

# GeoChemistry of the Land EarthSci 3323

## Spring 2023, Dr. C.E. Heinzl

*This syllabus is subject to change over the course of the semester...*

Lecture:	Mon., Wed., Fri	9:00 to 9:50	Latham Hall 126/128
Lab:	Tues.	9:30 to 11:20	
Professor:	Dr. Chad E. Heinzl		Latham Hall 126/128
Office hours:	Mon Noon to 1 Latham 116, Tues. Noon to 2 Seerley 12	and by appointment	
Office phone:	273-6168		
Email:	<a href="mailto:chad.heinzl@uni.edu">chad.heinzl@uni.edu</a>		
Social Media:	Twitter @Ubreccia Facebook: UNI Earth and Environmental Sciences Dept.		
Text:	Robin Gill, Chemical Fundamentals of Geology & Enviro. Geoscience, openPDF Recommended/have access to Iowa's Geological Past - W. Anderson		
Final Exam:	<b><u>Spring 2023 - Wednesday - May 10 - 10 to 11:50</u></b>		
Safety	Lab work can be inherently dangerous, you will be extensively instructed in how to keep yourself and your peers safe. If an accident does happen you will also be taught how to properly respond. UNI is not responsible for anything that happens in or outside the lab.		

### UNI Geochemistry of the Land Learning Outcomes -

- Apply geochemical principles to characterize and interpret a variety of geological problems
- Learn and practice proper laboratory safety
- Develop quantitative problem solving, geo-statistics and data management skills
- Discover, use and apply geologic laboratory tools including mineral and rock preparation, petrographic microscopes, X-Ray Diffraction, X-ray Fluorescence, Inductively Coupled Mass Spectrometry
- Read, understand and apply geochemical journal articles
- Convey geochemical information in oral and written formats through the development of meaningful spectrographs, photomicrographs, presentations and reports

### Course Description -

Distribution of elements in and on the Earth. Explores the chemical processes governing these distributions. Emphasizes the use of chemical signatures and patterns to address geologic problems from mining to sustainable environments. Three lecture periods, one laboratory period.  
Prerequisite(s): EARTHSCI 1300 (870:031) OR EARTHSCI 1400; CHEM 1110 (860:044), junior standing.

### Schedule

- |                   |                                                                                                                                              |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| 1 – January 16/20 | The Periodic Table applied to geology - Atoms, Bonds, Isotopes<br><i>Lab – Lab Safety and Geologic exploration of the periodic table</i>     |
| 2 – January 23/27 | Elements, minerals, rocks and the Earth's History<br><i>Lab – Lab Safety and Petrographic Microscopes an introduction</i>                    |
| 3 – January 30/3  | Geochemical variability in the Earth's crust and sediments #1, Mafic<br><i>Lab – Petrographic Microscopes, XRD and XRF of Mafic suites</i>   |
| 4 – February 6/10 | Geochemical variability in the Earth's crust and sediments #2, Felsic<br><i>Lab – Petrographic Microscopes, XRD and XRF of Felsic suites</i> |

- 5 – February 13/17 Mining Metallic resources – Emphasizing the Midcontinent Rift, IA, MN  
*Lab – Geology of Northern Minnesota through a laboratory lens #1*  
**Test 1 – Monday February 13 (approx. 100 points)**
- 6 – February 20/24 Characterization and processing of metallic resources  
*Lab – Geology of Northern Minnesota through a laboratory lens #2*
- 7 – February 27/3 Mining Non-metallic resources  
*Lab – Geology of Iowa Lab through laboratory lens – Field trip Test America/Eurofins, Cedar Falls*
- 8 – March 6/10 Characterization and processing of non-metallic resources  
*Lab – Aggregate properties, Field Trip to Rockford Fossil and Prairie Preserve and Lehigh Hanson Cement Plant and Materials Lab if possible*
- 9 – March 13/17 Chemical roles in Iowa’s Limestone Industry and Transportation Dept.  
*Lab – Iowa Limestone*  
**Test 2 – Friday March 17 (approx. 100 points)**
- 10 – March 20/24 *Spring Break*
- 11 – March 27/31 Chemical characterization, variability in Iowa’s Landscapes, Soils  
*Lab – Clay mineralogy*
- 12 – April 3/7 Quaternary – Glacial environments  
*Lab – Characterizing the Pre-Illinoian/Iowan Surface*
- 13 – April 10/14 Quaternary – fluvial land/water transitions  
*Lab – Geochemistry of Dry Run Creek*
- 14 – April 17/21 Archaeometry #1- Characterizing archaeological artifacts  
*Lab – Geochemistry of archaeological settings/excavations*
- 15 – April 24/28 Archaeometry #2 – Provenance of archaeological artifacts  
*Lab – Geochemistry of material cultures, e.g. pottery*
- 16 – May1/5 Tying geochemistry together to work for your developing career  
*Lab – Getting a job that uses geochemistry*
- 17 – May 8/12 (Finals Week) **Wednesday - May 10 - 10 to 11:50 (approx. 150 pts)**

**Grading procedures and policies** A >93%, A->90%, B+>87%, B >83%, B->80%, C+>77%, C >73%, C->70%, D+>67%, D >63%, D->60%, F < 60%

If you earn 93% of the total points you are guaranteed a grade of A. The lower limit for each grade range will not move up. A curve will not be used in this class. **There will be no make-up exams after the scheduled exams are given.** Should you have a scheduled conflict, please visit with me at least two weeks before the exam date. An unexcused absence during an exam will lead to an automatic zero. If there is an emergency, we will work together on a solution.

**Estimated Point distribution**

	Points
Tests	#1 @ 100 = 100
	#2 @ 100 = 100
Final exam	#3 @ 150 = 150
Homework, Lab & Field reports	300 = 300
	<b><u>Total = 650 points</u></b>
	<b>A = 600; B = 540; C = 475; D = 400</b>

**Class Attendance and Participation**

Course questions will reflect and cover class 1) discussions, 2) field and lab activities, 3) text/journal readings, and 4) small group activities. Anything I say/discuss is fair game for a quiz or exam. Attendance is essential. If you listen, ask questions, take very good notes, and study for tests chances for earning a good grade are high! And the general guidelines of UNI’s attendance policy will be employed, <https://policies.uni.edu/306>).

## **UNI - Statements for Non-discrimination and Accessibility**

### **A. Office of Compliance and Equity Management**

The University of Northern Iowa does not discriminate in employment or education. Visit 13.03 Equal Opportunity & Non-Discrimination Statement (<https://policies.uni.edu/1303>) for additional information.

### **B. Student Accessibility Services - Non-discrimination based on Disabilities**

The University of Northern Iowa (UNI) complies with the Americans with Disabilities Act Amendments Act of 2008 (ADAAA), Section 504 of the Rehabilitation Act of 1973, the Fair Housing Act, and other applicable federal and state laws and regulations that prohibit discrimination on the basis of disability. To request accommodations please contact Student Accessibility Services (SAS), located at ITTC 007, for more information either at (319) 273-2677 or Email [accessibility.services@uni.edu](mailto:accessibility.services@uni.edu). Visit Student Accessibility Services (<https://sas.uni.edu/>) for additional info.

## **Additional recommendations from UNI's Center for Excellence in Teaching & Learning**

### **A. Course materials, accessibility and opportunities for enhanced success**

- a. Textbook - is available via an open sourced PDF.
- b. Computers, statistical software and data - Computers and necessary software will be available in the Latham Hall first floor computer lab.
- c. Field trips - There will be a few Friday field trips... Every attempt should be made to attend, participate and learn from these opportunities.
- d. Course webpage - You will have access to some course materials and additional learning resources through the following webpage - [https://www.exploreiowageology.org/UNI\\_Geochem.php](https://www.exploreiowageology.org/UNI_Geochem.php)
- e. UNI-E-Learning - <https://elearning.uni.edu/>, This software will be used to help you keep track of your course progress - primarily scores from homework, fieldwork, tests, etc.
- f. Optional resources
  - 1) American Chemical Society - <https://www.acs.org/content/acs/en/careers/college-to-career/chemistry-careers/geochemistry.html>
  - 2) Carleton College Geochemistry <https://serc.carleton.edu/NAGTWorkshops/geochemistry/index.html>
  - 3) AAPG - Geochemistry <https://www.aapg.org/about/petroleum-geology/geology-and-petroleum/geochemistry#4354490-links>

### **B. Geochemistry classroom civility -**

- a. Be respectful to everyone at all times.
- b. Be on time, pay attention (do not hold side conversations during class), and participate.
- c. Represent UNI well when on and off campus.
- d. Reduce use and silence phones in class and during field trips.

### **C. Pro-Tips for doing well in this class**

- Everyone learns differently, I will do my best to use effective methods, but if you are struggling to learn the material let me know ASAP.
- Do the reading assignments before you come to class! Be a good detective, the concepts that you will be learning are connected, throughout the semester try to visualize the chemical connections throughout geologic environments.
- Take great notes, a lot of information will be coming your way.