GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Computer Aided Process Design

Subject Code: ME02072101

Subject Name: Design of Pollution Control Equipment

w. e. f. Academic Year:	2024-25
Semester:	2
Category of the Course:	Professional Elective Course

Prerequisite:	Knowledge of fundamentals of environmental and chemical engineering
Rationale:	Design, operation and maintenance of various pollution control equipment related to gaseous emissions, waste water and solid waste, design of equipments and understanding about environment management systems, pollution control norms and standards.

Course Outcome:

After completion of the course, student will able to:

No	Course Outcomes
01	Understand the application of unit operation for effluent treatment
02	Design equipment for gaseous emission control
03	Design equipment for wastewater treatment
04	Design equipment for solid waste management
05	Understand the various pollution control norms and standards

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	1	0	4	70	30	20	0	120

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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1.	**Introduction to air pollution control equipment:** Introduction, air quality standards, process parameters, operating conditions, gas characteristics, dust characteristics, performance required, different types of pollution control equipment, criteria for selection, auxiliary equipment.	4	10
2.	**Design of various air pollution control equipment:** Design of Absorber: Introduction, principle and theory, types of Absorption towers, design of packed tower, venture scrubber, falling film absorber. Design of Cyclone separators: Introduction, principle and theory, terminology, design and performance equations, Design of cyclone separator, design of multi cyclones. Design of Fabric Filter: Introduction, principle and theory, performance equations, design of fabric/bag filter, operation and maintenance. Design of Electrostatic Precipitator: Introduction, principle and theory, performance equations, design of ESP, operation and maintenance. Design of Wet scrubbers: Spray tower: Introduction, principle and theory, design of spray towers. Cyclone spray chamber : Introduction, principle and theory, design of Venturi scrubber: Introduction, principle and theory, design and performance equations	15	30
3.	**Introduction to waste water treatment**: Introduction, sources of effluent, water quality standards, waste water characteristics, different stages of waste water treatment plant, performance required.	3	10
4.	**Design of waste water treatment plant:** Primary treatment methods: Screening, Equalization, Oil Separation, Sedimentation and clarification. Secondary treatment method: Biological process, aerobic and anaerobic process. Tertiary treatment method: Ion Exchange-processes, Membrane Processes, Biological treatment Treatment for strong industrial waste: Design of Incinerators, multiple	15	30

	effect evaporators Common Effluent Treatment Plant (CETP): Location, Need, Design, Operation & Maintenance Problems and Economical aspects.		
5.	**Design of solid waste management system:** Sources of solid waste, hazardous solid waste, characterization of waste, resource recovery from solid waste, solid and hazardous waste disposal and transport, land disposal of solid waste, disposal norms Design of Secured landfill – site selection, design and operation of landfill, Landfill liner, leachate collection and removal, advance methods for treatment of landfill leachate, design of solid waste incinerator.	5	10
6.	**Noise pollution and its control:** Sources of noise, units and measurements of noise, effects of noise pollution, prevention and control of noise pollution, noise pollution standards	3	10
	Total	**45**	**100**

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
5	20	30	10	5	5

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:

1. Perry's Chemical Engineers Handbook , McGraw-Hill Education.
2. Coulson & Richardson's Chemical Engineering Design: Vol. 6 by R. K. Sinott, CBS
3. Wastewater Engineering, Treatment and Reuse, Metcalf and Eddy, Tata McGraw Hill.
4. Handbook of Solid Waste Management by George Tchobanoglous, Frank Kreith, McGraw-Hill Education
5. Introduction to Process Engineering and Design by Thakore & Bhatt, McGraw-Hill Education.

(b) Open source software and website:

Students can refer to video lectures available on NPTEL

(c) Suggested Activities for Students:

Students may be allotted one Open-ended Project / Mini Project on any of the above topic. Detailed equipment design based on the research papers published in reputed journals may be incorporated.

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