GUJARAT TECHNOLOGICAL UNIVERSITY

ENVIRONMENTAL SCIENCE AND TECHNOLOGY (35)
AIR POLLUTION CONTROL
SUBJECT CODE: 2153504
B.E. 5thSEMESTER

Type of course: Environmental Science & Technology

Prerequisite: A good understanding of air pollution and its control, along with some basics of pollutant dispersion for environmental science and technology.

Rationale: This subject is intended to make students aware about the noise and air pollution, various sources which contribute in degradation of air quality, assessing the air quality through air quality index, and various air pollution control methods and equipments used by industries.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	2	5	70	20	10	20	10	20	150

Content:

Sr. No.	Topic	Teaching Hours	Module Weightage (%)
1.	**Introduction to Air Pollution:** Air and its composition, Air Pollution, Sources of air pollution and its classification, Major air Pollutants and their characteristics, Specific group pollutants such as CFC, GHG etc. Air Pollutants from various industrial sectors. Impact of air pollution on human health and vegetation. **Introduction to noise:** Difference between sound and noise, Pitch and Frequency, Sound Pressure, Sound Pressure level (Decibel), Leq, sources of noise and harmful effects of noise, noise measurement and noise control measures.	9	25
2.	**Pollutant Dispersion:** Concept of atmospheric stability. Adiabatic and Environmental Lapse rate. Plume behavior. Effect of topography, terrain and structure on Pollutant dispersion. Effect of wind on Pollutant dispersion. Concept of maximum mixing depth and ventilation coefficient. Plume rise and Effective stack height.	9	25
3.	**Air Quality:** Introduction to Air quality index and Comprehensive Environmental Pollution Index etc. and its application. Sampling and measurement of air pollutants. Introduction to National Ambient Air Quality Standards. **Dispersion modeling:** Introduction to Dispersion modeling, its	9	25

	applications and limitations. Introduction to Gaussian Plume model and GLC determination.		
4.	**Impacts of Air Pollution:** Extreme air Pollution scenarios: Acid Rain, Global Warming, Smog, Ozone layer depletion etc. Various treaties and protocols: Kyoto Protocol and Montreal Protocol etc. **Control methods and equipment:** Introduction to control methods and equipment for Particulate matter and gases. Design and working of scrubbers, Electrostatic Precipitator, Gravity settlers, Cyclone separator, Filter bags etc. Other mechanisms of air pollution control such as Biochemical Processes, catalytic processes etc.	9	25

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
19	**24**	**21**	**15**	**21**	**-**

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. Environmental Pollution Control and Engineering, Rao C.S., New Age International (P) Limited, 1st Ed., 1991.
2. Air Pollution, Perkin, H.G. McGraw Hill 1974.
3. Air Pollution. Physical and Chemical Fundamentals, Sainfeld, J.H. McGraw Hill, N.Y. 1975.
4. Air Pollution: Measurement, Modeling and Mitigation, A Tiwari and J Colls, Taylor & Francis, 2010
5. Sources and Control of Air Pollution, R J Heinsohn and R L Kabel, Prentice Hall, 1999
6. Air Pollution Control Equipment Calulations, L Theodore, John Wiley and Sons, 2008
7. Catalytic Air Pollution Control, Hack, Furraoto and Gulati,John Wiley and Sons, 2009

Course Outcome: After learning this course the students would have:

1. Proper understanding about the various air pollutants, their source of generation, their impacts and mechanism of control
2. Basic information about Noise and its control.
3. Knowledge to analyze quality of air in the form of air quality index and dispersion modeling.
4. Hands on experience on sampling and measurements of air Pollutants

List of Experiments:

1.	Sampling of PM 2.5 in ambient air.
2.	Sampling of Respirable Suspended Particulate Matter PM10 in ambient air.

3	Sampling of Suspended Particulate Matter in ambient air.
4.	Sampling and analysis of nitrogen dioxide in ambient air.
5.	Sampling and analysis of sulphur dioxide in ambient air.
6.	Measurement of Noise using Sound Level Meter.
7.	Demo of Stack monitoring kit.
8.	Demo of weather monitoring station.
9.	Demo of handy air sampler

Design based Problems (DP)/Open Ended Problem:

1. Analysis of air quality at different places
2. Noise level measuring at different places
3. Design of various control equipment
4. Various case studies related to the subject

Major Equipment:

- Respirable dust sampler
- PM2.5 Sampler
- Stack monitoring kit
- Sound level meter
- Handy air sampler etc.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.