

**Syllabus for GEOL 5410 Spring 2020**  
**Applied Geochemical Analysis; 3 credit hours**

**Instructor:** Janet Dewey  
**My Office:** ESB 2014  
**307-766-3659** [jdewey2@uwyo.edu](mailto:jdewey2@uwyo.edu)  
**Tentative Office Hours:** W 2:00-4:00; T 11:00-12:00 or by appointment

**Prerequisites:** GEOL 4490 or permission of instructor

**Course Location and Time:** TR 9:35-10:50; GEOL 213

**Lab location and Time:** ESB 2032/2019; Lab Sections TBD

**Required Materials:** A lab coat and safety glasses that fit comfortably.

### **COURSE DESCRIPTION**

**Philosophy:** In order to become competent analytical scientists, we must understand the range of tools available to us, the theory behind the science, and the inherent benefits and limitations of each of these tools. Geochemical analysis should not be conducted in a “black box”; you should understand how your data will be generated, how reliable these data are, and how to report your data in a meaningful manner. In order to do this, you must take ownership of your project, your data quality objectives, and the methods with which you will generate your data — regardless of whether you analyze them in-house or send them to an external facility.

**Course Summary and Objectives:** This course is a practical survey of analytical methods commonly used in geochemical analysis. We will cover a range of topics and instruments to help you determine how best to approach your specific analytical needs. We will examine techniques such as surface area analysis, spectrophotometry, plasma optical emission spectrometry, flow injection analysis, chromatography, and dry combustion analysis. We will examine how data are generated, interferences and how to resolve them, detection limits, and quality control. The idea is to give you the practical experience needed to analyze samples, correctly interpret the results, and understand the limitations of those results.

**Outcomes:** By the end of this class the student will:

1. Be able to match analytical needs with the appropriate instrument
2. Be able to design and conduct chemical analyses including: match the calibration range to the samples; compensate for interferences, provide the requisite blanks and standards to determine precision and accuracy, and report results in a meaningful manner
3. Perform routine quality assurance tests and determine detection limits
4. Outline a series of basic troubleshooting steps

5. Be able to better interpret data from outsourced analyses and in publications

**Course Topics (the content and order is subject to change depending on instrument availability and at the discretion of the instructor). This is a list of instruments we might cover during the course, however we will NOT cover all of them due to cost and time constraints.**

**Units will be selected based on the needs of the students enrolled.**

1. Intro to chemical analysis: safety, regulatory issues, sample and standard preparation
2. Lab Math: Calibration, quality assurance, detection limits, etc.
3. UV/VIS Spectrophotometry
4. Flame atomic absorption spectroscopy
5. Inductively-coupled plasma optical emission spectrometry
6. Inductively-coupled plasma mass spectrometry
7. Ion Chromatography
8. Gas chromatography mass spectrometry
9. Flash combustion organic elemental analysis
10. Surface area analysis and porosity by gas adsorption

## **EXPECTATIONS AND POLICIES**

### **Class Format:**

1. Lecture: We will cover instrument theory and remote desktop to instruments at this time. Homework may be assigned periodically. Material will come from lecture, lab, and reading assignments.
2. Labs: There will be a two-hour group lab scheduled each week. We will examine the components of the variety of instruments, prepare standards and reagents and conduct sample analyses. Most labs will require a written evaluation of the procedure.
3. Outside of class: Students are expected to access the instruments outside of scheduled class times to check analytical runs, optimize procedures, and download data for analysis. Please contact me directly for access to the lab after hours.
4. Final Exam: There will be no final exam in this class.
5. Final Projects: All graduate students will be expected to complete a final analytical project. Each student will be required to choose one instrument and perform a set of analyses to answer a very specific research question. Students must demonstrate proper instrument setup, calibration, operation, post-analysis optimization, and data interpretation. You may begin your analytical project at any point during the semester after we have covered your instrument of interest. Students will be expected to write a concise report and present the results to the rest of the class. More details will be provided when the assignment is handed out. I will reserve the last 2 weeks of class for

project completion and presentation. Final project report will be due in my mailbox or inbox by 5:00 pm Tuesday May 14.

**Grading:**

Grading for this course is S/U. Grades will be calculated as follows:

Homework and class participation	35 %
Lab grade	35 %
Analytical project (Grad Students only)	30 %

**The instructor reserves the right to eliminate any portion of the required tasks and normalize the remainder within the above categories. 80% is required to pass this course.**

**Substantive changes to syllabus:**

This syllabus is a guide. Circumstances may alter the material covered or the order in which the material is covered due to instrument constraints. Therefore, information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice. Deadlines, requirements, and course structure are subject to change if deemed necessary by the instructor.

*The instructor will correspond with ALL students using their uwyo.edu email account. Students are responsible for checking UWYO email accounts regularly to ensure receipt of any information or changes pertinent to this course.*

**Attendance/Participation Policy:**

Class attendance is expected for a thorough understanding of course material. Due to the nature of this course and the expense involved in running the instruments, there will be no makeup labs except under very extenuating circumstances. Make-up labs will only be granted at the discretion of the instructor and with an official University Authorized Absence Form issued by the Dean of Students Office. Except in the case of emergencies, notification is expected prior to absence so that arrangements for a makeup lab may be made. Make-up labs MUST be completed within 2 weeks of the scheduled lab, except under extenuating circumstances. Should your research require you to miss a lab, you will be permitted one lab absence during the semester without having to make it up. Beyond your first absence, failure to attend lab or lab make-up will result in a zero for that lab.

**Classroom Behavior:**

Students are expected to conduct themselves in a safe, responsible and respectful manner at all times. We will be working with potentially hazardous chemicals and sensitive instruments.

Please come to lab on time and be ready to work; safety material for a particular exercise will be presented first. If you missed the beginning material covering safety concerns, you will not be allowed to participate in lab. Discourse should always be handled in a respectful manner. All views will be heard fully, but must be presented in a civil manner and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. I reserve the right to eject from class anyone who is engaging in disruptive, disrespectful, or unsafe behaviors.

Electronic devices such as mobile phones will be permitted for safety reasons, but should be set to silent and only used for emergency. Laptops are allowed for note-taking purposes. Video or audio recording during class is not allowed to protect the privacy of your fellow students.

**Diversity:**

“The University of Wyoming values an educational environment that is diverse, equitable, and inclusive. The diversity that students and faculty bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and considered a resource for learning. “

**Disability Support:**

“The University of Wyoming is committed to providing equitable access to learning opportunities for all students. If you have a disability, including but not limited to physical, learning, sensory or psychological disabilities, and would like to request accommodations in this course due to your disability, please register with and provide documentation of your disability as soon as possible to Disability Support Services (DSS), Room 128 Knight Hall. You may also contact DSS at (307) 766-3073 or [udss@uwyo.edu](mailto:udss@uwyo.edu). It is in the student’s best interest to request accommodations within the first week of classes, understanding that accommodations are not retroactive. Visit the DSS website for more information at: [www.uwyo.edu/udss](http://www.uwyo.edu/udss)”

**Academic Dishonesty:**

*University Regulation 2-114, defines academic dishonesty as “An action attempted or performed that misrepresents one’s involvement in an academic endeavor in any way, or assists another student in misrepresenting his or her involvement in an academic endeavor.”* There is a well-defined procedure to judge such cases, and serious penalties may be assessed.

Instructor’s statement: You may discuss labs/problem sets with one another; however the final product must be your own. I expect a good-faith effort for each lab/problem set and a demonstration that you have grasped the material and can interpret/discuss the material in

your own words. Plagiarism and cheating will not be tolerated. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114. The penalties for academic dishonesty can include, at my discretion, an “F” on the class component exercise, and/or an “F” in the entire course. Academic dishonesty means anything that represents someone else’s ideas as your own without attribution or fabrication of referenced information. Facilitation of another person’s academic dishonesty is also considered academic dishonesty and will be treated identically. For a complete definition refer to UW Regulation 2-114 [http://www.uwyo.edu/regs-policies/files/docs/section-2-regulations-july-2018/uw\\_reg\\_2-114\\_format\\_effective\\_7-1-18.pdf](http://www.uwyo.edu/regs-policies/files/docs/section-2-regulations-july-2018/uw_reg_2-114_format_effective_7-1-18.pdf).”

### **Title IX and Duty to Report:**

UW faculty are committed to supporting students and upholding the University’s non-discrimination policy. Under Title IX, discrimination based upon sex and gender is prohibited. If you experience an incident of sex- or gender-based discrimination, we encourage you to report it. While you may talk to a faculty member, understand that as a "Responsible Employee" of the University, the faculty member MUST report information you share about the incident to the university’s Title IX Coordinator (you may choose whether you or anyone involved is identified by name). If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are people who can meet with you. Faculty can help direct you or you may find info about UW policy and resources at <http://www.uwyo.edu/reportit>. You do not have to go through the experience alone. Assistance and resources are available, and you are not required to make a formal complaint or participate in an investigation to access them.

### **Student Resources:**

DISABILITY SUPPORT SERVICES: [udss@uwyo.edu](mailto:udss@uwyo.edu), 766-3073, 128 Knight Hall, [www.uwyo.edu/udss](http://www.uwyo.edu/udss)

COUNSELING CENTER: [uccstaff@uwyo.edu](mailto:uccstaff@uwyo.edu), 766-2187, 766-8989 (After hours), 341 Knight Hall, [www.uwyo.edu/ucc](http://www.uwyo.edu/ucc)

ACADEMIC AFFAIRS: 766-4286, 312 Old Main, [www.uwyo.edu/acadaffairs](http://www.uwyo.edu/acadaffairs)

DEAN OF STUDENTS OFFICE: [dos@uwyo.edu](mailto:dos@uwyo.edu), 766-3296, 128 Knight Hall, [www.uwyo.edu/dos](http://www.uwyo.edu/dos)

UW POLICE DEPARTMENT: [uwupd@uwyo.edu](mailto:uwupd@uwyo.edu), 766-5179, 1426 E Flint St, [www.uwyo.edu/uwupd](http://www.uwyo.edu/uwupd)

STUDENT CODE OF CONDUCT WEBSITE: [www.uwyo.edu/dos/conduct](http://www.uwyo.edu/dos/conduct)