23CE801 Advanced Biological process for waste water treatment 3-1-0-4

Course Description and Objectives:

To provide concepts on the principles and process designs of various treatment systems for water and wastewater and competency in the process employed in design of treatment systems leading to the selection of specific process.

Course Outcomes:

1.Understand the significance of advanced treatment processes in meeting stringent environmental regulations and standards.

2.Apply the latest advancements advanced biological process in wastewater treatment to explore emerging technology.

3. Analyze advanced biological treatment techniques and assess membrane process in waste treatment process.

Pedagogy: Conceptualising, applying & analysing

Syllabus:

Advanced waste water treatment : Overview of Advanced Waste Water Treatment Importance, Need& Purpose of Advanced Waste Water Treatment, Environmental regulations and discharge standards, Sequencing batch reactors (SBR), Moving bed biofilm reactors(MBBR), Biological Nutrient removal process(BNR)

Advanced Biological treatment techniques: Membrane bioreactors(MBR), Integrated fixed-film activated sludge (IFAS), Constructed wetlands, Bioelectrochemical systems (BES) for energy recovery, Advanced oxidation processes (AOPs): ozone, UV, Fenton's reagent, etc.

Combined Biological and Physico-chemical Processes: Membrane bioreactor (MBR) technology, Granular activated carbon (GAC) and biological activated carbon process(BAC),Oxidation ditch system, Moving bed biofilm reactor-membrane bioreactor (MBBR-MBR) combined systems, Biological phosphorus and nitrogen removal processes, Anammox (Anaerobic Ammonium Oxidation) processes.

Emerging Technologies in Wastewater Treatment: Photocatalysis and photocatalytic membranes, Bio-based treatment methods, Forward osmosis and pressure-retarded osmosis for energy recovery, Algal-based wastewater treatment systems, Process control and monitoring in advanced treatment, System troubleshooting and performance evaluation, Life cycle analysis and sustainability considerations, Smart technologies and automation in wastewater treatment, Circular economy approaches in wastewater management, Challenges and opportunities in the field of advanced wastewater treatment.

References:

1. Waste water Engineering: Treatment and Disposal by Metcalf &Eddy , 4th Edition, 2017

2. Environmental Engineering- Peary, Rowe &Tclobaloglous, 2017

3. Membrane Systems for Wastewater Treatment –Water Environment Federation, 2005

4. Membrane Bioreactors for Wastewater Treatment- by Aijie Wang, Yan Zhou, and Jianwei Chen.

5.Biological Wastewater Treatment: Principles, Modeling, and Design by MogensHenze, Mark C. M. van Loosdrecht, and George A. Ekama

Evaluation Criteria

1. Midterm -30%
2. Continuous Assessment: 30%
3. End semester exam: 40%

Employability: Design Consultancies