

Geos F493 Field Geology Part 1 (3 Credits) - 2024

Instructors

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Prerequisites

- Petrology and Petrography (Geos F214)
- Field and Computer Methods (Geos F225)
- Stratigraphy and Sedimentation (Geos F322)
- WRTG F111X and WRTG F211X or WRTG F213X
- Firearms and bear safety training (offered separately for UAF students in Spring)
- Junior standing; Permission by Instructor

Location

Various field locations in Central Alaska; 235, 237 & 316 Reichardt on UAF campus.

Meeting time

Meets daily 8:30 am to 5:30 pm (+ hours outside of field work) for a 3-week period.

'Office' Hours

Instructors will be heavily involved during the students' mapping as 'geo-buddies', accompanying them in the field, turning it into their 'office'.

Course type

In person, field

Textbooks

We will supply a field manual for your use, as well as handouts as needed during the course.

Catalog Course description

In three different tectonic regions in Central Alaska, sedimentary and crystalline rocks are studied with analogue and digital tools. You learn how to collect and interpret structural and lithologic data, create geologic maps and write scientific reports. Challenges increase with each project leading up to semi-independent mapping during the final project.

Department In-depth Course description

Practical experience in a variety of field settings collecting and presenting basic geologic field data, including field mapping of stratigraphic and structural problems using topographic maps, airborne, and satellite images, in both paper and digital form. The latter is accomplished with a mapping app and a tablet computer. Students will prepare geologic maps in a variety of tectonic and lithologic settings and develop written reports detailing the geologic history for several study areas. This course requires strenuous hiking off trails in a variety of terrains with up to 1500 feet of elevation gain per day.

This course is different from most you have taken, as it attempts to combine and consolidate lab skills you have acquired over the years with field skills. Most students have some difficulty with this course. Please don't let that scare you off: most people have also had at least some difficulty in learning to ride a bike or drive a car, too. It is our job to make this somewhat difficult experience also enjoyable and rewarding. We strongly encourage your feedback in this regard. With your cooperation & feedback we can all have a good time and learn a great deal.

Course Goals

Although most geologists spend their time on computers in the office or lab, a clear understanding about rocks and the processes that form them and the environment we live in requires some exposure to rocks in the field. As a geologist you learn the best in the field where you are confronted with the complexities of nature, the abundance or lack of data. In the field you are forced to learn how to process field data and document it on a

map, decide what material to collect and for which purposes. Furthermore, you will be able to manage your field project in such a way that you accomplish the maximum of the goal that you set at the beginning. Flexibility and the ability to improvise are crucial skills to be acquired, because weather conditions, accessibility in the field or unexpected findings ultimately will change the original plan. And finally, you will always become a better geologist after field work. Every time.

Student Learning Outcomes

By actively participating in this course you will become proficient at

1. Collecting lithologic and structural data and documenting them with analogue and digital tools
2. Making field geologic maps in a variety of different rock types and structures
3. Turning a field geologic map into a professional-quality final geologic map
4. Writing short and also extensive geologic reports of near-professional quality
5. Working with others in a (sometimes adverse) field setting
6. Designing and executing daily field traverses designed to most efficiently create a geologic map
7. Managing field projects
8. Integrating some geophysical data into your geologic mapping.
9. Practice safety in the field

Instructional Methods

The methods of instruction can be categorized as

- a. Short class room type lectures in Fairbanks and in the field (there in wall tents) on specific mapping skills, the application and interpretation of structural data (e.g., stereographic projection) and specific geologic problems. These lectures will take place in the first couple of days during the first segment (Fairbanks) and in the evenings of the Healy and Eastern Alaska Range mapping projects.
- b. Field instruction 1: Mapping tools and instruments (compass, GPS, mapping apps) are best introduced and practiced in small groups in the field.
- c. Field instruction 2: The purpose of Field Geology is to let students acquire skills that allow them to identify and interpret geologic rocks and structures IN THE FIELD. Therefore, teaching them these skills is best done in an outcrop in the field. The instructors will spend most of their time explaining geologic phenomena in front of the small group of 3-4 students they accompany that day. They will also inspect field notes and geologic field map during the day and provide constructive criticism if required. This kind of instruction is very intense during the first two segments, but will also continue to a lesser degree during the more independent mapping projects as the students gain more experience and confidence.
- d. Individual tutoring: After fieldwork is done for the day, students must add the data they collected during that day to their office map and other databases. Instructors will discuss with the student results, problems, and possible strategies for the next day in the field. This type of instruction will become more important in the final mapping project as students work more independently.
- e. Group discussion: With increasing independence, and confidence, groups are encouraged to share their day's findings with the rest of the field camp crew. Since none of the groups make identical observations, even if they have covered the same area, it provides a great pool of information and highlights the different perception and expertise of the students and the instructor who accompanies them. It is a great and fun way to promote collaboration. Group discussions are scheduled for each evening following dinner and camp chores, unless fieldwork was too long and tiring.

Course Policies

Completion of all projects and project reports is required for this class. A student who misses class without an adequate reason (e.g., health) will be dropped. **A student who fails to complete the second or subsequent project report will be dropped.** An 'incomplete' will only be given if a student has completed all field exercises but needs additional time for the final project.

Evaluation

For each mapping project you will turn in at least a clean version your field map and **a short geologic report**. Each of the major projects will be graded based on:

- Map (and associated graphics): 40%
- Geologic content of report: 40%
- Writing style (grammar, spelling, organization, clarity of presentation): 20%

Overall class grade based on a total of 340 points:

- Chena Ridge: 40 points.

- Healy: report (70 points) and question/problem sheets (30 points) for total of 100 points;
- Red Rock Canyon = 200 points.

A = $\geq 90\%$ > B $\geq 80\%$ > C $\geq 70\%$; D > 60%

Plagiarism/Cheating/Academic Dishonesty

Refer to UAF's Student Code of Conduct: <https://uaf.edu/deanofstudents/academic-integrity/>

The instructors of this class consider cheating to be the same as stealing—if you didn't go through the intellectual activity needed to create it, then you don't deserve credit for it. We encourage students to work together. We encourage students to ask us questions to help complete assignments. That said, it's important that your written work be your written work, unless specifically attributed to another. (For example, the source of a graphic or a piece of data needs to be given with the graphic/data.) This includes geologic maps and cross-sections. Written work containing material that is identical (or nearly identical) to that of another student and not appropriately cited will be graded with a zero (for the entire work) on the first instance. Repeat offenses will be reported to the Dean of Students for academic conduct violation review.

In our experience, students sometimes commit acts of academic dishonesty by mistake and (or) out of ignorance. Most students recognize that submitting a written assignment written by another constitutes plagiarism. Many do not realize that this includes significant parts of a written assignment, as well as the entire document. Many do not realize that if you provide another student with a copy of your written work (some or all) which is then used verbatim without attribution, the provider is also considered guilty of academic dishonesty. Obviously, intent of the provider is an important mitigating factor, but establishing intent is often difficult. Consequently, WE STRONGLY RECOMMEND: do not email your written work to another student. The temptation to use it verbatim might become irresistible.

Student protections statement

UAF embraces and grows a culture of respect, diversity, inclusion, and caring. Students at this university are protected against sexual harassment and discrimination (Title IX). Faculty members are designated as responsible employees which means they are required to report sexual misconduct. Graduate teaching assistants do not share the same reporting obligations. For more information on your rights as a student and the resources available to you to resolve problems, please go to the following site:

<https://catalog.uaf.edu/academics-regulations/students-rights-responsibilities/>.

Disability services statement

I will work with the Office of Disability Services to provide reasonable accommodation to students with disabilities.

ASUAF advocacy statement

The Associated Students of the University of Alaska Fairbanks, the student government of UAF, offers advocacy services to students who feel they are facing issues with staff, faculty, and/or other students specifically if these issues are hindering the ability of the student to succeed in their academics or go about their lives at the university. Students who wish to utilize these services can contact the Student Advocacy Director by visiting the ASUAF office or emailing asuaf.office@alaska.edu.

Student Academic Support

- Communication Center (907-474-5470, uaf-speakingcenter@alaska.edu, Gruening 507)
- Writing Center (907-474-5314, uaf-writing-center@alaska.edu, Gruening 801)
- UAF Math Services, uaf-traccloud@alaska.edu, Chapman 305
(<https://www.uaf.edu/dms/mathlab/>, for math fee paying students only)
- Developmental Math Lab (Gruening 406, <https://www.uaf.edu/deved/math/>)
- The Debbie Moses Learning Center at CTC (907-455-2860, 604 Barnette St, Room 120, <https://www.ctc.uaf.edu/student-services/student-success-center/>)
- For more information and resources, please see the Academic Advising Resource List <https://www.uaf.edu/advising/students/index.php>

Student Resources

- Disability Services (907-474-5655, uaf-disability-services@alaska.edu, Whitaker 208)

- Student Health & Counseling [**6 free counseling sessions**] (907-474-7043, <https://www.uaf.edu/chc/appointments.php>, Gruening 215)
- Office of Rights, Compliance and Accountability (907-474-7300, uaf-orca@alaska.edu, 3rd Floor, Constitution Hall)
- Associated Students of the University of Alaska Fairbanks (ASUAF) or ASUAF Student Government (907-474-7355, asuaf.office@alaska.edu, Wood Center 119)

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UAF Office of Rights, Compliance and Accountability
 1692 Tok Lane, 3rd floor, Constitution Hall, Fairbanks, AK 99775
 907-474-7300 uaf-orca@alaska.edu

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3. There are supportive measures available to individuals that may have experienced discrimination.
4. University of Alaska's Board of Regents' Policy & University Regulations (UA BoR P&R) 01.02.020 Nondiscrimination and 01.04 Sex and Gender-Based Discrimination Under Title IX, go to: <http://alaska.edu/bor/policy-regulations/>.
5. UA BoR P&R apply at all university owned or operated sites, university sanctioned events, clinical sites and during all academic or research related travel that are university sponsored.

For further information on your rights and resources [click here](#).

COURSE SCHEDULE

1. PREPARATION FOR INDEPENDENT FIELD MAPPING

Sites: Chena Ridge, UAF campus, Fairbanks

Time: 3 days

Objectives

1. Geologic, field, and writing assessments with remedial instruction as required.
2. Knowledge of greater Fairbanks area geology.
3. Practice mapping and writing—with feedback—in a semi-independent setting.

Activities

Hands-on wherever possible, including examination of writing styles.

1. Review/remedial (outdoor, on-site instruction wherever practical)
 - a. Pace measurement; pace and compass navigation.
 - b. Measuring, recording, and plotting structural data using a Brunton compass and stereonet.
 - c. Introduction to digital mapping tools (e.g., StraboSpot)
 - d. Field identification of major rock types and structures.
 - e. Report writing: organization, sentence structure, and conciseness.
 - f. Use of various-scale topographic maps: navigating, point location, TRS, & UTM coordinates.
 - g. Effective note-taking strategies.
 - h. Use of airborne and satellite imagery and geophysical maps.
2. Guided 1.5-day mapping activity on Chena Ridge at scale of 1:31,680 in groups of 4-5 students. Students write individual short reports.
3. **Closure: Report for Chena Ridge project. Due before next segment. (40 points)**

Modes of Instruction

- The first day features an in-class introduction to mapping, data acquisition and reporting procedures in the morning, followed by practical exercises outside or at nearby outcrops.
- The 1.5-day Chena Ridge mapping exercise will feature short (30-45 min) briefing in the morning and a short discussion to wrap up the day. Discussion of various structural features and lithologic properties will be held at the appropriate outcrops in the field.

2. SEMI-INDEPENDENT FIELD MAPPING

Sites: Healy, Denali National Park, Fairbanks (final report)

Time: 7 days

Objectives

1. Knowledge of the Healy/Suntrana area geology.
2. Practice unit description in sedimentary rocks
3. Practice construction of lithologic contacts.
4. Practice mapping and writing—with feedback—in a semi-independent setting.
5. Construction and interpretation of geologic and structural cross sections.
6. Identification and measurement of rock fabrics in metamorphic rocks
7. Understanding strategy for mapping larger areas.

Activities

1. Students form groups of 3-4 students that will work together throughout the
2. Semi-independent mapping (4-day) of sedimentary rocks (gravel, sand, sandstone, coal) at scales of 1:4,000 and 1:25,000.
3. Construction of detailed cross sections at scale of 1:4,000.
4. Identification and measurement of foliations and microstructures in mica schist and quartzite.

- Each day solve problems and answer questions pertaining to specific mapping areas in order to train observation skills and train students what to look for in specific rocks. Problem sheets due morning of next day **(30 points)**
- Closure: Written report with maps and cross sections. Due in Fairbanks before next segment. (70 points)**

Modes of Instruction

- Each morning begins with short 30 min briefing on the day's agenda.
- Various aspects of sedimentology and structural geology will be addressed with each group in the appropriate outcrops.
- After dinner, each group presents their highlights followed by a general discussion of the day's findings and problems.
- 1-2 hrs. lecture on construction of geologic cross sections during one afternoon.

3. SEMI-INDEPENDENT GEOLOGIC MAPPING

Sites: Red Rock Canyon, Eastern Alaska Range (mapping) and Fairbanks (report writing)

Time: 11 days (9 full days in Red Rock Canyon)

Objectives

- To better understand the geology of complex regions.
- Identification of crystalline (metamorphic and plutonic) rocks
- To work as a team in mapping the geology of an area.
- Practice digital mapping and project management.
- To work with some faculty supervision/assistance in geologic mapping.

Activities

- Semi-independent mapping in groups of 3-5 people accompanied daily by a "geo-buddy" (aka instructor). Instructors will switch between groups daily. Groups will remain together for the whole mapping project. Students will prepare individual maps and reports.
- Students will map with a tablet (provided to the students) using the StraboSpot app.
- Prepare a geologic map at 1:25,000 of a 6-10 km² portion of the Eastern Alaska. The 'office map' will be compiled nightly from the day's field work. Participate in nightly discussions concerning the geologic hypotheses and conclusions yielded by the various mapping groups.
- Using the map and field notes, prepare a report on the geology of the study area. It will be graded based on both its geologic content and its writing style. The **report** will include an abstract, introduction, results, discussion, and conclusions and will contain information on the structure and stratigraphy. **(100 points)**
- Students will meet individually with an instructor to discuss their writing skills in Fairbanks.
- Closure: Written report with maps and cross sections. (200 points)**

Modes of Instruction

- Before the departure to the field, students are introduced to a selection of rocks in hand samples and thin sections.
- The first day will introduce the students to most of the rock types encountered in the field. A detailed discussion of the rocks and lithologic units will take place in the appropriate outcrops.
- The evening of the first day will feature a 1 hr. lecture/discussion on the stratigraphy of the lithologic units.
- From day 2 on, each group will present their observations and problems to all participants. This is scheduled to last approximately 1 hr.
- 1 hr. lectures on the statistical analysis of structural data (stereographic projection), the regional tectonics of the Eastern Alaska Range, and metamorphic and igneous petrology pertaining to the mapping area, are scheduled for every second evening following dinner.
- Structural and petrologic aspects and problems will be addressed in the appropriate outcrops during the day.