

Field Methods of Geophysics and Hydrogeology

**GEOL 4376 and GEOP (ESCI) 5356
(in the future will be GEOP/ ESCI 4350)**

Meets: Maymester 2019, May 20, 2019 to June 8, 2019

Instructors: a multi-disciplinary faculty team from GEOL, GEOP and ESCI
Dr. Marianne Karplus, Dr. Hugo Gutierrez, Dr. Aaron Velasco, and Dr. Lin Ma

Please note that an organizational meeting will be held on May 8, 2019 to discuss field trips/field work.

Objective:

This course is the second part of your “capstone” class in Geology. It is where you bring together everything you have learned in your time as a major and apply it to solving problems in the field. We will be building on the skills you learned during Field Camp 1 and in all of your other classes.

This class will provide students with three weeks of field training and guidance to develop practical skills necessary to assess complex hydrologic, geologic and geophysical problems, to then propose, plan, execute and complete a multi-disciplinary field based hydro-geophysical study. An emphasis will be placed on the cross-disciplinary nature of this course and the integration of diverse hydrologic, geophysics and geochemistry tools to investigate a series of earth-system science questions and phenomena that are ubiquitous to many of the most challenging problems in the earth and environmental sciences.

Textbook: none required, although several books and field manuals will be recommended, reading assignments and supplements will be provided and posted on Blackboard

Activities to be conducted and practical skills to be developed:

- Planning a field study (including background research, methods to use for a particular problem or target, temporal and spatial resolution of measurements)
- Writing proposals and estimating costs for a field study
- Conducting the field study – actual data collection
- Processing and analysis of field data
- Integration of field data from several different techniques and disciplines
- Estimating uncertainties in results
- Oral and written presentations of results
- Identification and description of common rocks, minerals, soils, and other geologic materials
- Identification and description of tectonic, volcanic, geomorphic, and other landforms

Ideally (and most importantly), you will learn to operate as a scientist when solving problems: asking questions; making careful observations; thinking critically and quantitatively about those observations; developing multiple working hypotheses; and testing those hypotheses. Part of this will involve working cooperatively and communicating your ideas to others. Most importantly, you must learn to be honest with yourself and **trust your own observations and do your own work.**

Topics to cover under Geophysics and Hydrology field camp

Geophysical field methods:

- 1) Shallow seismic surveying
- 2) Electrical surveying
- 3) Ground-penetrating radar
- 4) GPS surveying
- 5) Gravity & magnetics

Field methods for the study and monitoring of groundwater and surface water, especially for those utilizing geophysical methods:

- 1) aquifer characterization (electrical resistivity (ER), seismic, gravity, hydrogeochemistry (HGCh), Isotope hydrology (IH))
- 2) fluvial and groundwater systems (ER, seismic, HGCh, IH)
- 3) surface-groundwater interactions (ER, seismic, HGCh, IH)
- 4) Bedrock-soil-vegetation interactions (Critical Zone Science)- Note: this has to do with moisture content in those compartments and accessibility to plants. This could also be verified/complemented with spatial analyses correlating underground spatial structures (in 2 or 3D) as revealed by geophysical data, with surface vegetation and topographic structures from aerial surveys (using drones)

POLICY ON CLASS PARTICIPATION: You are expected to come to class prepared and on time, especially on days when we will go to the field. You will be working in groups and your group members will evaluate your contribution/participation in the group as part of your grade in this course.

DISABILITY STATEMENT: If a student has or suspects he/she has a disability and needs an accommodation, he/she should contact the Center for Accommodations and Support Services (CASS) at 747-5148 (voice or TTY), at cass@utep.edu or go to room 106 Union East Building. The student is responsible for presenting to the instructor any CASS accommodation letters and instructions.

MILITARY STATEMENT: If you are a military student with the potential of being called to military service and/or training during the course of the semester, you are encouraged to let us know well in advance.

POLICY ON MAKE-UP WORK: Since this is an intensive 3 week class it will be difficult for you to remain in the course if you miss any day of class. If you have an absence due to illness (doctor's note required) or official University business (prior instructor approval and documentation required) you must work with the instructor to determine how work can be made up. Excessive illness might require you to request a medical withdrawal from the course.

POLICY ON ACADEMIC HONESTY: Academic Dishonesty will not be tolerated. All university guidelines will be strictly followed. Please read these guidelines carefully (<http://www.utep.edu/dos>). If you have any questions regarding the university policy please contact the Dean of Students. Note that a large part of this course will require you to work in groups. Although **reasonable collaboration is allowed** (even

encouraged), **all work you turn in is expected to be your own!** You MUST learn to trust your own observations and NOT rely on the interpretations of others, otherwise you are wasting your time. These three weeks are your opportunity to hone your field skills, so don't cheat yourself by copying the mapping of others. Copying of other's work WILL be noticed and WILL NOT be tolerated.

ASSIGNMENTS: Expect to be working every day of the three-week course, either in the field or in a lab or at home writing reports. We will typically start early in the morning and work until the late afternoon (times TBA). The course will be organized into 3 projects: 1) field work proposal and plans, 2) field work maps and report on data collection, 3) data analysis and final report integrating all stages from planning to final interpretations.

Grading:

Class participation*	10%
Written reports	50%
Oral presentations	30%
Peer evaluation*	10%
Total	100%

Important Dates:

Last day to select pass/fail option:	TBA
Last day to drop class	TBA
Last day of classes	June 8, 2019
Final presentations	June 7, 2019

Schedule = NOTE the schedule is a draft and may change due to weather and other factors.

Sunday	Monday May 20 th	Tuesday	Wednesday	Thursday	Friday	Saturday
	Geophysics & Hydrology	Geophysics & Hydrology	Geophysics & Hydrology	Geophysics & Hydrology	Geophysics & Hydrology	Field planning and proposal discussions
Independent work on proposals (no formal program)	May 27th. Leave El Paso for Bandelier NM	Field Data Collection	Field Data Collection	Field Data Collection	Field Data Collection	Field Data Collection
June 2nd Return to El Paso from Northern NM	Independent work on field reports (no formal program)	Process & interpret data	Process & interpret data	Process & interpret data	Process & interpret data; work on final reports	June 8th. Independent work on field reports (no formal program)

Field Sites and Logistics: Valles Caldera National Preserve. We will camp at Juniper Campground in Bandelier National Monument. **The field camp will be dry. No alcohol will be permitted in the vehicles or in the campground. We will be spending most of our time in Valles Caldera National Preserve and Bandelier National Monument, and you must abide by all local, state, and federal laws in those parks.**

Equipment and Safety Please be prepared when we go outdoors! Wear a hat, drink lots of water. A water bladder helps keep you hydrated, use sunscreen, wear sun-protective clothing, wear appropriate footwear, and be prepared for inclement weather (bring jackets and rain gear).

Among the other items you will need for your field assignments are: **a hand-lens (loupe), a field notebook, pencils/ pens, a metric scale ruler, a protractor, colored pencils, and a calculator.**

Be cognizant of your limits and potential dangers and **do not get yourself into situations where you can injure yourself or others.** For safety, you will typically be working with at least one other person and every group will carry a radio or means of communication. In addition, (optional, but recommended) field trip insurance will be available (at the Department's expense). **Any safety violations (e.g. failure to communicate, abandonment of field partners, etc.) will be dealt with seriously.**

Safety hazards present during Camp include but are not limited to:

- Weather – Be sure to always have drinking water and to stay hydrated. Wear sunscreen and protective clothing to guard against the sun. The sun and low humidity can give you sunburn, sun/heat stroke, and dehydration. Always be prepared for inclement weather (invest in raingear) – getting soaked to the skin in wintertime is a great way to get hypothermia. The temperatures will be cooler (possibility of snow even) in northern New Mexico, so be prepared.
- Terrain – Invest in sturdy walking shoes (and break them in before field camp) to save your feet and legs from injury. Maintain situational awareness of where you are walking and be aware if someone might be downslope from you in the path of rocks you may cause to fall. Be careful around steep and/or unstable slopes where there is a danger of falling, and do not go somewhere if you are not comfortable with the terrain. Never roll or throw rocks downhill or do anything else that can cause a danger to yourself others while in the field for this class – **if you are caught doing something egregiously stupid and dangerous, you will be immediately and automatically excused from the course with an F and sent home.**

Vegetation and critters – There are many spiky, prickly plants out there. Otherwise, it is unlikely that you will have many wildlife encounters. Snakes exist in the desert, and are normally present in the early mornings and late afternoons. Some poisonous arthropods, including scorpions are out there, too. So, always be careful of where you put your hands and feet! If you encounter a snake, stay calm and move away from it carefully. If you are bitten by something that might be poisonous, call for help immediately. Bees are present in numbers at some places – be careful if you are allergic to stings (inform the instructors if this is the case and always carry any needed medications). There are prairie dogs in Valles Caldera that could carry disease. Please be careful and do not touch prairie dogs or their dens. Other animals you might see include javelina and coyotes. Be very careful if you encounter either of these – avoid interacting with them and move away from the area where you see them and communicate with the rest of the group to make them aware of the animals. We will need to be very careful to place all food and scented products in bear boxes at the campground. **Do not keep these in your tent at night!**

Talk to the instructors if you have any concerns about field equipment or working in the field, especially in terms of safety. In particular the instructors need to know about any physical disability or condition that may affect your ability to work outside.