

**Semester-I, Paper-4**  
**ENVIRONMENTAL INSTRUMENTATION**

**Teaching scheme**

Lectures: 4 Hrs / Week  
Practical: 2 Hrs/ week

**Examination scheme**

Theory: 100 Marks  
Term work: 25 Marks

**Unit 1.**

(10 Hrs, 20 Marks)

Environmental Definition, Constituents, biochemical cycle, causes of pollution, types of pollution and their measurements, effects of pollution, Different sensors for measurement of pollution, difference between off-line Measurement and continuous monitoring.

Environmental Toxicology and Hazards, Common toxic agents, their analysis and safety measures, environmental regulations and standards.

**Unit 2.**

(10 Hrs, 20 Marks)

Review of standard methods of pollution analysis, Sampling Operations, Devices and techniques as related to environmental engineering.

Air Pollution Analysis: Analysis of Aerosols and Monitoring of gaseous pollutants like SO<sub>2</sub>, H<sub>2</sub>S, NO-Nox, CO-CO<sub>2</sub>, Ozone, NH<sub>3</sub> and organic gases, Vapor analysis, Monitoring of suspended particulate matter and trace metal pollutants.

**Unit 3.**

(10 Hrs, 20 Marks)

Water Pollution Analysis Physical Examination – color, conductivity, temperature, odor, turbidity, hardness. Chemical Characterization – Ca<sup>2+</sup>, Mg<sup>2+</sup>, Na<sup>+</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, HCO<sub>3</sub><sup>-</sup>, Al<sup>3+</sup>, Ba<sup>2+</sup>+Boron, F<sup>-</sup>, NO<sub>2</sub><sup>-</sup>, PO<sub>4</sub><sup>3-</sup>, Fe<sup>3+</sup> Mn<sup>2-</sup>, SiO<sub>2</sub><sup>2-</sup>, Biological Investigations – DO, BOD, bacteriological examination, and types of water quality monitoring instruments (pH meters, conductivity meters etc.)

Effluent Analysis: Physical Methods of characterization: density, viscosity, temperature, conductivity, turbidity, volatile, and dissolved solids, oil and immiscible liquids, color, odor, radioactivity, and analysis of organic pollutants. BOD, COD, TOC, Specific analysis of Organic pollutants, Analysis of metal pollutants, Analysis of anion and dissolved gases dissolved oxygen, pH, dissolved chlorides, suspended solids, nitrogen, sludge index

**Unit 4.**

(10 Hrs, 20 Marks)

Soil pollution and Pesticide Analysis: Analysis of Micronutrients, trace element pesticides, Chromatographic Characterization, Polarographic and Spectroscopic Analysis of pesticides.

- (a) Noise pollution and its Measurement: Units, Devices and maps Noise Control System.
- (b) Radiation pollution and its Measurement and Control.

**Unit 5.**

(10 Hrs, 20 Marks)

Instrumentation Setup for different types of pollution control like wastewater treatment, HVAC Control etc.

Environmental testing, Dry heat, Dry cold, Damp heat, Salt Spray, Dust, Altitude bump, Vibration Drop/Topple, free fall and study of ISO 14001.

**References:**

1. Environmental pollution analysis, "S.M. Khopkar", 1<sup>st</sup> Ed. Wiley eastern 1993
2. Basic concepts of Analysis chemistry, "S. M. Khopkar"
3. Environmental Engg., "Peary H.S. and other".
4. Sensor system for Environmental monitoring, "Campbell".
5. Basic Environmental technology (Ed. 1997), "J. A. Nathanson".
6. Environmental tech series, V, I, II, III, IV, "Neal K. Ustler".

**List of Experiments:**

Term work shall consist of at least **eight** experiments based on above topics.