

# **EAS 4221: Environmental Geochemistry Lab**

## **Overview**

Geochemistry laboratory will consist of (1) a hands-on laboratory portion in which students will learn basic techniques used by geochemists and (2) fieldwork to characterize the effect of an urban area on the chemistry of the Chattahoochee River. Ultimately, work completed by students both in the field and in the laboratory will be combined to produce a group report summarizing the findings.

## **Laboratory Sequence**

Students will work on each laboratory independently and maintain individual lab notebooks. Each student will be responsible for 10 graded laboratory assignments and at least three analytical techniques for the final project. The first lab will be an organizational meeting of students and laboratory instructors. The second lab will introduce the principles of quantitative analysis. A field trip to the Chattahoochee River is scheduled for the third week. Lab modules are designed to be completed in the 3-hour lab period and incorporate environmental and quantitative chemical elements from lecture and general chemistry.

### **Laboratory Experiments**

**Lab 1: Laboratory Introduction**

**Lab 2: Introduction to Quantitative Analysis**

**Lab 3: Field Methods (Field Trip I)**

**Lab 4: Thermodynamic Parameters and pH**

**Lab 5: Field Trip II**

**Lab 6: Acid Neutralizing Capacity (ANC) and Alkalinity (ALK)**

**Lab 7: Spectrophotometric Detection of Phosphate**

**Lab 8: Analysis of iron speciation by UV-vis Spectrophotometry**

**Lab 9: Analysis of Manganese by Graphite Furnace Atomic Absorption Spectroscopy (GFAAS)**

**Lab 10: Analysis of Cations by Flame Atomic Absorption Spectroscopy (FAAS)**

**Lab 11: Analysis of Anions by IC and Uv-vis Spectrophotometry**

**Lab 12: Mineral Equilibria and Dissolution Rates**

Laboratory modules 2 and 4 are assignments designed to introduce basic wet chemical techniques and improve quantitative skills in a chemistry lab (making standards and quantitative solutions, calibration methods, mathematics and dimensional analyses, and modeling.)

Laboratory modules 6, 7, 8, 9, 10, 11, and 12 are assignments in which you will analyze real samples from Stone Mountain Lake and its environment.

## **Environmental Sampling of a River**

During the semester, we will characterize the Chattahoochee River in two separate sampling spots. The initial sampling trip to the Chattahoochee will be conducted during the third week. There will be approximately 1 to 2 additional sampling trips later in the semester. Water samples will be brought back to the laboratory where they will be further analyzed. Students will take turn collecting data and samples from the two stations during the semester.

## **Chattahoochee River Project and Report**

All members of 4001 will complete a group report that will detail and discuss the chemical differences and similarities between Chattahoochee River sampling sites. Details for the group report are listed in the supplemental packet that the instructor will provide later in the semester.

## **Grading**

Each laboratory exercise will consist of the laboratory exercise, data collection, and post lab questions. Labs are officially due one week following the Thursday laboratory period. One lab report will be submitted per lab group. The final project and the seminar presentation are a group effort and shall be graded accordingly. Therefore the success of every student will depend on cooperation and teamwork. All data collected and calculations will be recorded in a laboratory notebook and will be inspected weekly by the laboratory and lecture instructors.

**Lab Reports (10)** 650 points (65 points each)

**Pre-lab Quizzes** 135 points (15 points each)

**Lab Notebook (weekly checks)** 65 points total

**Group Report** 150 Points 4

## **Tentative Laboratory Schedule Date**

Aug 27

Sep 10

Sept 17

Sept 24

Oct 1

Oct 8

Oct 22

Oct 29

Nov 5

Nov 12

Nov 19

Nov 26

Dec 3

## **Assignment**

Introduction; Tour of the laboratory

Field trip to Chattahoochee River

Introduction to Quantitative Analysis

pH and Thermodynamic Parameters

Field Trip II

Acid Neutralizing Capacity and ALK

Spectrophotometric Determination of Phosphate

Analysis of iron speciation by UV-vis.

Spectrophotometry

Analysis of Manganese by Graphite Furnace Atomic

Absorption Spectroscopy (GFAAS)

Analysis of Cations by Flame Atomic Absorption

Spectroscopy (FAAS)

Analysis of Anions by IC and analysis of iron

speciation by UV-Vis Spec

Mineral Equilibria and Dissolution Rates

Submission of Group report