GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: Post Graduate

Subject Code: ME03018021

Subject Name: Advanced Processes for Wastewater Treatment

w.e.f. Academic Year:	2024-25
Semester:	3
Category of the Course:	MOPEC

Prerequisite:	Knowledge of Physico-chemical and biological treatment of wastewater
Rationale:	Satisfying the stringent standards for disposal of treated effluents in various sinks and reusing or recycling of treated effluents for different uses requires that the wastewater be given more exhaustive and advanced treatment. Hence this subject aims to give knowledge to the students regarding advanced wastewater treatment technologies.

Course Outcome:

After Completion of the Course, Student will able to:

No.	Course Outcomes
1	Discuss methods of advanced treatment technologies for pollutant removal particularly
2	Compare the most appropriates types of filtration processes for advanced treatment of wastewater.
3	Explain the concept of advance treatment processes like adsorption, ion exchange for removal of pollutants.
4	Recommend advanced oxidation processes and electrochemical processes to treat concentrated wastewater.

Teaching and Examination Scheme:

Teaching Scheme(in Hours)			Total Credits L+T+(PR/2)	Assessment Pattern and Marks				Total Marks
				Theory		Tutorial/Practical		
L	T	PR	C	ESE (E)	PA/ CA (M)	PA/CA(I)	ESE (V)	
3	0	0	3	70	30	0	0	100

Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1	**Technologies used for Advanced Treatment:** Residual Constituents in treated wastewater, classification of treatment technologies	**3**	**7**
2	**Depth filtration & surface filtration:** Selection and design consideration, available technologies, filter appurtenances	**4**	**10**
3	**Membrane filtration processes:** Classification of membrane technologies, membrane materials and configurations, membrane fouling, applications of membrane filtration, Electrodialysis	**8**	**20**
4	**Membrane Bioreactor:** Working principle of MBR, types of MBR processes, Membrane modules and materials, operating parameters, MBR Fouling and its prevention technique, applications of MBR	**4**	**10**
5	**Adsorption:** Types of adsorbents, Adsorption kinetics, process applications, reactivation of Adsorbents	**4**	**10**
6	**Ion-Exchange:** Ion exchange Materials, Ion-exchange Reactions, Exchange capacity of resins, Applications and operational considerations	**4**	**10**
7	**Advanced Oxidation Processes:** Chemistry of Advanced Oxidation Processes, technologies, Applications and operational consideration	**8**	**20**
8	**Electrochemical Processes:** Working principles, factors affecting and its applications of Electro coagulation, Electro floatation, Electro oxidation Hydro-Cavitation	**7**	**13**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**15**	**15**	**25**	**25**	**-**

Where R:Remember; U:Understanding; A:Application, N:Analyze and E:Evaluate C:Create(as per Revised Bloom's Taxonomy)

References/Suggested Learning Resources:

(a) Books:

- Waste water Engineering: Treatment and Disposal by Metcalf & Eddy
- Membrane Systems for Wastewater Treatment –Water Environment Federation
- Membrane Separation Processes by Kaushik Nath
- Water Treatment Principles and Design by R. Rhodes Trussell Ph.D., P.E., BCEE, NAE, John C. Crittenden Ph.D., P.E., BCEE, NAE, David W. Hand Ph.D., BCEEM, Kerry J. Howe Ph.D., P.E., BCEE
- Fundamentals of Water Treatment Unit Processes by David Hendricks.

(b) Open sources of software and website:

- **NPTEL**

Suggested Activities for Students:

- Industrial wastewater treatment plant visit.
- Common Effluent Treatment Plant Visit.

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