

ENVIRONMENTAL POLLUTION AND CONTROL

ENCH 304

Lecture : 3
Tutorial : 1
Practical : 3/2

Year : III
Part : I

Course Objectives:

The objective of this course is to provide concepts of major environmental pollution issues, including air, water, land, and noise pollution, their sources, transport mechanisms, hazards, and impacts on ecosystems. By the end of the course, students will be able to analyze pollution problems, evaluate control strategies, and design appropriate solutions for sustainable environmental management.

1 Introduction (4 hours)

- 1.1 Understanding and defining pollution
- 1.2 Degradation of global environmental health
- 1.3 Root causes, impact and mitigation of pollution

2 Fundamental Concepts of Pollutant Transport (5 hours)

- 2.1 Units of measurement
- 2.2 Material balance
- 2.3 Energy fundamentals
- 2.4 Stoichiometry
- 2.5 Enthalpy in chemical systems
- 2.6 Chemical equilibria

3 Water Pollution (9 hours)

- 3.1 Hydrological cycle
- 3.2 Water pollutants
- 3.3 Biochemical and chemical oxygen demand
- 3.4 Effect of oxygen-demanding wastes on rivers
- 3.5 Water quality in lakes and reservoirs
- 3.6 Biological wastewater treatment

4 Air Pollution (9 hours)

- 4.1 Overview of emissions and its effects
- 4.2 Clean air act
- 4.3 Progress in controlling emissions and improving air quality
- 4.4 Source apportionment and criteria pollutants
- 4.5 Stationary sources

- 4.6 Temperature inversions
- 4.7 Indoor air quality
- 4.8 National and WHO guidelines of air quality

5 Noise Pollution (3 hours)

- 5.1 Sources and effects of noise pollution
- 5.2 Rating systems
- 5.3 National and WHO guidelines of traffic noise
- 5.4 Noise control techniques

6 Solid Waste Management (9 hours)

- 6.1 Solid waste and its properties
- 6.2 Municipal solid waste management and source reduction
- 6.3 Lifecycle assessment
- 6.4 Waste management methods
 - 6.4.1 Recycling
 - 6.4.2 Composting
 - 6.4.3 Landfilling
 - 6.4.4 Waste-to-energy technology

7 Climate Science (6 hours)

- 7.1 Earth atmosphere
- 7.2 Global temperature and energy balance
- 7.3 Greenhouse gas (GHGs)
- 7.4 Ozone depletion and aerosols
- 7.5 Global warming and climate change
- 7.6 IPCC assessment reports
- 7.7 Oceans and climate change

Tutorial (15 hours)

- 1. Dry application of mass and energy transfer and chemistry in environmental pollution
- 2. Calculation of wastewater strength in terms of BOD and COD
- 3. Calculation of air pollution in terms of PM, and gaseous pollutants
- 4. Calculation of noise pollution and climate change potential
- 5. Calculation of potential of solid waste in energy production

Practical (22.5 hours)

- 1. Determination of dissolved oxygen (DO) in different water and wastewater samples by Winkler's method
- 2. Determination of dissolved solid, suspended solid, total solid and volatile solid of wastewater samples
- 3. Wastewater treatment plant demonstration
- 4. Measurement of biochemical oxygen demand (BOD) of wastewater sample

5. Measurement of chemical oxygen demand (COD) of wastewater sample
6. Demonstration of solar irradiance data using pyranometer
7. Demonstration of noise pollution using a sound level meter

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapters	Hours	Marks distribution*
1 and 2	9	12
3	9	12
4	9	12
5 and 6	9	12
7	9	12
Total	45	60

* There may be minor deviation in marks distribution.

References

1. Masters, G. M., Ela, W. P. (2007). Introduction to environmental engineering and science (Latest Edition). Pearson Education.
2. Davis, M. L., Cornwell, D. A. (2022). Introduction to environmental engineering. McGraw Hill Education.
3. Mihelcic, J. R., Zimmerman, J. B., Auer, M. T. (2021). Environmental engineering: Fundamentals, sustainability, design. John Wiley & Sons.
4. de Nevers, N. (2016). Air pollution control engineering. Waveland Press.
5. Enger, E. D., Smith, B. F. (2023). Environmental science: A study of interrelationships. McGraw Hill Higher Education.
6. Godish, T. (1997). Air quality (Latest Edition). Lewis Publishers.
7. Climate Change 2007 – Impacts, adaptation and vulnerability contribution of working group II to the fourth assessment report of the IPCC (978052188010-7 Hardback; 978052170597-4 Paperback).