

Course Number	: CE403
Course Name	: Wastewater Engineering
Credits	: 3-0-0-3
Prerequisites	: Environmental Science (IC 230)
Intended for	: UG/ M. Tech. /MS
Distribution	: Discipline Core

Preamble: The objective of this course is to help students in understanding different aspects of waste water treatment plant. The course will be helpful for the students to develop the ability to apply the understanding of the physical, chemical and biological phenomenon for an efficient design of sewage treatment plant. The course will also help them understand about the regular maintenance while operating the sewage treatment unit for sustainable recycling. The course also focuses on the advanced design constraint of wastewater treatment plant based on the feedback of the local climatic conditions. The expected outcome of the course is that the students will be able to develop and ability to estimate, design and maintain the sewage treatment plant.

Course Outline:

1. **Planning and hydraulic design of sewerage system:** Population forecasting of town, equivalent sewage flow estimation, onsite, decentralized and centralized systems, Sewer pipelines and the materials, sewers hydraulics, Storm drainage, Storm runoff estimation, sewer appurtenances, corrosion in sewers its prevention and control, sewage pumping, drainage in buildings, plumbing systems for drainage, wastewater Collection System, Instrumentation and automation techniques. .
(8 hours)
2. **Primary treatment Processes:** Unit Operations and Processes, Selection of treatment processes, Onsite sanitation, Septic tank, Grey water harvesting ,Primary treatment ,Principles, functions and design of sewage treatment units ,screens ,grit chamber, primary sedimentation tanks ,Construction, Operation and Maintenance aspects.
(8 hours)
3. **Secondary treatment Processes:** Selection of Treatment Methods, Hydraulic Principles, Functions Activated Sludge Process and Extended aeration systems, Trickling filters and their design, Sequencing Batch Reactor(SBR), Membrane Bioreactor (MBR), Waste Stabilization Ponds, Reclamation and Reuse of sewage, Recent Advances in Sewage Treatment ,Construction, Operation and Maintenance aspects.
(10 hours)
4. **Sewage Disposal, Recycle and Reuse:** Standards for Disposal Methods, dilution, Mass balance principle, Self-purification of river, Oxygen sag curve, deoxygenation and reaeration, Dissolved oxygen Modelling, Land disposal, Agriculture uses of treated Sewage, Cycle of emerging organic contaminant and their effects on human health, sodium hazards, Soil dispersion system. (10 hrs)



5. **Sludge and Solid Waste Management:** Sludge characterization, Thickening, Design of gravity thickener, Sludge digestion, Standard rate and High rate digester design, Biogas recovery, Sludge Conditioning and Dewatering, Sludge drying beds, ultimate residue disposal. (6 hours)

Textbooks:

1. Metcalf, L., Eddy, H. P., & Tchobanoglous, G. (1979). Wastewater engineering: treatment, disposal, and reuse (Vol. 4). New York: McGraw-Hill.
2. Karia, G. L., & Christian, R. A. (2013). Wastewater treatment: Concepts and design approach. PHI Learning Pvt. Ltd..
3. Duggal K.N., "Elements of Environmental Engineering" S. Chand and Co. Ltd., New Delhi, 2014.
4. Mackenzie L. Davis, Ph.D., P.E., DEE,. Water and Wastewater Engineering: Design Principles and Practice, McGraw-Hill Education, 2010.

Reference Books/Journals:

1. Metcalf, Leonard, Harrison P. Eddy, and Georg Tchobanoglous. Wastewater engineering: treatment, disposal, and reuse. New York: McGraw-Hill, 1979.
2. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers, New Delhi, 2015.
3. Journal of Water Processing Engineering-Elsevier
4. Journal of Environmental Engineering-ASCE

6. **Similarity Content Declaration with Existing Courses**

S.N.	Course Code	Similarity Content	Approx. % of Content
1	CE 3XX (Wastewater Treatment)	Less than 5%	Less than 10%

Proposed by: Dr Deepak Swami

School: SE

Signature _____ Date _____

Recommended/Not Recommended, with Comments:

Chairman, CPC

Date: _____

Approved / Not Approved

Chairman, Senate

Date: _____