23CE802 Applied Filtration and membrane technology for waste water treatment

3-1-0-4

Course Objectives:

To provide necessary knowledge and skills to apply advanced filtration and membrane technology for effective and sustainable wastewater treatment, addressing modern challenges in water management and environmental protection.

Course Outcomes:

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

2.Apply the latest advancements advanced physical and chemical process in wastewater treatment to explore emerging technology.

3. Analyze advanced physical and chemical treatment techniques and assess membrane technology in waste treatment process.

Pedagogy: Conceptualising, applying & analysing

Syllabus:

Filtration: Process and fundamentals of filtration, principles of filtration, mechanism of filtration, rate of filtration, various filter materials and its properties, Mechanisms of particle removal: sieving, surface filtration, depth filtration, Filtration equation, filter bed hydraulics.

Filter design and sizing principles, Pressure filtration vs. vacuum filtration, Solid-Liquid Filtration: Cake filtration theory, Filter cake resistance models, Filtration process optimization, Filtration aids and their role in solid-liquid separation.

Air Filtration: Principles of air filtration, Air filter types and applications, High-efficiency particulate air (HEPA) filters, Electrostatic precipitators and baghouses.

Specialized Filtration Techniques: Granular media filtration, Cartridge filtration, Centrifugal filtration, Magnetic filtration, Tangential flow filtration (TFF), Cross-flow filtration, Common filtration system issues, Filter replacement, troubleshooting case studies

Membrane Technology: Overview of membrane-based separation processes, Types of membranes: polymeric, inorganic, ceramic, etc., Membrane morphology and structure, Diffusion, convection, and osmosis in membranes, Mass transfer models in membrane processes, Membrane fouling and fouling mechanisms, Membrane Fabrication Techniques: Phase inversion, solution casting, chemical vapour deposition in inorganic membranes, membrane characterisation, membrane modules and process configuration, Application and emerging trends in membrane Technology

References

1.AWWA,Water quality and treatment; a handbook of public water supplies
2. Membrane Technology and Applications" by Richard W. Baker, Membrane Technology and Research, Inc..
3. Membrane Separations Technology: Principles and Applications" by R.D. Noble and T. Matsuura.
4. "Membrane Filtration Handbook: Practical Tips and Tricks" by M. R. Wiesner, K. K. Chellam, and Y. Cohen.

Evaluation Criteria

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

Employability: Design Consultancies