

**Environmental Geochemistry Lab (Wednesday, 12pm-3pm; ES&T L1155)****Lab Instructor:** Meg Grantham**Office:** ES&T L1112**Email:** meg.grantham@eas.gatech.edu**Office Hours:** Thurs 11 am-12 pm or by appointment (email please)**Lab Instructor:** Keaton Belli**Office:** ES&T 1108**Email:** keaton.belli@eas.gatech.edu**Office Hours:** Mon 1-3pm or by appointment (email please)**Overview**

Geochemistry laboratory will consist of two parts: 1) a hands-on laboratory portion in which students will learn basic laboratory techniques used by geochemists and 2) a fieldwork portion where students will learn basic environmental sampling techniques. Over the course of the semester, students will learn skill sets that will allow them to compare and contrast the geochemistry of different natural environments in an urban setting. Ultimately, work completed by students both in the field and in the laboratory will be combined to produce a final presentation summarizing the findings.

**Learning Objectives:**

Upon completion of this course, students will be able to:

1. Employ established field protocols to collect water samples from two urban streams
2. Quantify major inorganic chemical composition of aqueous samples using spectrophotometry, ion chromatography, and flame atomic absorption spectroscopy
3. Apply quantitative chemical analysis "tools of the trade" to each dataset (serial dilutions, calibration curves, simple statistics, concentration units, and dimensional analysis)
4. Present their results and interpretation to their peers and stakeholders from the community in the form of written and oral presentations

**Laboratory Sequence**

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. Prior to lab, each student will download and complete a pre-lab quiz posted on T-square which will be handed into the lab instructor at the beginning of the lab. Students will work on each lab assignment with a partner and maintain individual lab notebooks. Each student will be responsible for turning in a written lab report summarizing the work completed during lab. Lab reports are due at the beginning of the following lab. The first lab will be an organizational meeting of students and laboratory instructors followed by required safety training. The second lab will introduce the principles of quantitative analysis. A field trip to Tanyard Creek is scheduled for the second week and a second field trip to Proctor Creek will take place during the fourth week.

## **Laboratory Experiments and Tentative Schedule**

<b>Lab 1 (Aug 23):</b>	<b>Laboratory Introduction and Safety Training</b>
<b>Lab 2 (Aug 30):</b>	<b>Introduction to Quantitative Analysis and prepare anion standards</b>
<b>Lab 3 (Sept 6):</b>	<b>Field Methods (Field Trip I to Tanyard Creek)</b>
<b>Lab 4 (Sept 13):</b>	<b>Introduction to Alkalinity</b>
<b>Lab 5 (Sept 20):</b>	<b>Methods (Field Trip II to Proctor Creek)</b>
<b>Lab 6 (Sept 27):</b>	<b>Analysis of Cations by FAAS Field</b>
<b>Lab 7 (Oct 4):</b>	<b>Analysis of Anions by IC, Proctor Creek Alkalinity Measurements</b>
<b>(Oct 11):</b>	<b>No Lab</b>
<b>Lab 8 (Oct 18):</b>	<b>PHREEQC modeling</b>
<b>Lab 9 (Oct 25):</b>	<b>Spectrophotometric Detection of Dissolved Silica and Phosphorus</b>
<b>Lab 10 (Nov 1):</b>	<b>Analysis of Soluble Iron by UV/Vis Spectrophotometry</b>
<b>Lab 11 (Nov 8):</b>	<b>Lead Geochemistry and Discussion of Field Data</b>
<b>Lab 12 (Nov 15):</b>	<b>Final Presentation and Lab Clean-up</b>

Laboratory module 3 is designed to introduce basic wet chemical techniques and improve quantitative skills in a chemistry lab (e.g. making standards and quantitative solutions, calibration methods, mathematics and dimensional analyses, and modeling).

Laboratory modules 5-10 are assignments in which students will analyze real samples from Tanyard Creek and Proctor Creek. Lab 11 will use a simple experiment and PHREEQC to model of the geochemistry of lead in drinking water

### **Environmental Sampling of Tanyard and Proctor Creek**

During the semester, we will take a field trip to Tanyard Creek and learn various environmental sampling techniques. We will take a second field trip to the Proctor Creek to take water and soil samples from several different natural environments (e.g. river, creek, marsh, etc.). Water samples will be brought back to the laboratory where they will be further analyzed during the subsequent laboratory modules.

### **Tanyard and Proctor Creek Final Presentation**

All members of this class will prepare a final group presentation that will detail and discuss the chemical differences and similarities between different sampling sites. Details for the final presentation are listed in the supplemental packet that the instructor will provide later in the semester.

## Grading

Each lab will consist of a pre-lab quiz, laboratory exercise, data collection, and post lab questions. Lab reports are officially due at the beginning of the following laboratory period. You will be deducted 10 points per day late for late reports. One lab report will be submitted per person. All data collected and calculations will be recorded in a laboratory notebook and will be inspected weekly by the laboratory instructors.

<b>Lab Reports:</b>	65%
<b>Pre-lab Quizzes:</b>	15%
<b>Lab Notebook (weekly checks):</b>	5%
<b>Final Report:</b>	15%

***Student Accommodations:*** If you have any kind of disability, whether apparent or non-apparent, learning, emotional, physical, or cognitive, and you need some accommodations or alternatives to lectures, assignments, or exams, please feel free to contact me to discuss reasonable accommodations for your access needs. Students with disabilities who require reasonable accommodation to fully participate in course activities or meet course requirements are encouraged to register with the Office of Disability Services at 404-894-2563 or [disabilityservices.gatech.edu](http://disabilityservices.gatech.edu). Please contact Prof. Glass following registration to discuss necessary accommodations, allowing *more than one week before an upcoming exam* should accommodations be sought.

***Honor Code:*** The instructor, teaching assistants and students in this class, as members of the Georgia Tech community, are bound by the Georgia Tech Academic Honor Code. No plagiarism will be tolerated on homework, exams, or the written project. Please see [honor.gatech.edu](http://honor.gatech.edu) for Georgia Tech's Academic Honor Code, which you are required to uphold.

***Absences:*** The Institute Absence policy is available at: [www.catalog.gatech.edu/rules/4/](http://www.catalog.gatech.edu/rules/4/)