3rd Edition, 2012)
5. Metcalf and Eddy. Wastewater Engineering, Treatment and Resource Recovery", 5th Edition, 2014)

Reference Book:

Prerequisites :

Nil**.**

ASSESSMENT SYSTEM FOR THEORY

	Without Project (%)	With Project/Complex Engineering Problems (%)
Quizzes	15	10-15
Assignments	10	5-10
Mid Terms	25	25

Project	-	5-10
End Semester Exam	50	45-50

ASSESSMENT SYSTEM FOR LAB

Lab Work/ Psychomotor Assessment/ Lab Reports	70%
Lab Project/ Open Ended Lab Report/ Assignment/ Quiz	10%
Final Assessment/ Viva	20%

Teaching Plan

Week No	Topics/Learning Outcomes
1-2	**Introduction to Environmental Engineering:** Issues related to Environmental Engineering, Global Warming, Green House Gas Emissions, Acid Rain, Mitigation measures to address environmental challenges, and Major environmental issues in Pakistan. Water Engineering Sanitary Engineering
3-4	**Water demand and supply** Water use and consumption, types, and variation in demand, maximum demand, **Water Quality** Basic concepts in water chemistry (hardness, alkalinity, turbidity, electroneutrality, TDS, TSS, pH, conductivity, turbidity etc. Water impurities and health significance, Water quality guidelines/standards, Water quality monitoring
5-6	**Water Treatment** Unit operations in water treatment (Screening, Coagulation, flocculation,

	Filtration, Rapid Sand Filter, and Membrane technology
7-8	Treatment of surface and groundwater
9	**Mid Semester Exam**
10	Design of different unit operations for the treatment of ground and surface water
11-12	**Basics of Wastewater Treatment** The concept of COD, BOD, Aerobic Treatment, Anaerobic Treatment systems, Pros and Cons of aerobic and anaerobic treatment systems Miscellaneous Water Treatment Techniques Fluoridation, Ion and Manganese Removal, Water Softening Methods, Water Disinfection and Chemicals
13-14	**Wastewater Treatment** The concept of TSS, VSS, SRT, HRT, Organic Loading Rate. The basic calculation for the determination of the above parameters
15-16	**Water distribution** Layout and design of water transmission works and distribution networks (Hardy cross and Equivalent pipe method), Service reservoir, fixtures, and their installations, tapping water mains, urban and rural water supply. **Emergency water treatment methods:** Low-tech and emergency water treatment for rural community, residual and sludge management, energy from the waste materials
17-18	**End Semester Exam**

Practical

Experiment No	Description

1	Preparing standard solutions on weight basis, volume basis, molarity, density, and specific gravity
2	Analysis of pH, conductivity, and total dissolved solids Determination of pH, dissolved oxygen, and conductivity
3	Analysis of turbidity and total suspended solids (TSS) of surface water samples Analysis of total suspended solids (TSS) and total dissolved solids (TDS)
4	Determination of water hardness as CaCO3.
5	Determination of alkalinity (titration method)
6	Jar test for optimal coagulant dose.
7	Determination of residual Chlorine.
8	Analysis of COD
9	Analysis of BOD
10	Investigate nitrogenous compounds in wastewater (Ammonium-nitrogen, nitrates, and nitrites) Determination of ammonium-nitrogen in wastewater
11	Investigate phosphate concentration (Total phosphorous, phosphate phosphorus in wastewater) Determination of total phosphorous in wastewater
12	Determination of total coliform in drinking water