

Course Type	Course Code	Name of Course	L	T	P	Credit
DC	ESC309	Wastewater Engineering	3	0	0	9

Course Objective

To describe the objective, principles and design of effluent treatment processes and sewerage system for higher discharge standards and effluent re-use.

Learning Outcomes

- Understand the role of each unit process within typical treatment process trains, their interaction and the context of when they are applied.
- Appreciate the advantages, disadvantages and limitations of the technologies and new developments

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Wastewater Engineering -An Overview, wastewater characteristics and concern , wastewater treatment new directions and concerns ,Analysis of flow rate ,mass loading, process analysis and selection, reactor, types of reactor ,mass balance analysis, types of reactions, analysis of reaction rate & order, flow sheets for wastewater treatment plant	6	The unit will provide an overview of sources, characteristics and understand the basic engineering concepts of designing an ETP
2	Sewerage: Types & sources of sewage ,sewerage system, hydraulic design of sewer, selection Types of sewer, construction laying and testing of sewer lines design of Sewage Pumping Station, Maintenance of sewerage system, introduction to sewer CAD.	8	This unit will help student in understanding the engineering principles& design of various types of sewerage system.
3	Preliminary& primary treatment processes - design and operation of approach channel, screening , gravity separation theory, grit removal system , design and operation of type –II settling, flow equalization, Coagulation & flocculation, design of clari-flocculator, dissolved air floatation and aeration system	11	This unit will help the students in understanding the design and operation of physico-chemical process used in STP.
4	Fundamentals of biological system: derivation of bacterial growth kinetics. Process design and operation of attached growth, suspended growth and hybrid process: activated sludge process - its modifications, oxidation ditch, aerated lagoon; Waste stabilization pond; Biofilter, trickling filter, RBC; Anaerobic treatment - reactors, UASB reactor, Design and operation of biological nitrification and de-nitrification system. Floating aquatic plant system	9	This unit provides a detailed overview of biological treatment technologies used for wastewater treatment.
5	Design of sludge disposal facility: Gravity Thickener, Anaerobic digester, and Sludge drying bed. Disposal and Reuse of Treated effluent, Effluent Standards	8	This unit will provide and understanding on sludge treatment design facilities used in STP.

Text Book

- Wastewater Engineering: Treatment and Reuse (4th ed.)-Metcalf and Eddy
- Wastewater Treatment for Pollution Control (3rd ed.) - SJ Arceivala, Tata McGraw Hill,1998.

Reference Book

- **Wastewater Treatment Plants: Planning, Design and Operation** Holt - SR Qasim, Rinehart & Winston, NY, 1985
- **Environmental Engineering-II**, S K Garg, Khanna Publishers, India