GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3171307

Semester – VII
Subject Name: DESIGN OF AIR POLLUTION CONTROL EQUIPMENTS

Type of course: Professional core Course

Prerequisite: Knowledge of subjects Fundamentals of Air Pollution and Air Pollution Control & Management

Rationale: This course provides fundamentals for selection and design of the most appropriate air pollution control systems. It also provides the basics regarding the auxiliary equipments necessary for efficient working of air pollution control system of any industry.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ES (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs
1	**Design Fundamentals and Elements of Air Pollution Control System:** • Introduction: Sources of Pollutant Generation and Elements of Air Pollution Control System • Design Fundamentals: Bernoulli's Equation, Pressure, Types of Pressure, and Pressure Drops/Losses, Pressure Profile for a System, Temperature, Temperature and Pressure Corrections. • Hoods: Principle, Application, Types of Hoods • Ducts: Principle, Application, Types of Ducting System, Components of Ducting System • Stack: Principle, Application, Types of Stacks • Fans and Blowers: Principle, Application, Types of Fans and Blowers • Others: Flow Control Strategies and Handling Equipments.	**05**
2	**Selection of air control equipments:** • Introduction, process parameters • Operating conditions • Gas Characteristics • Dust Characteristics • Performance Required • Process Of Selection And Plant /Site Layout	**03**

	• Auxiliary Equipments	
3	**Cyclone separators:** • Introduction, Principle And Theory • Terminology, Performance Equations • Design Numericals • Design Of Cyclone Separator • Operation And Maintenance and improving Performance	**05**
4	**Fabric Filters:** • Introduction, Principle And Theory • Terminology And Performance Equations, • Design Numericals • Design Of Fabric Filter • Operation and Maintenance and Improving Performance.	**05**
5	**Electrostatic Precipitator:** • Introduction, principle and theory • Terminology and performance equations • Design Numericals • Operation and maintenance and improving performance.	**05**
6	**Wet scrubbers:** • Spray towers : Introduction, principle and theory, terminology • Cyclone spray chamber : Introduction, principle and theory, terminology **Venturi Scrubber:** • Introduction, principle and theory • Terminology and performance equations • Design Numericals • Design of venturi scrubbers • Operation and maintenance and improving performance	**03**
7	**Absorption tower and Adsorption Tower:** • Introduction, principle and theory, terminology, types of Adsorption towers and Design Equations	**02**

Suggested Specification table with Marks (Theory): (For BE only)

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

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

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. Air Pollution Control in Industries Vol. 1 & 2 by T K Ray Publishers: Tech Books International.
2. Air Pollution Control equipment calculations by Louis Theodore.
3. Air Pollution by M N Rao & H V N Rao
4. Air Pollution Control in industries by C S Rao
5. Air Pollution Control Engineering by Lawrence K. Wang, Norman C. Pereira, Yung-Tse Hung
6. Handbook-of-Air-Pollution-Control by Margeret-Pence

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Discuss requirements of Auxillary and Air Pollution Control Equipments.	15
CO-2	Select the most suitable and cost-effective air pollution control equipment to remove air pollutants	10
CO-3	Carry out a preliminary design of air pollution control equipments to reduce Particulate matter.	65
CO-4	Discuss concept and design theory of Absorption and Adsorption tower.	10

List of Practicals:

1. Detailed design and drawing of Cyclone Separator
2. Detailed design and drawing of Venturi Scrubber
3. Detailed design and drawing of Bag Filter
4. Detailed design and drawing of Electrostatic Precipitator
5. Detailed design and drawing of Hood
6. Detailed design and drawing of Duct
7. Detailed design and drawing of ID/FD Fan