

Course Objectives:

- To discuss the methods available for sample extraction techniques from different environmental samples
- To discuss, analyse and design the chromatographic methods and atomic spectroscopy for contaminant analysis
- To discuss, analyse and design the air sampling techniques.

Introduction to the course: Pollutants in the environment and their sources; general classifications of pollutants and their chemical structures, properties and toxicity; units of measurement; quality control and quality assurance program in environmental analysis; errors in quantitative analysis, precision and accuracy in measurement, statistics in microanalysis, control charts, and detection limit

Sample extraction techniques and removal of interference from sample extracts: purge and trap separation of volatile substances, liquid-liquid extraction, solid phase extraction, ultrasonic extraction, supercritical fluid extraction; sample clean-up methods

Wet methods: Titrimetric and colorimetric procedures, general discussion, Beers law and spectroscopic methods; analysis of common anions in environmental waters by wet methods; chemical and biochemical oxygen demand

Gas chromatography: Principles of chromatography; peaks separation; resolution efficiency of columns; understanding chromatograms and identifying compounds; GC columns and detectors; quantification methods, external and internal standard methods; minimum detection limits

High performance liquid chromatography: Reversed phase and normal phase liquid chromatography, HPLC instrumentation and detectors; post-column derivatization; ion chromatography Mass spectrometry: Interpretation of mass spectra, basic GC/MS instrumentation, ion sources, mass analyzers, ion detectors, quantification

Atomic spectroscopy: flame and furnace atomic absorption spectroscopy, inductively coupled plasma emission spectroscopy: sample digestion methods

Air Analysis: Air sampling plan, sampling of indoor air, use of adsorbent tubes and canisters, solvent and thermal desorption techniques; filter cassettes

References:

Environmental Chemical Analysis, S.Mitra, Patnaik, Keccakus, CRC Press, 2019

Handbook for analytical quality control in water and wastewater laboratories, USEPA , 2001