EVSC 612 (Environmental Analysis)

An Outline of the Course

This course covers the general topics on the analysis of pollutants in environmental matrices including the instrumentations, theory and techniques for their measurements. This course also consists of laboratory experiments.

COURSE SYLLABUS

EVSC 612 - ENVIRONMENTAL ANALYSIS for FALL
TIERNAN **Hall** 205
Thursday: 545PM - 935PM
Instructor: Dr. Chaudhery Mustansar Hussain
Office: Tiernan 151D
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Office Hours: Tiernan Hall 151D, by arrangement/email

Details of Class Lectures and Topics

1. 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
2. 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
3. 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
4. High performance liquid chromatography: Reversed phase and normal phase liquid chromatography, HPLC instrumentation and detectors; post-column derivatization; ion chromatography
5. Mass spectrometry: Interpretation of mass spectra, basic GC/MS instrumentation, ion sources, mass analyzers, ion detectors, quantification
6. Atomic spectroscopy: flame and furnace atomic absorption spectroscopy, inductively coupled plasma emission spectroscopy: sample digestion methods

7. *Mid-term Exam*

8. 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
9. Air Analysis: Air sampling plan, sampling of indoor air, use of adsorbent tubes and canisters, solvent and thermal desorption techniques; filter cassettes
   10-14. Laboratory Experiments

There would be to four to five laboratory experiments in this course. Below is the tentative list of experiments, subject to change:

1) Analysis of inorganic ion in water by UV/visible spectrophotometric method
2) Analysis of organic pollutants by gas chromatography
3) Analysis of organic pollutants in water by HPLC method.
4) Analysis of metals by flame atomic absorption spectroscopy.
5) Gas chromatography/mass spectrometric analysis: demonstration

Laboratory safety procedures must be strictly adhered for all laboratory experiments. Students are advised to participate in group discussions in the class.

Suggested readings:

Environmental Chemical Analysis by B.B.Kebbekus and S.Mitra, published by Blackie Academic and Professional

Grading: Exam+ Lab Reports + (Attendance, Participation) + Presentation
(Exam: 50, Lab reports: 30%, Attendance 10%, Presentation 10%)

<u>Learning Outcomes:</u>

Upon completion of the course you should have a facility in the following areas:

1. **Understand the fundamentals of environmental analysis**
2. **Know role of sample preparation in environmental analysis**
3. **Understand theory and techniques for their measurements of pollutants**
4. **Demonstrate a broad and coherent knowledge and understanding of analytical chemistry and instrumental methods of analysis, including gas chromatography, HPLC chromatography and mass spectrometry**
5. **Use spectroscopic techniques to determine analyze various pollutants in environment.**
6. **Draw conclusions from analytical data using appropriate statistical analyses in conventional chemical and mathematical notation after collecting, recording, validating, interpretation of analytical data**
7. **Demonstrate the ability to communicate results, information or arguments effectively in written analytical reports**
8. **Demonstrate the ability to learn independently and self-direct your learning;**
9. **Apply teamwork skills by working effectively, responsibly, ethically and safely in an individual or team context.**

THE NJIT HONOR CODE WILL BE UPHELD, AND THAT ANY VIOLATIONS WILL BE BROUGHT TO THE IMMEDIATE ATTENTION OF THE DEAN OF STUDENTS. STUDENTS WILL BE CONSULTED WITH BY THE INSTRUCTOR AND MUST AGREE TO ANY MODIFICATIONS OR DEVIATIONS FROM THE SYLLABUS THROUGHOUT THE COURSE OF THE SEMESTER.