

Subject Code: 02EN0103
Subject Name: Fundamentals of Air Pollution & Control
M.Tech Year – I (Semester I)

Objectives: To convey knowledge on indoor/ particulates/ gaseous air pollutant and its emerging trends.

Credits Earned: 4 Credits

Course Outcomes: At the end of the course student will able to:

1. Understand the basics of atmospheric chemistry.
2. Classify sampling techniques and analyze air quality.
3. Understand plume behaviour for different atmospheric stability conditions.
4. Assess concentration of pollutant at different receptor locations.
5. Comprehend air pollution control systems and their efficiency.

Pre-requisite of course: Basic information of air pollution

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	Atmosphere & meteorology: Structure, classification, global and micro climate, wind and temperature profiles, stability study, inversions study, plume behaviour, diffusion, lapse rate & mixing height.	4
2	Sources of air pollution and air quality monitoring: Stationary and mobile, fugitive emissions, primary and secondary pollutants, air pollution effects (local, national and global scale), incidents of air pollution, emission factors, predictions and inventory, stack monitoring and standards.	8
3	Air pollutants Dispersion and modelling: Fundamentals, classification & types of models, objectives of air quality modelling, Box model, Gaussian model, Assumptions.	10

4	Fundamentals of air pollution control: Principle, properties of VOC's & aerosols (physical properties, size distribution and chemical properties), and particle dynamics – terminal settling velocity, slip correction factor.	5
5	Control device for particulates: Types and classification, selection criteria, design aspects, basics of APCD, GSC, efficiency of settling chambers, cyclone separators.	10
6	Control device for gaseous pollutants: Absorption – types, mechanism and theory of equilibrium curve, mass balance application, tower diameter and height.	5
Total Hours		42

List of Experiments

- [1] Demonstration of air pollution monitoring instruments.
- [2] Calibration of High Volume Air Sampler (HVS).
- [3] Utilization of High Volume Air Sampler to determine PM 10 and PM 2.5 in ambient air.
- [4] Measurement of SPM; SO_x; NO_x and CO in ambient air.
- [5] Elemental analysis of particulate matter.
- [6] SO_x in ambient air by lead candle method.
- [7] Applications of stack monitoring kits to determine air pollutant.

Design based Problems (DP)/Open Ended Problem:

- [1] Dispersion modelling of air pollutants (design based problem/Open ended problem)

Reference Books:

- [1] Fundamentals of air pollution, IVth ed. By Daniel A. Vallero.
- [2] Environmental Engineering Arcadio P. Sincero and Gregoria A. Sincero, Prentice Hall of India, 1999.
- [3] Environmental Pollution Control Engineering- CS Rao, Wiley Eastern Ltd., New Delhi, 1996.
- [4] Air Pollution Control Equipment H. Brauer and Y. B. G. Verma, Berlin Heidelberg, New York.
- [5] Air Pollution- Its Origin and Control - Kenneth Work and Cecil F. Warner, IEP, New York.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
5%	15%	40%	30%	10%	-

Instructional Method:

- a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by white board, may also use any of tools such as collaborative learning, demonstration, role play, Quiz, brainstorming, MOOCs, Active Learning Assignments etc.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.