Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NESC502	Water and Wastewater Engineering	3	1	0	4

Course Objectives

Understanding the principles and design of water treatment processes, water distribution system, effluent treatment processes and sewerage system for effective compliance of discharge standards and effluent re-use.

Overall Learning Outcomes

Upon successful completion of this course, students will be able to:
- Gain an insight into the structure of water purification and water supply scheme for drinking water.
- Appreciate water and wastewater quality criteria and standards, and their relation to public health.
- Understand the role of each unit operation/process within a typical effluent treatment process, their interaction and the context of when they are applied.

Unit No.	Topics to be covered	Contact Hr (L+T)	Learning outcomes
I	**Drinking water:** Surface and ground water sources, Source selection process, water demand forecasting, water quality parameters and drinking water standards.	5+1	To understand the criteria for planning of water supply system including the identification of degree of treatment.
II	**Treatment processes (Process, Mechanism and Design):** Sedimentation, Coagulation and Flocculation processes, Granular media filtration, Disinfection, Water softening, Aeration, Adsorption, Other water treatment processes. Treatment of specific contaminants: Fluoride, Nitrate, Iron, Manganese and Arsenic.	9+4	Will gain an insight about the principle and mechanism of different treatment unit required for drinking water treatment.
III	**Hydraulics design:** Design and hydraulic analysis of water distribution system, distribution reservoirs, distribution systems, capacity and pressure requirements, design of distribution systems. Determination of reservoir capacity, Gravitational, pumping and combined water supply schemes, Design considerations for pumps.	6+2	Students will develop a theoretical understanding about the distribution system of water supply project.
IV	**Wastewater:** Sources and characterization of wastewater, discharge standards, Hydraulic Design of Sewer: Types and Design of sewerage, construction, laying and testing of sewer lines, Design of Sewage Pumping Station, Maintenance of sewerage system.	5+1	Provide an overview of sources, characteristics and the basic engineering concepts of designing an effluent treatment plant (ETP).
V	**Physico-chemical treatment processes (Process, Mechanism and Design):** Approach channel, Screen, Grit chamber, Type–II Settling Tank, Equalization tank.	5+2	Help students in understanding the design and operation of physico-chemical process used in ETP.
VI	Derivation of bacterial growth kinetics. Treatment processes (Process, Mechanism and Design): Activated sludge process, Trickling filter, Oxidation ditch, SBR & UASB reactors, Waste stabilization pond, Biological nitrification & denitrification systems, Phosphorus removal.	8+3	This unit deals with the design and operation of biological treatment technologies used for wastewater treatment.
VII	**Sewage disposal:** Sludge characteristics and disposal methods, design of sludge thickeners, digesters and sludge drying bed.	4+1	This unit will provide an understanding of sludge treatment/disposal facilities.
		42+14	

Text Books:

1. Environmental Engineering- Peavy, H. S., Rowe, D. R., and Tchobanoglous, G. McGraw Hill.
2. Wastewater Engineering: Treatment, disposal, reuse - Metcalf & Eddy Inc. Tata McGraw Hill.

Reference books:

1. Theory and practice of water and wastewater treatment- Ronald L. Droste, Ronald L. Gehr, Wiley.
2. Industrial Water Pollution Control - WW Eckenfelder, Jr., McGraw Hill.
3. Basic Environmental Technology: Water supply, waste management and pollution control- Jerry A. Nathanson, Richard A. Schneider, Pearson Publication.
4. Wastewater Treatment for Pollution Control- SJ Arceivala, Tata McGrawHill.