

Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE5180 - Air Pollution and Control Engineering

Credit Distribution: C:12 L:4 T:0 P:0 E:0 O:8 TH:0

Course Type: Theory

Description: Course Objectives: To introduce the students to the basics of air pollution, current air pollution issues, principles, concepts, methods adopted in the air quality management. To provide an introduction to design principles and their applications in design of air pollution control system. Expected Outcomes: In this course students will (i) grasp the fundamentals of air pollution and its associated environmental impacts (ii) learn to describe the key concepts of air quality management

Course Content: Introduction: air pollution definition, sources and classification of air pollutants, air pollution episodes, effects of air pollutants on human health, vegetation and materials Air Quality Standards and Legislation: air pollution control legislation, air quality criteria and standards, ambient air quality standards, emission standards, elements of regulatory control Measurement and Monitoring of Air Pollutants: types of air sampling, sampling train, sampling of particulate and gaseous pollutants, stack emission monitoring, analysis and measurement of particulate and gaseous pollutants, online monitoring system Air Pollution Meteorology: urban micro-meteorological concepts-boundary layer structure, air pollution pathways, air quality phenomena-inversion, ventilation, urban heat island, atmospheric stability classification, plume behavior, wind velocity profiles, wind and pollution rose diagrams Air Quality Management : scales of air pollution problems, emission inventory, air quality management concept, elements of air quality management, statistical techniques in air quality data analysis and air quality indices air quality management practices in developed and developing countries Basics of Air Pollution Control: general ideas in air pollution control, philosophy of air pollution control, engineering control of air pollution at sources, control principles and methods used to control gaseous and particulate pollutants and selection of air pollution control equipment Design of Air Pollution Control Equipment: Design of settling chamber, cyclone separators, wet and dry scrubbers, bag filters, electrostatic precipitators Vehicular Emissions Control: emissions from gasoline, diesel, CNG and biodiesel engines, catalytic converters and filters Indoor Air Pollution Control: sources and types of indoor air pollutants, control of indoor air pollution Current Issues: hazardous air pollutants, CO₂ budgeting, air pollution effects on climate change, global air pollution, air pollution mitigation and adaptation to climate change Air Laboratory-particulate matter sampling, gaseous sampling, indoor air sampling, bio aerosols sampling and stack monitoring.

Text Books:

- Boubel, R.W., Fox, D.L., Turner, D.B. and Stern, A.C., 2005. Fundamentals of Air Pollution, 3rd Edition, Academic Press, New York.
- de. Nevers, N., 2000. Air Pollution Control Engineering. McGraw Hill, Boston.

Reference Books:

- Wark, K. and Warner, C.F., 1981. Air pollution: its origin and control. Harper and Row Publishers Inc., New York, USA.

- Theodore, L., 2008. Air Pollution Control Equipment Calculations. John Wiley & Sons Inc Publication, New Jersey.
- Arya, S. P., 1999. Air pollution meteorology and dispersion, Oxford University Press
- Devinny, J.S., Deshusses, M.A. and Webster, T.S., 1999. Bio-filtration for Air Pollution Control, Lewis Publishers, New York.
- Perkins, H.C., 1974. Air Pollution. McGraw-Hill Kogakusha, Limited, Tokyo.
- Bradstreet, J.W., 2004. Handbook of hazardous air pollutants, Crest Publishing House, New Delhi
- Peavy, H.S. Rowe, D.R. and Tchobanoglous, G., 1985. Environmental Engineering. McGraw Hill International Editions, New York.
- Rao, C.S., 1995. Environmental Pollution Control Engineering. Wiley Eastern Limited, New Age International Limited, New Delhi.

Prerequisite: NIL