



5xx proposed course: Analytical Geochemistry

Units: 3

Spring 2025—Fridays—1:15-3:45 PM

Location: USC ZHS Basement Lab XX

Instructor: Seth John

Office: USC ZHS 271

Office Hours: Friday 8AM-9AM

Contact Info: sethjohn@usc.edu

Course Description

This class will introduce students to a wide variety of analytical techniques used in geochemistry. Early in the semester there will be two or three field trips to collect samples from the Los Angeles region, for example from the San Gabriel mountains and the Los Angeles River. The rest of the semester will focus on analysis of these samples. Classes will typically begin with a lecture to introduce analytical techniques, and then proceed to a hands-on opportunity to process samples and work with instruments including quadrupole ICPMS, multi-collector ICPMS, ICP-OES, carbon isotope analysis, and microbiological plating. Towards the end of the semester students will develop their own group research projects and present results to the class and in a written report.

Learning Objectives

Students will be introduced to several common techniques of environmental analytical chemistry, bacteriological analysis, sediment digestion, elemental concentration analysis by ICP-MS, stable isotope ratio analysis by multi-collector ICP-MS, Fe(II) and Fe(III) analysis by ferrozine, and sediment visual and textural analysis. Students will relate these geochemical data to the local history and environment of Los Angeles. These scientific and environmental themes will be tied together in research presentations and a final paper due at the end of the class. Specific learning outcomes include: The student will be able to demonstrate a familiarity with common analytical chemistry techniques, the student will be able to demonstrate a better understanding of how to interpret scientific data, the student will be able to demonstrate an ability to relate scientific data to historical context in order to make novel scientific discoveries.

Prerequisite: Students are expected to have completed an undergraduate introductory chemistry class with a laboratory component, or similar. Please discuss with Seth if you are not sure whether your prior coursework is adequate.

Co-Requisite: Students who have not already completed a USC General Lab Safety Course offered by the Office of Environmental Health and Safety must do so on their own during the first week of classes. Students will also need to complete site-specific training for work in the John Lab and USC PLASMA analytical facility.

Course Notes

Slides from each lecture will be posted on Brightspace.

Technology

Students should have a computer with Excel for data processing, and will need to access Brightspace for class materials and to turn in assignments.

Required Readings and Supplementary Materials

There is no specific required reading for this course. Instead, students are expected to find their own primary literature relating to scientific and historical aspects of samples analyzed in class, and to incorporate those materials into their final presentations and papers.

Description and Assessment of Assignments

Weekly quizzes (10 pts each) will be given many weeks at the beginning of class, and will cover the lecture material from the previous week. Students should review the prior week's lecture slides before class to prepare.

Assignments (50 pts each) will be given at several points throughout the semester covering topics such as data organization and data processing, as well as brief scientific writing challenges.

Final presentations will occur during the last class of the semester. Students will be divided into groups, typically with each group responsible for a single sampling location. Together the students should cover key findings from their site, with each student tackling a specific topic or sample type. Students are encouraged to incorporate material from other scientific or historical papers which could be relevant to interpreting data from their site. Students should work together as a group to make sure that they have a cohesive presentation, but will be graded individually.

Final papers will be due at the scheduled time of the final exam, and should cover the same material as the student presentations.

Participation

Students must participate in field trips unless excused beforehand by Seth for a valid reason. (Things come up, and I'm happy to be flexible on attendance for both personal and research reasons, just chat with me.)

Grading Breakdown

Assessment Tool (assignments)	Points	% of Grade
Weekly quizzes	200	20
Assignments	200	20
Final presentation	300	30
Final report	300	30
TOTAL	1000	100

Grading Scale

Course final grades will be determined using the following scale:

Letter grade	Corresponding numerical point range
A	90-100
B+	87-89.9
B	83-86.9
B-	80-82.9
C+	77-79.9
C	73-76.9
C-	70-72.9
D+	67-69.9
D	63-66.9
D-	60-62.9
F	59.9 and below

Assignment Submission Policy

Assignments should be submitted through Brightspace.

Grading Timeline

Quizzes and assignments will typically be graded within one week of submission.

Attendance

Students should attend class unless excused beforehand by Seth for a valid reason. (Things come up, and I'm happy to be flexible on attendance for both personal and research reasons, just chat with me.)

Classroom norms

Students should be kind, supportive, and friendly to others during class. Students are expected to work collaboratively and contribute to the final group project.

Academic Integrity

The University of Southern California is foremost a learning community committed to fostering successful scholars and researchers dedicated to the pursuit of knowledge and the transmission of ideas. Academic misconduct is in contrast to the university's mission to educate students through a broad array of first-rank academic, professional, and extracurricular programs and includes any act of dishonesty in the submission of academic work (either in draft or final form).

This course will follow the expectations for academic integrity as stated in the [USC Student Handbook](#). All students are expected to submit assignments that are original work and prepared specifically for the course/section in this academic term. You may not submit work written by others or "recycle" work prepared for other courses without obtaining written permission from the instructor(s). Students suspected of engaging in academic misconduct will be reported to the Office of Academic Integrity.

Other violations of academic misconduct include, but are not limited to, cheating, plagiarism, fabrication (e.g., falsifying data), knowingly assisting others in acts of academic dishonesty, and any act that gains or is intended to gain an unfair academic advantage.

Academic dishonesty has a far-reaching impact and is considered a serious offense against the university. Violations will result in a grade penalty, such as a failing grade on the assignment or in the course, and disciplinary action from the university itself, such as suspension or even expulsion.

For more information about academic integrity see the [student handbook](#) or the [Office of Academic Integrity's website](#), and university policies on [Research and Scholarship Misconduct](#).

Please ask your instructor if you are unsure what constitutes unauthorized assistance on an exam or assignment or what information requires citation and/or attribution.

Policy on generative AI

Students must always note when AI of any sort has been used in written or presented materials. Policies for each assignment will be discussed in class, as the use of generative AI will sometimes be encouraged, and other times disallowed.

Course Content Distribution and Synchronous Session Recordings Policies

USC has policies that prohibit recording and distribution of any synchronous and asynchronous course content outside of the learning environment.

Recording a university class without the express permission of the instructor and announcement to the class, or unless conducted pursuant to an Office of Student Accessibility Services (OSAS) accommodation. Recording can inhibit free discussion in the future, and thus infringe on the academic freedom of other students as well as the instructor. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Distribution or use of notes, recordings, exams, or other intellectual property, based on university classes or lectures without the express permission of the instructor for purposes other than individual or group study. This includes but is not limited to providing materials for distribution by services publishing course materials. This restriction on unauthorized use also applies to all information, which had been distributed to students or in any way had been displayed for use in relation to the class, whether obtained in class, via email, on the internet, or via any other media. Distributing course material without the instructor's permission will be presumed to be an intentional act to facilitate or enable academic dishonesty and is strictly prohibited. ([Living our Unifying Values: The USC Student Handbook](#), page 13).

Course Evaluations

Students are asked to complete evaluations at the end of the semester.

Course Schedule

Week	Date	Lecture topic	Labwork	Other events
Week 1	Jan 9	Petri dishes	Petri dish preparation; gather sampling supplies	
	Monday Jan 16			FIELD TRIP 1 - Mountains to the city: A journey along the Arroyo Seco and LA River
Week 2	Jan 16	NO CLASS	See above	MLK Birthday
Week 3	Jan 23	The LA River	Sediment core and water sample preparation ; Core sectioning, sampling, and description; plate counts	FIELD TRIP 2 - City to the sea: A journey along the LA River and LA Harbor
Week 4	Jan 30	XRF	Iron(II) analysis by ferrozine; plate counts	
Week 5	Feb 6	ICPMS I – Sample to cones, Cones to detector	Bacterial abundances; plate counts	
Week 6	Feb 13	ICPMS III – collision cells and QQQ	Plate counts; ICPMS dissection; Sample prep	Ocean Sciences Meeting
Week 7	Feb 20	NO CLASS		President's Day
Week 8	Feb 27	ICPMS IV – sector field and multi-collectors	More sample prep; more analysis	
Week 9	Mar 6	ICP-OES	More sample prep; more analysis	
Week 10	Mar 13	NO CLASS		USC spring break
Week 11	Mar 20	Double-spike techniques	More sample prep; more analysis	
Week 12	Mar 27	Stable isotope analysis	More sample prep; more analysis	
Week 13	Apr 3	Other techniques (flame AA, GFAA, Hg analyzers)	More sample prep; more analysis	
Week 14	Apr 10	Other inlets (lasers, GC, HPLC)	More sample prep; more analysis	
Week 15	Apr 24		Final presentations	
Finals			Final reports due	Refer to the final exam schedule in the USC <i>Schedule of Classes</i> at classes.usc.edu .

Statement on University Academic and Support Systems

Students and Disability Accommodations:

USC welcomes students with disabilities into all of the University's educational programs. [The Office of Student Accessibility Services](#) (OSAS) is responsible for the determination of appropriate accommodations for students who encounter disability-related barriers. Once a student has completed the OSAS process (registration, initial appointment, and submitted documentation) and accommodations are determined to be reasonable and appropriate, a Letter of Accommodation (LOA) will be available to generate for each course. The LOA must be given to each course instructor by the student and followed up with a discussion. This should be done as early in the semester as possible as accommodations are not retroactive. More information can be found at osas.usc.edu. You may contact OSAS at (213) 740-0776 or via email at osasfrontdesk@usc.edu.

Student Financial Aid and Satisfactory Academic Progress:

To be eligible for certain kinds of financial aid, students are required to maintain Satisfactory Academic Progress (SAP) toward their degree objectives. Visit the [Financial Aid Office webpage](#) for [undergraduate-](#) and [graduate-level](#) SAP eligibility requirements and the appeals process.

Support Systems:

[Counseling and Mental Health](#) - (213) 740-9355 – 24/7 on call

Free and confidential mental health treatment for students, including short-term psychotherapy, group counseling, stress fitness workshops, and crisis intervention.

[988 Suicide and Crisis Lifeline](#) - 988 for both calls and text messages – 24/7 on call

The 988 Suicide and Crisis Lifeline (formerly known as the National Suicide Prevention Lifeline) provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week, across the United States. The Lifeline consists of a national network of over 200 local crisis centers, combining custom local care and resources with national standards and best practices. The new, shorter phone number makes it easier for people to remember and access mental health crisis services (though the previous 1 (800) 273-8255 number will continue to function indefinitely) and represents a continued commitment to those in crisis.

[Relationship and Sexual Violence Prevention Services \(RSVP\)](#) - (213) 740-9355(WELL) – 24/7 on call

Free and confidential therapy services, workshops, and training for situations related to gender- and power-based harm (including sexual assault, intimate partner violence, and stalking).

[Office for Equity, Equal Opportunity, and Title IX \(EEO-TIX\)](#) - (213) 740-5086

Information about how to get help or help someone affected by harassment or discrimination, rights of protected classes, reporting options, and additional resources for students, faculty, staff, visitors, and applicants.

[Reporting Incidents of Bias or Harassment](#) - (213) 740-2500

Avenue to report incidents of bias, hate crimes, and microaggressions to the Office for Equity, Equal Opportunity, and Title for appropriate investigation, supportive measures, and response.

[The Office of Student Accessibility Services \(OSAS\)](#) - (213) 740-0776

OSAS ensures equal access for students with disabilities through providing academic accommodations and auxiliary aids in accordance with federal laws and university policy.

[USC Campus Support and Intervention](#) - (213) 740-0411

Assists students and families in resolving complex personal, financial, and academic issues adversely affecting their success as a student.

[Diversity, Equity and Inclusion](#) - (213) 740-2101

Information on events, programs and training, the Provost's Diversity and Inclusion Council, Diversity Liaisons for each academic school, chronology, participation, and various resources for students.

[USC Emergency](#) - UPC: (213) 740-4321, HSC: (323) 442-1000 – 24/7 on call

Emergency assistance and avenue to report a crime. Latest updates regarding safety, including ways in which instruction will be continued if an officially declared emergency makes travel to campus infeasible.

[USC Department of Public Safety](#) - UPC: (213) 740-6000, HSC: (323) 442-1200 – 24/7 on call

Non-emergency assistance or information.

[Office of the Ombuds](#) - (213) 821-9556 (UPC) / (323-442-0382 (HSC)

A safe and confidential place to share your USC-related issues with a University Ombuds who will work with you to explore options or paths to manage your concern.

[Occupational Therapy Faculty Practice](#) - (323) 442-2850 or otfp@med.usc.edu

Confidential Lifestyle Redesign services for USC students to support health promoting habits and routines that enhance quality of life and academic performance.