



# GUJARAT TECHNOLOGICAL UNIVERSITY

**Master of Engineering**

**Subject Code: 3731604**

**Semester III**

**Subject Name: Design of Pollution Control Systems**

**Type of course: Program Elective – V**

**Prerequisite:** Knowledge of fundamentals of environmental and chemical engineering.

**Rationale:** Design, operation and maintenance of pollution control systems related to gaseous emissions, waste water and solid waste, design of equipments and understanding about environment management systems.

**Teaching and Examination Scheme:**

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

**Syllabus Content:**

Sr. No.	Content	Total Hrs
1	Introduction to air pollution control equipments:  Introduction, air quality standards, process parameters, operating conditions, gas characteristics, dust characteristics, performance required, different types of pollution control equipments, criteria for selection, Auxiliary equipments.	3
2	Design of various air pollution control equipments:  Design of Absorbers: 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 Filters: 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 towers : Introduction, principle and theory, design of spray towers. Cyclone spray chamber : Introduction, principle and theory, design of Venturi scrubbers: Introduction, principle and theory, design and performance equations	15



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<b>3</b>	Introduction to waste water treatment  Introduction, sources of effluent, water quality standards, waste water characteristics, different stages of waste water treatment plant, performance required.	<b>3</b>
<b>4</b>	Design of waste water treatment plant:  Primary treatment methods: Screening, Equalization, Oil Separation, Sedimentation and clarification. Secondary treatment methods: Biological process, aerobic and anaerobic process. Tertiary treatment methods: Ion Exchange-processes, Membrane Processes, Biological treatment Treatment for strong industrial waste: Design of Incinerators, multiple effect evaporators Common Effluent Treatment Plants (CETPs): Location, Need, Design, Operation & Maintenance Problems and Economical aspects.	<b>15</b>
<b>5</b>	Design of solid waste management systems  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.  Design of Secured landfills – site selection, design and operation of landfills, Landfill liners, leachate collection and removal, advance methods for treatment of landfill leachate, design of solid waste incinerators.	<b>9</b>
<b>6</b>	<b>NOISE POLLUTION AND ITS CONTROL</b>  Sources of noise, units and measurements of noise, effects of noise pollution, prevention and control of noise pollution	<b>3</b>

## **Suggested Specification table with Marks (Theory):**

<b>Distribution of Theory Marks</b>					
R Level	U Level	A Level	N Level	E Level	C Level
<b>10</b>	<b>15</b>	<b>25</b>	<b>10</b>	<b>10</b>	<b>-</b>

**Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)**



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Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

### Reference 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.

### Course Outcomes: After successful completion of the course, students will be able to

Sr. No.	CO statement	Marks % weightage
CO-1	To understand fundamentals of pollution control systems	20 %
CO-2	To design key air pollution control equipments	40 %
CO-3	To design liquid effluent treatment plants	20 %
CO-4	To design solid waste management systems	20 %

**List of Experiments: NA**

**Major Equipment: NA**

**List of Open Source Software/learning website:**

- Students can refer to video lectures available on NPTEL.