B. Tech. Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CE302: Environment Engineering-II	**L**	**T**	**P**	**NIL**
	3	**0**	**0**	

Course Objective: This course aims to conceptualize various aspects of wastewater collection, treatment, disposal, and reuse. The course focuses on understanding wastewater generation, planning, and layout of sewerage systems, learning principles, and designing preliminary, primary, secondary, and tertiary treatment units for sustainable reuse and disposal of treated wastewater in lakes, rivers, and estuaries. This course also deals with sludge thickening and digestion. Assessment of the impact of treated wastewater disposal on river water quality is also undertaken in this course.

S. No	Course Outcomes (CO)
CO1	To analyse the sewer network, characteristics of wastewater, and assess the efficiency of various unit operations of wastewater treatment.
CO2	To decide the treatment train and design its various unit operations for effective treatment of wastewater and sludge.
CO3	To assess the impact of wastewater disposal on river water quality based on the Streeter-Phelps equation and the Qual-II model by the EPA.
CO4	To audit the existing wastewater treatment plant for gaps/inefficiencies and recommend appropriate augmentation of the treatment scheme.

S. No	Contents	Contact Hours
UNIT 1	Types of sewerage systems and their components, estimating municipal sewer discharge and storm discharge, operation and maintenance of sewers, quality characteristics of municipal sewage, BOD, COD, suspended solids, pH, and other important characteristics of sewage, variation in sewerage flow. Standards of wastewater/sewer discharge as per IS codes. Planning and financing of sewerage systems. Unit Operations and Processes (Physical, Chemical, Biological), layout of sewage treatment plant.	7
UNIT 2	**Hydraulic Design of Sewers and stormwater drains:** Design of circular and egg-shaped sewers, freeboards in sewers, hydraulics formulae for flow velocities, self-cleaning and non-scouring velocity, hydraulic characteristics of circular sewers running full and partially full. Forces acting on sewer pipes, need for the design of thrust blocks. Pumps for lifting sewers. Sewer pipe materials, sewer construction and maintenance, Sewer Appurtenances; manholes, storm water inlets, catch basins, sewer ventilators etc.	8
UNIT 3	**Preliminary and Primary Treatment Units:** Theory and design principles of Screens, Grit Chambers, Oil and Grease removal, Skimming Tanks, Primary Sedimentation Tank, inlet-outlet arrangements. Design of preliminary and primary treatment units based on CPHEEO manual.	8

UNIT 4	**Secondary Treatment:** Principles of biological wastewater treatment, growth and food utilization, suspended and attached growth systems, basic concepts and design of various components of activated sludge process-based treatment system, trickling filters, oxidation ponds, lagoons, and oxidation ditches, Secondary clarification. Designs of activated sludge plants, trickling filters, oxidation ponds, and secondary clarification based on CPHEEO manual. Rural sanitation practices, design of septic tank. Anaerobic processes, design of anaerobic filter and anaerobic digestor.	12
UNIT 5	Introduction to environmental studies- Definition, scope, and importance, natural resources, renewable and non-renewable resources, Social issues and the environment, human population and environment	7
	Total	**42**

REFERENCES

S.No.	Name of Books/Authors/Publishers	Year of Publication / Reprint
1	Metcalf & Eddy "Wastewater Engineering: Treatment and reuse", McGraw Hill Education.	2017
2	Peavy, Howard S., Rowe, Donald R. and Tchobanoglous, George, "Environmental Engineering" McGraw Hill Education (India) Pvt. Ltd., New Delhi.	1985
3	CPHEEO Manual on Sewerage and Sewage Treatment, Ministry of urban Development, New Delhi.	1983
4	S.K. Garg, "Sewage Disposal and Air Pollution Engineering", Khanna Publishers.	2024