| CEDX 43 | INDUSTRIAL WASTEWATER | L | T | P | C |
| SDG: 6 | TREATMENT | 3 | 0 | 0 | 3 |

COURSE OBJECTIVES:

COB1: To impart knowledge on the sources of industrial wastewater, environmental impacts and the statutory requirements.

COB2: To provide the knowledge on preliminary treatment methods of industrial wastewater.

COB3: To familiarize on the advanced treatment employed for industrial wastewater.

COB4: To provide insight knowledge on the process for waste audit and pollution prevention techniques.

COB5: To impart knowledge on the wastewater treatment method for different industrial effluent.

MODULE I   TYPES AND GENERATION   9

Water use in industries - Industrial wastewater generation rates - Sources, types of industrial wastewater - Disposal standards - Environmental impacts on streams, land and sewerage system - Difference between industrial & municipal wastewaters - Regulatory requirements for treatment - Toxicity and Bioassay tests

MODULE II   INDUSTRIAL WASTEWATER TREATMENT   9

Principle and functions of - Equalization - Neutralization – Oil Separation – Flotation - Aerobic and anaerobic biological treatment - High rate reactors - Nutrient removal - Quality requirements for wastewater reuse

MODULE III   ADVANCED TREATMENT TECHNIQUES   9

Heavy metal removal - Membrane Separation Process - Chemical oxidation - Ozonation – Photo catalysis - Wet air Oxidation - Evaporation – Ion Exchange - Zero effluent discharge systems

MODULE IV   INDUSTRIAL POLLUTION PREVENTION   9

Strength reduction – Volume reduction techniques - Waste Audit - Evaluation of pollution prevention options - Waste minimisation - Barriers for waste minimisation - Cleaner production.

MODULE V TREATMENT OF WASTEWATER FOR SPECIFIC 9 INDUSTRIES

Industrial wastewater characteristics, Wastewater treatment for Textiles - Tanneries - Pulp and paper - Pharmaceuticals - Sugar - Distilleries - Food Processing - Fertilizers – Steel and Thermal Power Plants

L – 45; TOTAL HOURS – 45

TEXT BOOKS:

1. Athar Hussain, Sirajuddin Ahmed. "Advanced Treatment Techniques for Industrial Wastewater", IGI Global, USA, 2018.
2. Arceivala, S.J., "Wastewater Treatment for Pollution Control & Reuse", McGraw-Hill, New Delhi, 3ʳᵈ Edition, 2006.
3. Narayana Rao M and Amal K. Datta "Wastewater Treatment, Rational methods of Design and Industrial practices", Oxford and IBH Publications, Third Edition, New Delhi, Reprint 2009.
4. NG Wun Jern. "Industrial Wastewater Treatment". World Scientific, Imperial College Press, Singapore, 2020.
5. Patwardhan, A. D, "Industrial Wastewater Treatment", PHI Learning (P) Ltd., New Delhi, 2017.

REFERENCES:

1. Frank Woodard, "Industrial Waste Treatment Handbook", Butterworth Heinemann, New Delhi, 2001.
2. John Arundel, "Sewage and Industrial Effluent Treatment", Wiley Blackwell, 2nd Edition, 2013.
3. Metcalf and Eddy, "Wastewater Engineering: Treatment and Reuse", McGraw – Hill, New Delhi, 2017.
4. Srinu Naik Sapavatu, Shirish H. Sonawane, Y. Pydi Setty, T. Bala Narsaiah, "Innovative Technologies for the Treatment of Industrial Wastewater: A Sustainable Approach", Apple Academic Press and CRC Press, Taylor & Francis Group, Canada, 2017.
5. Vivek V. Ranade and Vinay M. Bhandari, "Industrial Wastewater Treatment, Recycling and Reuse", Butterworth Heinemann, Elsevier, USA, 2014.

COURSE OUTCOMES:

At the end of the course the student will be able to

CO1: Identify the various sources of industrial wastewater and will be able to list the statutory requirements.

CO2: Describe the functions of the common units of industrial

wastewater treatment

CO3: Explain the advanced methods of industrial wastewater treatment

CO4: Describe the waste audit and pollution prevention techniques.

CO5: Identify the wastewater treatment method based on different industrial effluent.

Board of Studies (BoS) :

18th BoS of CE held on 05.04.2023

Academic Council:

20th Academic council held on 13.4.2023

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	L	L	M	-	L	M	H	L	-	-	-	-	-	-	H
CO2	L	L	M	-	H	M	H	L	-	-	-	-	-	-	H
CO3	L	L	M	-	H	M	H	L	-	-	-	-	-	-	H
CO4	L	L	M	-	H	M	H	L	-	-	-	-	-	-	H
CO5	L	L	M	-	L	M	H	L	-	-	-	-	-	-	H

Note: L- Low Correlation   M - Medium Correlation   H -High Correlation

SDG 6: Ensure availability and sustainable management of water and sanitation for all.

Statement: The holistic understanding of industrial wastewater treatment leads to the prevention of pollution caused by the industrial effluents and improves the possibility for recycling and safe reuse.