



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Diploma Engineering

Level: Diploma

Branch: Environmental Engineering

Subject Code : DI04013021

Subject Name : Air Pollution & Control

w. e. f. Academic Year:	2025-26
Semester:	4 th
Category of the Course:	PCC

Prerequisite:	Knowledge of Environment and sustainability
Rationale:	The course will provide a detailed knowledge of air quality management with an emphasis on the sources of air pollution, including the effects on humankind, plants and animals. In depth awareness of central, state, and local regulatory requirements in respect of air pollution laws and regulations will be provided. Principles of air pollution prevention and control, equipment and technology used for the purpose will be dealt with description of control of specific gaseous emissions.

Course Outcome:

After Completion of the Course, Student will able to:

No	Course Outcomes	RBT Level
01	Identify the sources, types, causes and effects of air pollution.	
02	Calculate the stack height based on the meteorological components related to air pollution.	
03	Select location and type of sampling.	
04	Select appropriate air pollution control methods based on ambient conditions with consideration of air pollution control laws.	
05	Explain control methods of specific gaseous emissions like SO ₂ & NO ₂	

*Revised Bloom's Taxonomy (RBT)

Teaching and Examination Scheme:

Teaching Scheme (in Hours)			Total Credits L+T+ (PR/2)	Assessment Pattern and Marks				Total Marks
L	T	PR		C	Theory		Tutorial / Practical	
			ESE (E)		PA (M)	PA (I)	ESE(V)	
3	0	2	4	70	30	20	30	150



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Course Content:

Unit No.	Content	No. of Hours	% of Weightage
1. Air Pollutants	1.1 Air pollution an Environmental problem. 1.2 Classification of air pollutants: Natural contaminants, Particulate, Gases and vapors, Primary and secondary air pollutants 1.3 Sources of Airpollution: Stationary sources, Mobile sources. 1.4 Effects of air pollution on: human health, animals, plants, Properties, Society 1.5 Linkages between Air Pollutants and Greenhouse Gases (GHGs): Short-lived climate pollutants (SLCPs), black carbon, methane, ozone. 1.6 National Clean Air Programme (NCAP) & Nationally Determined Contributions (NDCs)	8	20
2. Meteorology	2.1 Meteorological factors influencing air pollution: Dispersion, Temperature Lapse Rates and Stability. 2.2 Measurement of wind speed, direction and temperature 2.3 Effect of meteorological parameters on Plume behavior 2.4 Regalement chart for plume behavior 2.5 Dispersion of air pollutants, Determination of Stack height 2.6 Stability classes	8	20
3. Air Pollution Sampling and Measurements	3.1 Sampling methods 3.2 Duration of Sampling 3.3 Ambient Sampling and its location: Collection of Gaseous Air Pollution, Collection of Particulate matter 3.4 Stack Sampling and selection of sampling location 3.5 Fugitive & Diffused emission, Indoor/Occupational Air pollution 3.6 Continuous Emission Monitoring Systems (CEMS): For SO ₂ , NO _x , CO, CO ₂ , PM, VOCs.	8	20
4. Air Pollution Control Methods and Equipment	4.1 Types of collection methods. 4.2 Particulate Emissions Control Equipments: Gravity settling, cyclones, Fabric Filters, Electrostatic Precipitators, Wet Scrubbers, Hybrid Filters 4.3 Selection of Collectors.	14	30



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	<p>Control of Gaseous Emissions: Absorption by Liquids, Adsorption by Solids</p> <p>4.5 Air pollution control laws/acts at different central, state and local levels and by regulatory bodies.</p> <p>4.6 Control of SO₂: Chemistry of SO₂, Lime and Limestone Scrubbing, Wet lime scrubbing, Single Alkali scrubbing and Double Alkali scrubbing, Dry process</p> <p>4.7 Control of NO_x: Combustion control methods, catalytic reduction (SCR, SNCR)</p> <p>4.8 AI-based predictive maintenance of scrubbers, optimization of combustion to reduce NO_x and CO₂</p> <p>4.9 Introduction to Environmental Management Systems (EMS): ISO 14001, ISO 45001, and their role in compliance and air quality improvement</p> <p>4.10 Corporate Environmental Reporting: ESG metrics related to air pollution, carbon footprint, and sustainability disclosures.</p>		
5. Sector Wise Mitigation Measures to Control Air Pollution	<p>5.1 Mitigation measures for Urbanisation like City Planning, Clean technology interventions in rural areas like clean fuel, solar lighting, paved roads, ban on refuse burning etc.</p> <p>5.2 Mitigation measures for Transportation like travel demand management, avoid-shift-improve approach, use of public transportation, encourage non-motorized transport, fuel quality and vehicle emission norms etc.</p> <p>5.3 Mitigation measures for Industrialisation like vigilance and enforcement etc.</p> <p>5.4 Mitigation measures for Power generation like Improved power supply, monitoring of control equipments etc.</p> <p>5.5 Mitigation measures for Agricultural activities like power generation from crop residue</p>	07	10
	Total	45	100

Suggested Specification Table with Marks (Theory):

Distribution of Theory Marks (in %)					
R Level	U Level	A Level	N Level	E Level	C Level
35	45	20	-	-	-



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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:

S. No.	Title of Book	Author	Publication with place, year and ISBN
1	Air Pollution and Control	Rao, M.N and Rao, H.N.	McGraw Hill Education; 1st edition (1 July 2017); ISBN-13 : 978-0074518717
2	Air Pollution and Control	K.V.S.G. Muralikrishna	USP,2017, ISBN-13 : 978-9383828593
3	Air Pollution: Its Origin and Control	Wark and Warner	Pearson; 3rd edition (15 January 1998), ISBN-13 : 978-0673994165
4	Textbook of Air Pollution And its Control	S.C. Bhatia	Atlantic (1 December 2021), ISBN-13 : 978-8126908257
5	Handbook of Air Pollution Analysis	Roy M. Harrison	Springer, ISBN-13 : 978-9401083119
6	IS:5182 , Methods for measurements of air pollution(Part-I,II,IV,V,X)	BIS	BIS, May 1999
7	Industrial Safety, Health And Environment Management Systems	Prof. Sunil S.Rao & R.K.Jain	Khanna Publishers, ISBN-13 : 978-8174092106

(b) Open source software and website:

1. www.gpcb.gov.in
2. <https://cpcb.nic.in/about-namp/www.neeri.res.in>
3. www.Nptel.ac.in
4. <https://www.indiacode.nic.in/>



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Suggested Course Practical List:

S. No.	Practical Outcomes (PrOs)	Unit No.	Approx. Hrs. required
1	Sampling and Analysis of PM10 in Ambient Air	I	04
2	Sampling and Analysis of PM2.5 in Ambient Air	I	04
3	Measurement of meteorological parameters (wind velocity, wind direction, humidity, temperature, solar insolation, rainfall) and drawing wind rose diagram.	II	04
4	Stack Emission Monitoring using Isokinetic Sampling	III	04
5	Indoor Air Quality Assessment using Multi Gas Monitor	III	02
6	Sampling and Analysis of PM10 & PM2.5 using Spectrometer	III	04
7	Laboratory scale study on few air pollution control devices.	IV	02
8	Sampling and Analysis of SO2 and NO2 in Ambient Air	V	04
9	Prepare a site visit report after visiting an industry/industry supported lab listed below 1. Thermal power plant (ESP, scrubber, stack monitoring). 2. Cement industry (bag filters, cyclones, fugitive dust control). 3. Petrochemical/refinery (flare systems, VOC recovery). 4. Chemical/pharma plant (scrubbers, activated carbon adsorption). 5. Steel plant (ESP, secondary gas cleaning systems).	All	02
			Total:30

List of Laboratory/Learning Resources Required:

S. No.	Equipment Name with Broad Specifications	PrO. No.
1	<ul style="list-style-type: none">Analytical BalanceHigh volume air samplerFilter mediaUV SpectrophotometerFlame photometerDistillation AssemblyChemical testing glasswaresHot air oven	1 to 14



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Suggested Project List:

- a) Make a report after gathering information about the values of ambient air pollution in your town or city and compare them with that of other cities
- b) Prepare chart for: Different types of Plume behaviour.
- c) Prepare working model for air control equipment
- d) Study and prepare report on effect of lockdown on Air Quality in various countries.
- e) Study and prepare report on National Clean Air program and identify its limitations
- f) Prepare a list of significant steps taken by the government to curb air pollution
- g) Study and prepare report on strategies to overcome challenges in NCAP
- h) Study and enlist various National policies and programs proposed by government to tackle air pollution
- i) Enlist major international treaties formed to tackle air pollution
- j) Study and prepare report on role of air pollution in environmental issues like ozone depletion, global warming, climate change, acid rain
- k) Carbon footprint estimation of a campus and suggestions for air pollution reduction and carbon neutrality
- l) Prepare an ESG scorecard for a selected industry focusing on air pollution control.
- m) Prepare a chart showing ISO 14001 implementation cycle and its link with clean air.

Suggested Activities for Students:

- a) Preparation of chart of various methods to analyze different forms of Nitrogen
- b) Preparation of chart of various methods to analyze Fluoride
- c) Study and List the effects of Nitrogen and Phosphorus in water and waste water
- d) Undertake micro-project.
- e) Give seminar on any relevant topic.

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