SYLLABUS

 University of Wyoming

GEOLOGY 4717

May-June 2019

**About the instructors –**

Director: Dr. Barbara John (structural geology and petrology)

Instructor in Petrology: Dr. Ken Sims

Instructors in Sedimentation and Tectonics: Dr. Jay Chapman

Instructor in Near Surface Geophysics: Dr. Andy Parsekian

Teaching Assistants: Russell Callaghan, Fabio da Prat, Chris Doorn, Lisa Kant, Cole Messa, Greg Stark

**Course Prerequisites -**

A grade of C or higher is required in mineralogy (GEOL 2010), stratigraphy and sedimentation (GEOL 2100), and structural geology and tectonics (GEOL 4610). In addition students will benefit from having taken general field geology (GEOL 2080), and petrology (GEOL 2020).

**About this course –**

Geology field camp is your opportunity to develop skills of observation and interpretation while learning the technical aspects of field mapping, rock description and interpretation, and structural analysis. Preparation of maps, stratigraphic columns, geologic or geophysical cross-sections, graphical plots of data, and reports is a critical part of the course.

As you know from structure and tectonics and other courses, geologic fieldwork and mapping both require the synthesis of knowledge and skills from many aspects of geology. It is both intellectually and physically challenging, but steady progress and the occasional epiphany are very rewarding. They can also be frustrating ….. be patient as you develop and refine your geologic intuition and field skills. This class provides ample time for instructor-student contact; ask questions and ask for comments on your map and/or field data, and notes while in the field, or any other help you might need. Take your time, be careful in note taking and mapping, and think about the geology you are mapping. Plan geologic traverses to answer questions and solve problems as they develop in the field. We will have consultations with the instructor and/or TA at the beginning of each field day (and in the field), to your review progress, and go over your plan for the day, and help with geologic questions as they arise.

Beyond learning specific field techniques, the course serves a number of critical roles in your general education, including: 1) applying knowledge of core subject areas (e.g. scales of geologic time and spatial relationships), 2) employing the scientific method to answer real-world, field-based questions, 3) developing proper data acquisition skills, while learning limitations in quantity and quality of data, 4) developing sound interpretation(s) based on limited data for analysis (e.g. cross-sections), 5) developing creative thinking and problem solving skills including 3D geometries, 6) developing an awareness and understanding of geologic resources and hazards, and 7) learning to communicate effectively, and work collaboratively and professionally.

The course is divided into four modules that vary in specific content from year to year but make full use of abundant "textbook-quality" field sites in Wyoming, Colorado, Utah, California and Nevada. This year we will conduct field work in four main areas: (1) the Sierra Nevada, White-Inyo Mountains, and Long Valley caldera regions of eastern CA, (2) the Summer Coon Mountains, Colorado, (3) western WY, and (4) in and around Laramie, WY.

The first module (3 weeks, 3 credits) provides an introduction to basic field techniques, including geologic mapping using topographic maps, aerial photographs, Google Earth images and LiDAR maps; description of sedimentary, metamorphic, and igneous (volcanic and plutonic) rocks; measuring sedimentary and volcanic sections; structural measurements; illustrating the geometries of deformed rocks with cross-section; integration of data sets into a coherent geologic history; and report writing. Beyond the general field techniques allied with geologic mapping explored in the first two weeks, the final week of this module focuses on the processes that influence the landscape surrounding the eastern Sierra Nevada and Owens Valley (CA), via a series of one-day exercises designed to investigate active geologic processes including glaciation, active faulting and deformation, volcanism, and climate change, hydrology, and human exploitation of resources. Each exercise includes field-based data gathering, ranging from stream gaging to estimating active fault scarp height and fault slip rate, the relative dating of glacial deposits, and young volcanism (< 1 Ma).

Rotating faculty from UW Geology & Geophysics, and several graduate teaching assistants bring expertise in volcanology, petrology, sedimentology, Earth surface processes, tectonics, paleobiology/paleoecology, climate science, and field geophysics for three additional modules (1 credit each) over the second half of the course.

**Learning Outcomes -**

* Identify and classify basic geologic materials, including minerals, rocks, fossils, structures, and landforms, and know their basic material/mechanical characteristics and/or biological properties.
* Create basic types of geologic maps using standard symbols, and standard field measurement techniques and equipment.
* Visualize and comprehend geological materials or structures in 3-D based on 2-D data sets. Perform basic geologic analysis including taking field notes (and sketches), making lithostratigraphic and biostratigraphic correlations, measurement of stratigraphic sections, active stream flow, fault scarps, and map and cross-section construction.
* Communicate the major geologic events in an area based on notes, map and stratigraphic data you collect in the field.

Upon completion of the course, you will have the skills necessary to perform many field tasks required in geologic professions and will be able to conduct field studies at a graduate level.

**Course expectations –**

For the duration of this course, you are expected to participate in all projects and give each assignment your utmost effort. Since the course requirements include mineralogy, stratigraphy/sedimentation, and structural geology, you will be expected to know the content of those courses. However, this class is not a test. You will be taught how to create a geologic map and cross-section from field date, measure stream flow and interpret the water cycle in a basin, map active tectonic features in the field, and how to use different geologic, hydrologic and geophysical field equipment. If you don't understand a concept or procedure, or have forgotten previous course contest, we encourage you to ask questions as early as you can.

 **Grading-**

Due to the nature of the course, the grading system has to remain flexible. Weather can (and likely will) force us to modify the field projects as we go. If you have any questions about grading as the course proceeds, please ask.

Your grade will be based on the following projects:

1. Big Pine introduction to mapping (4 days), Westgard/Poleta stratigraphy and detailed structural mapping (5 days), 3-4 day-long projects (Mono Basin water cycle, glacial history, magmatism and extensional tectonics, etc) based at French Camp, and a 1 day project on structural and intrusive relations in the middle crust exposed in Lamoille Canyon, Ruby Mountains, NV
2. igneous mapping project Summer Coon Mountains (4 days)
3. sedimentation and tectonics in the Wyoming thrust belt (5 days)
4. near-surface geophysics (5 days)

**Project assessment**

All projects will be graded on their presentation, accuracy, content, with an additional grade assigned for participation (field and camp - 10%).

**Map:**

* Data recording and density: sufficient and appropriate for field conditions and structural complexity in the area being investigated
* Contacts and units are accurate and defensible – free of major unexplained thickness changes and consistent with all measurements and observations. Rule of V’s observed. Location and detail/subtlety evaluated.  Structure as mapped and interpreted is shown by standard geologic symbols and supported by data and observations. Map must be internally consistent.
* Complete legend/map explanation for all symbols and units. North arrow and scale included.

**Cross Section:**

* Consistent with all major structural features present on your map and notebook, and mechanically correct in all aspects.

**Stereonet plots:**

* Plot fold measurements as poles to determine any fold hinge orientation (trend and plunge), axial surface (strike and dip).

**Reports:**

* Organized, complete and concise; speaks specifically to the field area and map data. Reflects knowledgeable application of structure and stratigraphic concepts and terminology.

**Field notes:**

* Mechanics: includes date & field location at top of each page, legibility, completeness (coherent descriptions), and consistency and interconnectedness.
* Drawings and Sketches: scale and orientation, usefulness and relevance, active model testing by visual representation.
* Evidence of Scientific Thought: frequent making and testing of predictions evident, uncertainty is acknowledged and dealt with, and general evidence of active and responsive thought.

**Stratigraphic columns:**

* Graphic section – provide title at top, show names, ages and thicknesses of units.
* Correct use of lithologic symbols – distinguish between main units.
* Thicknesses – is total thickness of section reasonable?
* Lithologic descriptions – emphasis on key identifying characteristics of units; organization, consistency, detail, accuracy

Geology 4717-01 grading (tentative)

*1) Big Pine project (30 pts total)*

10 pts Big Pine map

15 pts Big Pine unit descriptions

5 pts field notebook

2) Owens Valley Project (60 pts total)

15 pts Fish Spring Hills map

10 pts Cinder Cone map

15 pts unit descriptions

10 pts field notebook

10 pts geologic history including fault slip estimate

*3) Poleta Project (140 pts total)*

40 pts Poleta field map (20 pts), field notebook (10 pts), draft stratigraphic section (10 pts)

20 pts Poleta final measured stratigraphic section, unit descriptions

60 pts Poleta final map and explanation

20 pts Poleta cross-section

*4) French Camp projects (25 pts each; 3 of the 5 outlined)*

25 pts glaciation (McGee Creek and Bloody Canyon)

25 pts Bishop tuff and volcanic tablelands (fault zone evolution)

25 pts Mono Lake water cycle (natural history and human impacts

25 pts Mono-Inyo craters (magmatism and tectonics at the margin of the Basin and Range)

25 pts Contact metamorphism and skarn mineralization associated with emplacement of the Sierra Nevada batholith

*5) Mid-crustal synthesis, Lamoille Canyon, Ruby Mountains, NV (25 pts total)*

10 pts Lamoille Canyon middle crust synthesis (field notebook with labeled sketches of cross-

cutting relations )

15 pts 2 page report highlighting the geologic history

**Course Behavior Policy -**

For the duration of GEOL 4717, you will be living and working closely with both your fellow students and instructors. You must treat all members of field camp with the respect and consideration. Spirited debate and disagreement are expected in any classroom and all views will be heard fully, but at all times we will behave civilly and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere.

Recreation is encouraged, but must be conducted safely at all times, and with thoughtfulness for others. If you plan to hike back to camp or go for a run after mapping, you are required to inform the instructor or a TA beforehand, indicating where you are going and when you will return. This can be a very enjoyable time for all if everyone follows these simple guidelines -

Specific requirements–

* no alcohol (beer, wine or hard liquor), or illegal substances (really)
* no use of or carrying firearms
* 10 PM-6 AM noise curfew in camp
* no seconds on meals until everyone has been served
* participation in meal prep and dish washing rotation
* keep a clean camp and clean vehicles (no living out of the back of the vehicle)
* no harming or harassing wildlife or livestock
* campfires must be doused to a slurry before going to sleep EVERY night

**Field behavior -**

While in the field, you are expected to work in a professional manner. We will generally start work at 8AM, and end by 5 PM. While you are encouraged to work on your maps and cross-sections/stereonets in the evenings, we cannot allow you to continue mapping after dinner for safety reasons.

The guidelines to follow include –

* work with your assigned partner(s), and your assigned partner(s) only
* work diligently, and be mindful of safety
* treat public and private property with respect
* do not litter or smoke in the field (NO orange or banana peels, cigarette butts, or toilet paper)
* work independently when required
* no earbuds in the field…leave them in camp or the vehicles

**Field preparation -**

You are REQUIRED to carry at least 2 liters of water in the field each day. Every field day bring water, lunch, and field gear inside the vehicle with you. Do not expect to stop at a store (there are none). When we leave Laramie May 16, please have your own lunch and water.

**Course Statement on 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 Disability Support Services (DSS), Room 128 Knight Hall as soon as possible.*

*You may also contact DSS at (307) 766-3073 or**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 -**

*Academic dishonesty will not be tolerated. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114.* Academic dishonesty is defined as ‘an act attempted or performed which misrepresents one’s involvement in an academic task in any way, or permits another student to misrepresent the latter’s involvement in an academic task by assisting the misrepresentation’

*“Penalties for academic dishonesty can include, at my discretion, an “F” on an exam, 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. It is intellectual theft – stealing - and includes (but is not limited to) unapproved assistance on examinations, plagiarism (use of any amount of another person’s writings, blog posts, publications, and other materials without attributing that material to that person with citations), or fabrication of referenced information. Facilitation of another person’s academic dishonesty is also considered academic dishonesty and will be treated identically.”*

Students are expected to adhere to the above. Students that obtain work from previous field camp students (at UW or elsewhere) will be dismissed from the course with a grade of F. If you have any questions about what is allowable and what is not, please ask ! These issues are sometimes not clear-cut, especially because you are doing group projects.

**Removal from field camp -**

There have been a few cases of students being expelled from the UW field camp. The causes for expulsion include, but are not limited to:

* Use of illegal substances or alcohol
* Reckless use of vehicles
* Endangerment of self, other students or staff
* Harassment of other students or staff, sexual or otherwise
* Refusal to comply with rules or participate in projects
* Continually uncooperative or dangerous behavior

**Duty to Report -**

*UW faculty is 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*](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.*

**Cell phones -**

 Many of our campsites are outside cell service. There will be stretches of time as long as 6 days when you will NOT be able to make cell phone calls. In emergencies we can be reached by the BLM/Forest Service rangers. Cell phones may be charged from vehicles while the vehicles are being driven, but not when in camp. **There will be periods when your cell phone is dead and cannot be charged.** Set your phone to airplane mode to conserve the battery.

**Safety -**

The first priority for field camp is everyone’s safety. DO NOT engage in any activities that endanger yourself or others.

* Rock climbing, bouldering and boulder rolling are not permitted, ever.
* Alcohol (beer, wine or hard liquor) will not be tolerated while away from Laramie, in vehicles or camp.
* Never climb any cliff, mountain or outcrop that makes you feel uncomfortable
* If you feel the driver if your vehicle is driving dangerously, tell the field camp director immediately.
* If you are in a situation that puts your safety at risk or you perceive you may out your safety at risk, remove yourself from that situation immediately and inform the field camp director.

*Lightening i*s a very real danger across the west. At the first sign of lightening, quickly get down from any ridge or mountains. Even if you do not see flashes, you are in striking distance if you can hear thunder. Return to the vehicles and get inside with the windows closed. Do NOT touch the frame or lean against the vehicle. If there is no shelter, crouch in the open (to avoid direct strikes) twice as far from the tallest tree as it can fall. You can also crouch in a grove of small trees. Stay away from water, and move away from a group of people and drop your pack and hammer. An enclosed vehicle is safer than an open picnic area.

*Beetle kill trees* are also a very real danger especially in WY and CO. Be aware of your surroundings, and alert when walking through the forest for dead, beetle kill trees. These can break and fall almost instantly in a wind. Avoid dense patches of dead trees. Stay out of the forest when there are strong winds that could blow down trees. If you are already in the forest when the winds kick up, head to a clearing out of range of any potential falling trees.

*Snakes and biting insects* are always a risk outdoors. We suggest you wear long pants, and at least ankle top hiking boots, and use insect repellent when needed.

*Ticks* are common in some of the areas we will work. You should check for ticks every evening, paying special attention to the backs of your knees, groin and torso. If you are bitten by a tick use tweezers to grasp the tick by the head as close to your skin as possible. Do not squeeze the body ! Pull straight out until the tick loosens and comes free; this can take several seconds. If pieces of the tick’s mouth remain, pull them out separately. Smash the tick in toilet paper; do not use your bare hands. Wash the bite site thoroughly with soap and water, and thoroughly wash your hands.

Ticks transmit infection only after biting, and the risk of acquiring Lyme disease is only 1.2-1.4% in areas where the disease is common (Eastern US). The risk of Lyme disease in the West is lower. However, there is a rick of tick fever in in the west, though it often goes away o its own and is not dangerous, though complications can occur.

If you are bitten by a tick, watch the bite site (redness around the bite), for fever-like symptoms 3-6 days after the bite (tick fever), or a circular rash between 104 weeks after the bite and flu-like symptoms (Lyme disease). In each case, medical help is recommended.

*West Nile virus* is contracted through mosquito bites and can be prevented by wearing mosquito repellent. The incubations period for the virus is 3-14 days. According to the CDC, people over 50 are at greatest rick for server reactions. When someone is infected with West Nile virus they typically have one of three outcomes – no symptoms (80%), West Nile Fever (~20%), or severe West Nile disease (<1%). If you develop a high fever with a severe headache consult your doctor.

*Bears* inhabit many of the areas where we will be working. The chances of meeting bears are extremely low, largely due to the bears’ disinterest in most people. All bears are however potentially dangerous; they are unpredictable and able to inflict serious injury. NEVER feed or approach a bear. Do not cook or eat in or near your tent, or get food orders on your sleep bag. Do not keep food, toothpaste, sunscreen and other smelly items in your tent.

*Mountain lions* are common in the areas we visit. They are very shy, with chances of an encounter being VERY small, but some precautions should be taken. Stay with your mapping partner(s) make noise as you hike; this will prevent encounters. If you see a mountain lion, do not squat or bend over (you resemble prey), and do not turn your back (running triggers the instinct to chase). Face the lion and look as large as possible, flap your jacket, shout, throw rocks and slowly back away.

*Dehydration* and *heat-related illness* can be avoided. The sun is very strong at the elevations we will be working at. You should wear sunscreen (and bring an adequate supply), light colored shirts that cover your shoulder, and a floppy hat (not a baseball cap, as your ears are exposed). Drink plenty of water. And note in a dry climate, you may not be aware of how much fluid you have lost to sweat. If you are experiencing headaches, dizziness, muscle cramps, nausea, rapid pulse, heavy sweating or clammy skin, very high body temperature, and/or disorientation, you may have heat illness or varying severity. At the first sign of these symptoms, find some shade for rest (even if it is under/adjacent to a parked vehicle, drink water and loosen your hear and clothing. You may need to send your field partner for some help.

If you miss a project due to preventable heat exhaustion (no hat, no shirt, no water), you will get zero points for the project.

*Hypothermia* is caused by exposure to cold, aggravated by wet, wind, and exhaustion. It is the number one killer of outdoor recreationalists. The moment your body begins to loose heat faster than it produces it, you are undergoing exposure. Persistent or violent shivering is a clear warning that you are on the verge of hypothermia. Symptoms may include vague, slow, slurred speech; memory lapses or incoherence; immobile, fumbling hands, frequently stumbling, drowsiness; or apparent exhaustion. To prevent hypothermia, 1) stay dry, 2) wear wool (not cotton), 3) be aware of the wind, 4) understand ‘cold’ (most hypothermia cases develop in 40-50 degrees, dangerous temperatures if you are wet or exhausted, 5) sleep in a tent.

*Driving* University regulations require that all travel for the course is in university vehicles. You cannot drive your own vehicle to field camp. Drivers of university vehicles must operate the vehicles cautiously and safely at all times. Only drivers in the UW motor pool system may drive a university vehicle.

Your safety during field camping working hours and recreation time is your own responsibility. If you are concerned about your safety at any time, you have the right to choose not to participate in that activity, but are required to notify the staff immediately.

**Physical/dietary requirements -**

Please inform the field camp directors or any physical requirements, or risks related to any physical or dietary needs or requirements you have. If you have dietary requirements, please inform the camp cook and director as soon as possible. We will do our best to accommodate your needs, but beware that our campsites are primitive with no nearby grocery stores to supply from.

**Equipment for the course-**

Personal equipment

* sleeping bag (good to freezing temperatures)
* sleeping pad or air mattress (no cots)
* small tent (can be shared) w/ ground sheet
* sturdy, ankle high hiking boots (tennis shoes are not adequate) – be sure to break these in before camp!
* après field shoes (old tennis shoes, Tevas, crocs, etc)
* 2-3 pairs of good hiking socks
* long pants
* shorts
* 2-3 long-sleeved shirts
* underwear
* warm jacket, knit hat, mittens or gloves
* rain jacket or rain poncho
* rain pants
* day pack (large enough to hold your water bottles, lunch, extra layers, etc.)
* belt (for Brunton compass cases and rock hammer)
* whistle
* pocket knife
* small first aid kit
* at least 3, 1 liter water bottles
* sun hat
* sunscreen (if you are VERY sun sensitive, bring light cotton garden gloves)
* lip balm
* insect repellent
* sunglasses (for safety and sun protection)
* toiletries
* personal medications (min 3 week supply)
* small towel
* solar shower (can be shared)
* swim suit (if you want to dip into a hot spring, lake or river)
* bandana or light cotton scarf
* small flashlight or headlamp, extra batteries
* quarters/dollar bills for laundry (we will stop for laundry in Bishop a couple times during the 3 weeks in CA; soap provided)

field equipment

0.5mm pencils (mechanical are best)

eraser

assorted color pencils

plastic ruler and protractor

very-fine felt pen (black) to ink office copy maps and cross-sections

grain size card

stereonet + tracing paper overlays

(recommended)

inexpensive watch w/ alarm - you are responsible for meeting the group on time, and cell phones cannot always be charged

calculator with trig functions

camera

we will provide –

hand lens (10x), rock hammer, acid bottle + acid, field notebook, compass, map board and all maps + overlays

**Gear checkout-**

All field mapping supplies required for the course is available for you to borrow. You must return all items at the end of the course, or you will be charged the following –

|  |  |
| --- | --- |
| Brunton compass | 425$ |
| GPS | 130$ |
| Hand lens | 25$ |
| Map board | 35$ |

In addition, you are responsible for the cost of repair of these items. For example, a broken Brunton mirror is $30.

**Payment of Fees:**

Fees are due to UW before June 29, 2019 (last day of field camp). If you postpone paying your fees waiting for financial aid, be warned that you assigned grade will be ‘incomplete’ until all fees are paid. There can be no exception to this rule.