B. Tech. Civil Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CE208: Environmental Engineering -1	**L**	**T**	**P**	**CE205: Fluid Mechanics**
	3	**0**	**2**	

Course Objective: This course aims to conceptualize various aspects of water treatment schemes from its raw water source to the end user. The course helps in working out the raw water requirements, planning the layout of treatment schemes, and transmission and distribution of drinking water to end users, considering factors like reliability, cost-effectiveness, and adherence to quality and quantity parameters. The course emphasizes understanding the concept of water treatment processes and engineering unit operations to develop the effective design of treatment plants.

S. No	Course Outcomes (CO)
CO1	To describe the qualitative and quantitative requirements of drinking water for a water supply scheme and the development of skills in identifying appropriate raw water sources.
CO2	To estimate the safe yield of groundwater wells and familiarize with using Renny walls as a source of raw water. Also, to design, test, and operate the pipe network to deliver treated drinking water.
CO3	To assess the capacity of the storage/distribution reservoir of treated drinking water. Also, familiarize with the requirements of water supply for small communities.
CO4	To understand fundamental concepts of various unit operations like aeration, coagulation & flocculation, settling, and filtration. Also, to understand the concept of the total energy line and the hydraulic requirements of any water treatment scheme.
CO5	To develop the layout and schematic diagrams for any water supply schemes and design the treatment units as per the CPHEEO Manual on Water Supply & Treatment.

S. No	Contents	Contact Hours
UNIT 1	**Water demands** estimates for projected population; Population forecasting using the logistic curve method; Sources of water and their characteristics; Quality and Quantity of surface and ground waters; physical, chemical, and biological water quality parameters; Drinking water quality requirements. **Factors governing the selection** of a source of water supply. The safe yield of a confined and unconfined aquifer, Radial collector wells. Intake structures and their design	8

UNIT 2	**Methods of treatment and flow sheets** as per the CPHEEO manual; Theory of Aeration, Coagulation & flocculation, Jar test, Settling, Types of settling (I to IV), Softening, Filtration, Disinfection, Concept of total energy line through unit operations; Hydraulics requirements, Schematic diagrams. Chemical computations in water treatment in respect to coagulation, alkalinity, and water softening.	8
UNIT 3	**Designs as per CPHEEO manual**: Design of spray-type aerator, Design of Mechanical Rapid Mix Unit, Design of Clariflocculator, Design of Sedimentation tank, Design of Settling tank, Design for tube settlers, Design for Rapid Gravity Filter.	8
UNIT 4	**Various types of conduits**, connections, and fittings. Design of economical size of rising main; Thrust Block, Laying and Testing of water supply pipelines. Types and capacities of pumps. Layout of distribution network, Storage capacity of distribution reservoir, and wastage of water in the distribution system. Hardy-Cross method, equivalent pipe method of pipe network analysis. Use of EPANET for water network analysis.	8
UNIT 5	**Plumbing systems in buildings and houses**: water connections, requirements for indoor water treatment units, and water supply for small communities. assessment of the need for the project, The Proposed Project, Institutional and Financial Aspects.	10
	Total	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Peavy, Howard S., Rowe, Donald R., and Tchobanoglous, George, "Environmental Engineering," McGraw-Hill Education (India) Pvt. Ltd., New Delhi.	1985
2	CPHEEO Manual on Water Supply & Treatment, Ministry of Urban Dev., GOI.	2009
3	Garg, S.K., "Water Supply Engineering, Vol 1", Khanna Publishers, New Delhi. (ISBN 0-07-6080479-3)	2022
4	Qasim, Syed, "Water Works Engineering: Planning, Design and Operation," Prentice Hall India Learning Private Limited.	2000