



UNIVERSITY OF CALGARY

DEPARTMENT OF GEOSCIENCE COURSE OUTLINE SUMMER 2016

1. Course: GLGY 435, Field Methods II

Lecture Sections: *none*

Lab Section B01: August 16-30, 2016 – Dillon MT

Dr. R. Meyer, Office: ES 110; Tel. No.: 403-210-7848; email: rmeyer@ucalgary.ca; Office Hours: “open-door” policy

Geoscience Department ES 118, 403-220-5841, geoscience.ucalgary.ca, geoscience@ucalgary.ca

2. Prerequisites: Geology 323, 337 and 381; one of Geology 311 or 333; one of Geology 341 or 343 and admission to the Geology or Applied and Environmental Geology programs. See section 3.5.C in the Faculty of Science section of the online Calendar (www.ucalgary.ca/pubs/calendar/current/sc-3-5.html)

Antirequisites: Credit for both Geology 435 and either Geology 437 or 439 will not be allowed.

Notes: Enrolment in [Geology 435](#) is restricted to Geology and Applied and Environmental Geology majors. Registration for non-majors will require consent of the Department. This course occurs in rugged field conditions and varying weather, for which participants must be prepared and equipped. It may occur outside Canada. Students will be required to cover food and accommodation costs, and a supplemental fee will be assessed.

3. Grading: The University policy on grading and related matters is described in sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Field Notes (graded during and after field work; handed-in with report)	25%
Active participation and “spot” tests in the field	10%
Geologic Map (25%), cross-section (10%), stratigraphic column (10%); handed-in with report	45%
Written report (due August 28)	20%

Each piece of work (e.g. lecture and lab exams, lab assignments, project) submitted by the student will be assigned a percentage score. The student’s average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade. The conversion between course percentage and letter grade is given below.

Letter Grade	Percent	Letter Grade	Percent
A+	95-100	C+	65-69
A	90-94	C	60-64
A-	85-89	C-	56-59
B+	80-84	D+	53-55
B	75-79	D	50-52
B-	70-74	F	0-49

4. Missed Components of Term Work: The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in [Section 3.6](#). It is the student’s responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar

5. Scheduled out-of-class activities: A Safety Briefing will be held prior to departure, either Tuesday Aug 16 or Wednesday Aug 17, in room ES 136 –exact date and time to be announced. Aside from that, the classes take place entirely off-campus, in southern Alberta and in the area of Dillon, Montana, USA.

REGULARLY SCHEDULED CLASSES HAVE PRECEDENCE OVER ANY OUT-OF-CLASS-TIME-ACTIVITY. If you have a clash with this out-of-class-time-activity, please inform your instructor as soon as possible so that alternative arrangements may be made for you.

6. **Course Materials:** Textbooks recommended (for review and reference): Geological Field Techniques (2010) by Angela Coe, which was used in a preceding Field Course GLGY 337, and Sedimentology/Stratigraphy, Facies Models, and Structural Geology textbooks.
7. **Examination Policy:** There will be no written Exams in this course; see point 3., above. Students should also read the Calendar, [Section G](#), on Examinations.
8. **Approved Mandatory and Optional Course Supplemental Fees:** Supplementary fees will be promulgated by Group Studies.
9. **Writing across the curriculum statement:** The quality of the student's writing will be a factor in the evaluation of student work. See also [Section E.2](#) of the University Calendar.

10. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Misconduct:** Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under [Section K](#). Student Misconduct to inform yourself of definitions, processes and penalties.
- (b) **Assembly Points:** In case of emergency during class time, be sure to FAMILIARIZE YOURSELF with the information on [assembly points](#).
- (c) **Academic Accommodation Policy:** Students with documentable disabilities are referred to the following links: Students with Disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html> [B.1](#) and Student Accessibility Services: <http://www.ucalgary.ca/access/>.
- (d) **Safewalk:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call 220-5333 for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **Freedom of Information and Privacy:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPP). As one consequence, students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page. For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **Student Union Information:** [VP Academic](#) Phone: 220-3911 Email: suvpaca@ucalgary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca; [Student Ombudsman](#)
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI Surveys.

Accompanying document provides all required Course Information including outline, schedule of activities, logistics, equipment needed, etc.: **GLGY435 B01_Info+Outline+Logistics_S16**

Department Approval: ORIGINAL SIGNED

Date: April 21, 2016

Associate Dean's Approval for
out of regular class-time activity and
alternate final examination arrangements: ORIGINAL SIGNED

Date: April 22, 2016

UNIVERSITY OF CALGARY
FACULTY OF SCIENCE
DEPARTMENT OF GEOSCIENCE
GLGY 435-B01 – COURSE INFORMATION
SUMMER 2016



1. Course: GEOLOGY 435, Section B01
Title: Field Methods II

Date/Place:
August 16–29, 2015
Writing-on-Stone Provincial Park (Aug 18)
Dillon, Montana (Aug 19–29)

Instructor: Rudi Meyer
ES110
210-7848
rmeyer@ucalgary.ca

Teaching Assistant: Makram Hedhli

2. Prerequisites: GLGY 323, 337 and 381; one of GLGY 311 or 333, one of GLGY 341 or 343 and admission to the Geology or Applied and Environmental Geology programs.

Note: Students are responsible to make sure they meet all prerequisite requirements. The Faculty of Science policy on pre- and co-requisite checking is outlined in the University of Calgary 2015-2016 Calendar.

3. Aside from the applicable tuition fees, there are additional costs associated with this Field Course (as administered by the University of Calgary Group Studies Program –see below).

4. Brief outline: the course is an exercise in surface mapping of clastic and carbonate rocks near Dillon, Montana. Topographic maps and aerial photographs will be used as a base. Work will focus on the description and documentation of lithologies and stratigraphy, measurement of corresponding sedimentary and structural data, and integration of field observations. The Field Notes will provide the data for a written report, including description/ interpretation of mapped units and geologic history, as well as a geologic map and cross-section.

5. The University policy on grading and related matters is described in the University of Calgary 2015-2016 Calendar. In determining the final grade in the course the following weights will be used:

Field Notes (graded during and after field work; handed-in with the report)	25%
Active participation and “spot” tests in the field	10%
Geologic Map (25%), cross-section (10%), strat. column (10%); handed-in with report	45%
Written Report (due August 28)	20%

6. A passing grade must be obtained for each of the above grading components of the course. Writing and the grading thereof will be a factor in the evaluation of student’s work. There will not be a final examination in this course.

7. Academic misconduct (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a ‘zero tolerance’ policy regarding dishonesty. You are expected to have read and to understand the sections on Principles of Conduct, and Academic/Non-Academic misconduct in the 2015-2016 University Calendar.



MAPPING PROJECT

You will be mapping an area near Dillon, Montana of approximately 11 km² on a 1:24,000 topographic base map and aerial photographs. The folded and faulted succession is made-up of Permian to Eocene-age sedimentary rocks (conglomerates, sandstones, shales, carbonates and other chemical deposits), and minor igneous ‘surprises’. The objectives of the project are:

- (1) to make a geologic map and cross-section of the area;
- (2) to assemble a stratigraphic column of selected formations in the field area;
- (3) derive general depositional environments for the different units, and a reasonable succession of depositional systems;
- (4) write a report including a brief description and interpretation of stratigraphic units, principal deformation structures, and a brief geologic history as inferred from your field evidence.

As you can see from the above you will need to know how to identify sedimentary rocks and constituent minerals. While mapping we will learn and practice how to recognize lithologies and interpret depositional structures in the field including the nature of contacts and bedding types, common body and trace fossils, diagenetic features (*e.g.* cements, paleosols), and the description and qualitative interpretation of tectonic structures (*e.g.* folds, faults, fractures). You should be familiar with geological field techniques, that is, be able to use a geological compass effectively, and use a Jacob staff (or ‘pogo’ stick). In order to document and make sense out of the data that you gather in the field it is most important to keep well-organized, methodical, thorough field notes. You will be working in the field in pairs, but each student must take their own notes and prepare their own map, strat column, section, and report.

Before the course you will want to read/review relevant chapters in the textbook “Geological Field Techniques” (2010) by Angela Coe, particularly Chapters 2-4 (Basics), Chap.6 (Sedimentary rocks and graphic logs), Chap.8 (Structural data), Chap.10 (Geological maps), and Appendices A6, A10.

Another useful book is “Sedimentary Rocks in the Field: A Color Guide” (2005) by D.A.V. Stow, containing tables and diagnostic illustrations, summary reviews of sedimentology and stratigraphy, and it is compact enough to be taken into the field.

In your GLGY 381 and 343 textbooks you will want to review relevant aspects on stratigraphy (type successions), sedimentology (structures, depositional environments) and the representation of geological bodies on maps and cross-sections. The instructors will bring some references, but it is a good idea to coordinate with other students in the group to have a few copies of reference texts available during the course.

It is recommended that you bring a laptop computer, if you have one. The Department has a small number of laptops for those that do not own one. We also bring a printer to be shared by the participants.



COURSE LOGISTICS

REGISTRATION with the **GROUP STUDIES PROGRAM**

GLGY 435 Field Schools are administered by the UofC's [Group Study Program \(GSP\) Office](#). This means that once you are registered in the course, and the Department of Geoscience has approved your registration, your [@ucalgary](#) e-mail will be provided to the Group Study Program team. GSP will e-mail you instructions on how to apply and register with them online. It is MANDATORY that you check your [@ucalgary](#) account and respond to all instructions in order to participate in the program.

Please follow all steps outlined by GSP, this will include making an appointment to sign registration documents and pay program fees (which will be outlined in the student cost summary provided by GSP), and submitting a copy of your passport and travel insurance. If your citizenship requires a visa in order to enter the USA, please look into that now to see what is required. Please e-mail group.study@ucalgary.ca if you need any additional support.

ITINERARY

<i>August 16 or 17</i>	TBA	Field School Safety briefing in ES 136 – <u>Required of all participants</u> .
<i>August 18</i>	6:00 am	Meet in Parking Lot 21 near the Math Sciences Building to pack the vans with field school and participant's gear.
	6:30 am	Leave for Writing-on-Stone Provincial Park, southern Alberta.
	Afternoon	Sedimentary warm-up outcrop Exercise(s).
	Overnight	Camping at Writing-on-Stone Provincial Park. Be prepared to share tents with your peers. We will coordinate via email to bring only the tents that we need for this night only.
<i>August 19</i>	All day	Drive to Birch Creek Center, near Dillon, Montana. We will make a couple of brief stops on the way to take-in some roadside and regional geology.
<i>Aug 19</i>	All day	Regional reconnaissance – SW Montana.
<i>August 20 to 28</i>	All day	Mapping Project; last two days will be dedicated to finalize the Report.
<i>August 29</i>	All day	Drive back to Calgary; arrival in the evening.

TRAVEL

You will be asked to provide basic personal information when you register with GSP including that related to citizenship and passport #.

You will require a valid passport to cross into the U.S. and back into Canada. For non-residents of Canada, make sure whether you require a visa to enter the U.S. or re-enter Canada; if you do, take care of this beforehand.

You will require supplementary medical travel insurance. In the U.S., even if covered by basic provincial health care, you will be asked to pay 'up-front' if medical attention is needed. The Group Studies Program (GSP) will arrange for your medical travel insurance or you can obtain the eleven (11) days of medical travel coverage that you need (Aug 19 – 29) inexpensively from an insurance provider or a travel agency.

***** NOTE: if for some reason you can not comply with the travel requirements above, you must sign-up for a different Field School section *****

TRANSPORTATION

The Department of Geoscience of the University of Calgary will provide field vehicles for the duration of the Course.



ACCOMMODATIONS

August 18 Tenting at Writing-on-Stone Provincial Park (washroom, shower facilities).

Aug. 19 to We will be staying at the Birch Creek Center located in the East Pioneer Mountains
Aug 29 within Beaverhead-Deerlodge National Forest, 35 km north-west of Dillon, MT.

Originally constructed as a Civilian Conservation Corps Camp (to provide work for the unemployed during the depression years), the Birch Creek Center has since been enlarged and renovated. It provides rustic, ‘dormitory/barrack-style’ accommodations in wood-stove heated cabins.

*** **BRING YOUR OWN** sleeping bag (or sheet & blanket), pillow, towel, and personal toiletries (soap, shampoo, etc...). Depending on what cabins will be assigned to our group there will be 2+ people to a room; private sleeping rooms are not available.

FOOD

August 18 Bring a sack lunch for Day 1. Camping at Writing-on-Stone that evening the instructors will put together dinner (not including beverages) for all of us; do not bring cooking appliances.

August 19 Breakfast/lunch on the road; we will stop at fast-food outlets. Dinner at Birch Creek Center.

Aug 20-29 Your accommodation at the Birch Creek Center includes three meals a day: a hot/cold buffet breakfast, a buffet to self-assemble sack lunches for the field, and a complete, warm dinner. The Center’s kitchen is not available for private use, nor are cooking appliances permitted in the lodging areas. Pop, tea and coffee are available 24/7 particularly on the two days that we will stay in camp completing the project. Any other snacks or refreshments outside of these meals are up to you. We will arrange time and vans to buy refreshments/ snacks every couple of days.

Aug 29

Breakfast at the Birch Creek Center. Lunch and/or dinner on the road to Calgary.

*** NOTE: Please let me and GSP know of any dietary requirements with anticipation ***

FACILITIES AT THE BIRCH CREEK CENTER

We will have access to meeting/workroom facilities (large tables, electrical outlets, and chalkboard).

Coin-operated washer and dryer facilities are available.

There are no TVs and Internet connectivity is marginal at best; connectivity is available at times in one or two “hot” spots (more like lukewarm spots...). However, there is lots of mountain and forest air, hiking trails, fire-pits, horseshoe pits, volleyball and basketball courts (to relax at the end of field days and between ‘office’ work).



A satellite phone is available for emergency purposes: **(254) 240-7559**

Messages can always be left at the Birch Creek Director’s office, (406) 683-7891 on the Western Montana College campus in Dillon, and will be relayed to the Birch Creek Center the following day.

Snail mail/packages are delivered 1 day after they are received in Dillon, and should be addressed as follows:

name, c/o UofC Geology Field Course
Birch Creek Center
710 South Atlantic
Dillon, MT 59725-3598, U.S.A.

Regarding emergencies: a manager with first-aid training is on-site 24 hours a day, first-aid kits are available, and should it be required, the nearby Beaverhead Ambulance can be contacted for transportation.

COSTS

See **Student Cost Summary** provided by the Group Studies Program. Overall, this Field School is comparable or less expensive than other GLGY 435 Field Schools even with an unfavourable currency exchange rate. You will need US dollars for any meals on-the-road, and for extra refreshments and snacks. Estimate what you will need for the duration of the course and buy some US\$ cash beforehand. You will be able to use your credit card (or debit card machines) for purchases 'in the city'. It is advisable to have some provision for access to emergency cash.

SAFETY

You will be asked to provide the instructor with basic safety information including an 'Emergency telephone contact'. A General Field Safety briefing will be held prior to departure –this meeting is compulsory: you will not be able to go on this Field School if you miss this meeting. You will be asked to read, complete and sign a form of 'Informed Consent' in which you indicate that you are aware of, and understand the risks inherent in field activities of this kind. The following specific aspects are aimed at making this Field Course a safe experience for all participants:

Driving

The instructor drivers of the vehicles have a great responsibility to ensure the safe transportation of her/his passengers; students are required to use safety belts. Traffic along highway, secondary and country roads tends to move very quickly and most highway travelers are not used to groups of geologists examining outcrops. Please be particularly careful at any roadside stopping place where visibility is obscured by a bend in the road.

In the field

The field area is 1,600 m-high desert country, it should be **hot** and dry at that time of year, temperature in the high 20's, but conditions can change quickly, so be prepared –wear layers. Make sure you drink plenty of fresh water while you are out in the field — it is the best way to combat heat and fatigue (about 2 litres of water is a reasonable minimum!). We will do field work in pairs –make sure you look after your partner as you would look after yourself. Spiny bushes and cacti abound, and there are some relatively harmless insects and snakes, but no bears!

Under all circumstances be considerate of your field partner when it comes time to micturate and to fulfill other calls of nature. If you have a chronic illness or severe allergy come prepared to deal with the problem, and instruct the staff and your field partner(s) on how to best help you if an emergency should arise.



Some safety practices:

- Do not venture close to cliff edges — they can crumble, or you can lose your balance.
- When walking up relatively steep slopes, take great care not to dislodge loose rocks; if you do, you must shout a warning to the people behind/below you as loudly as possible.
- At all times be alert and watch-out for falling rocks when you are under or next to a cliff. If somebody appears on the cliff top above you, get away from the fall zone as quickly as possible and let them know that you are working below.
- Rock climbing is not allowed at any time during this course.
- Avoid crossing busy highways to examine road cuts, whenever possible. If you choose to cross, look both ways before crossing. Walk, remain alert, and stand well off the roadway while you examine the rocks.

On the use of hammers:

▶▶▶ **Wear safety goggles over your eyes !**

You will need a hammer to break-off rock samples and examine freshly exposed surfaces. Hammers should be hard steel masonry or rock hammers. They should only be used on rock corners/edges with a chance of being knocked off. Choose your samples thoughtfully, you will not learn much about an outcrop by reducing it to rubble. Do not hammer indiscriminately or excessively, and do not swing the hammer wildly or near people. Use downward blows and make sure no one is standing close to you, or looking over your shoulder. Do not hammer at rocks above your head. Never use a hammer to strike another hammer, as this produces steel fragments which may penetrate even a closed eye.



PERSONAL and GEOLOGICAL EQUIPMENT for Field Work

(also see *Course Description and Equipment Lists* on the Department's *Field School Schedule* webpage)

PERSONAL

1. Passport (essential)
2. Driver's license (essential)
3. Watch (essential –*if you are not back on the road in time you will be left behind...*)
4. Belt to carry Brunton compass (essential –*otherwise it is much too easy to lose it...*)
5. Backpack of the large daypack type (essential)
6. Field or hiking boots (essential)
7. Outdoor clothing for cold, warm, hot or wet weather (essential)
8. **Hat**, preferably with an all-around brim (essential)
9. Canteen, water bottle, or thermos; absolute minimum 1 lt. (essential)
10. Sunscreen (essential –*there are very few clouds in SW Montana*)
11. Sun glasses (almost essential –*it is very bright out there!*)
12. A couple of good plastic bags, to keep things dry should it rain
13. Personal first-aid kit
14. Personal items (toilet paper, tissues, etc.)
15. Insect repellent
16. Pen knife
17. Student identification
18. Information about your supplementary health/accident insurance such as policy #, phone #
19. Enough money to meet your needs (essential)
20. Bathing suit or equivalent (*we may have a chance to visit nearby hot springs*)

GEOLOGICAL

1. Handlens, at least 10x (essential)
2. Grain size comparator (essential)
3. Geological hammer (essential)
4. Clipboard or sheet holder for at least a 8½ x 11" base map (essential)
5. Hardcover field notebook; size about 4½ x 7" (essential)
6. Protractor (essential)
7. Rulers in cm and inches (essential)
8. Mechanical pencils and fine-tipped felt pens (essential)
9. Coloring pencils; about 12 colours (essential)
10. Pencil eraser (essential)
11. Permanent felt tip marker to label samples
12. Pencil sharpener
13. Stereonet (useful)
14. Graph paper
15. Tracing paper
16. Camera
17. Binoculars (*not essential but useful; bring if you have them and are willing to carry them around*)
18. Calculator (*mostly for use in 'the office'*)
19. Textbook(s): coordinate w/other students to bring different books.