

Prepared by the Department of Natural Sciences & Life Fitness

Date of Departmental Approval: October 1, 2007

Date approved by Curriculum and Programs: January 29, 2008

Effective: Fall 2008

1. **Course Number:** ENV201  
**Course Title:** Environmental Instrumentation
2. **Description:** This course exposes the student to a variety of analytical techniques and instruments utilized in environmental chemical analysis. It is designed to couple theory of equipment operation with a basic understanding of the chemical principles involved. The laboratory time is divided between practical hands-on benchwork and field experiences. (1 class hour/4 laboratory hours)
3. **Student Learning Outcomes:**  
Upon successful completion of this course, students are able to do the following:
  - Demonstrate proficiency in practical hands-on field experiences for chemical analysis which is routinely performed in environmental science.
  - Perform sample collection, handling and preservation of various types of samples following protocol.
  - Demonstrate proficiency in a variety of analytical techniques and instruments utilized in environmental chemical analysis, for example, pH and dissolved oxygen meters, and various spectrophotometers.
  - Calculate working solution volumes and concentrations, generate linear regressions, and execute computerized spreadsheets. Report analytical results.
  - Record field and lab data using standard operating procedures.
  - Compile an individual project report.
4. **Credits:** 4 credits
5. **Satisfies General Education Requirement:** No
6. **Prerequisites:** ENV105 and ENV115
7. **Semester(s) Offered:** Spring
8. **Suggested General Guidelines for Evaluation:** Exams, Quizzes, Final, Laboratory
9. **General Topical Outline (Optional):** See attached.

## Course Outline

### ENV201 Environmental Instrumentation

- A. Sample Collection, Handling and Preservation
  - 1. Sampling Protocol: Planning a Sampling Strategy
  - 2. The Representative Sample: Random vs. Judgmental Sampling
  - 3. Sampling Equipment: Devices and Containers for soil, air and water.
  - 4. Sampling Techniques: soil and water
  - 5. Sampling Techniques: gases and vapors
  - 6. Sample Documentation and Preservation, Chain of Custody (COC)
  
- B. Methods of Analysis
  - 1. Sample Preparation: Interferences and Detection Limits
  - 2. Quality Control
  - 3. Field Quality Control: Duplicate Samples
  - 4. Quality Control in the Laboratory: Equipment Calibration, Matrix spike and Blank samples
  
- C. Selection of Appropriate Methodology: Standard Methods
  - 1. Electrode (potentiometric) Methods:
    - a. Use of bench top and field model pH and Dissolved Oxygen Meters
    - b. Use of YSI 3800 in-well probes
  - 2. Spectrophotometry
    - a. Visible light - Use of Spec 20: Absorption Spectrum/Phosphate
    - b. Infrared (ir Spec) - Use of PE 1600 FTIR: Hydrocarbon Analysis
    - c. Ultraviolet - Use of PE 202 UV/Visible: Nitrate Analysis
    - d. Atomic Absorption - Use of PE 290B: Heavy Metals/Sodium
  - 3. Chromatography
    - a. Solid/Liquid Chromatography - Use of Thin Layer and Columns to separate pigment mixtures
    - b. Vapor Phase: Gas/Liquid Chromatography - Use of HP 5890II: VOC Analysis
  - 4. Mass Spectroscopy
    - a. Introduction to Atomic Mass Units
    - b. GC/Mass Spectrometer Combinations - Use of HP 5996A
  - 5. PID/FID
    - Instrumentation for Site Safety and Rapid Detection of Organics in the Field - Use of Foxborough PID/FID