

## Field Geology II: Geology, Geophysics, and Hydrology Field Camp

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### GEOL 4376, GEOP 4350, and GEOL 5315

Meets: Maymester 2022, May 16, 2022 to June 5, 2022

Instructors: a multi-disciplinary faculty team from GEOL, GEOP and ESCI

Dr. Jose Hurtado, Dr. Marianne Karplus, and Dr. Lin Ma

An organizational meeting will be held during finals week (May 9-13) 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 two weeks of field training and guidance to develop practical skills necessary to address complex geologic, hydrogeologic, and geophysical problems, and to collect and analyze multi-disciplinary field geologic, hydrogeologic, and geophysical data. An emphasis will be placed on the cross-disciplinary nature of this course and the integration of diverse geologic, hydrogeologic, 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:**

- 1 Use a topographic map for navigation and recording of geologic data.
- 2 Construct and use topographic maps, topographic profiles, stratigraphic columns, and geologic maps.
- 3 Use a Brunton compass for navigation and for measuring geologic structures.
- 4 Use (digital) maps and aerial imagery in the field.
- 5 Keep an organized and complete field book.
- 6 Visualize and interpret geologic data and relationships in three-dimensions.
- 7 Understand groundwater systems using geologic, hydrogeologic, and geophysical methods.
- 8 Collect field hydrogeologic and geophysical data.
- 9 Process field hydrogeologic and geophysical data.
- 10 Interpret and integrate multi-disciplinary datasets and report results and interpretations.
- 11 Estimate uncertainties in results.
- 12 Present research results orally and as written reports.

**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 in the Geology component of the field camp**

1. Rock and mineral identification and description in the field, with an emphasis on volcanic rocks.
2. Description and analysis of outcrops and field relationships.
3. Definition of rock units and tracing contacts between units.
4. Identification and analysis of faults and other structures.
5. Use of field relationships and stratigraphy to construct a relative sequence of geologic events.
6. Use of field relationships to construct a geologic map and accompanying geologic cross-section.
7. Formulation and testing of multiple working hypotheses.
8. Flexible planning and execution of traverse plans.
9. Relating surface geology to subsurface hypotheses and data, including geophysics.

### **Topics to cover in the Geophysics and Hydrology components of the field camp**

Geophysical field methods:

- 1) Shallow seismic surveying
- 2) Electrical resistivity surveying (ER)
- 3) Ground-penetrating radar (GPR)
- 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:** Expect to be working every day of the three-week course, either in the field or in a lab or at home writing reports. 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 participation will be 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](mailto: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.

**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.** On field days, we will typically start early in the morning and work until the late afternoon (times TBA). The course assessment will be organized into 3 projects: (1) field research proposal; (2) mapping project and field report from geological and geophysical surveys near Flagstaff, AZ; (3) data processing, analysis, and interpretation presented in a final report integrating geological, hydrogeological, and geophysical data.

**Grading:**

Class participation*	20%
Written reports	60%
Oral presentations	20%
Total	100%

Important Dates:

Last day to select pass/fail option	***
Last day to drop class	***
Final presentations	Friday, June 3, 2022
Last day of classes	Sunday, June 5, 2022

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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	May 16th. Intro to Field Geology II (@ UTEP)	Cristo Rey Field Mapping	Hydrology and Geophysics Field Teaching	Hydrology and Geophysics Field Teaching	Research proposals for Flagstaff, AZ (@ UTEP)	Work on research proposals
<b>Research Proposals due 5pm</b>	May 23rd. Geotour to Flagstaff, AZ!	TBA around Flagstaff	TBA around Flagstaff	TBA around Flagstaff	TBA around Flagstaff	TBA around Flagstaff
TBA around Flagstaff	May 30th. Memorial Day! Geotour, return to El Paso, TX	Day on your own to work on mapping project and field report.	<b>Mapping project and field report due</b> Process & interpret hydro-geophysics data	Process & interpret hydro-geophysics data	Process & interpret hydro-geophysics data; <b>Final presentations due</b>	Work on final hydro-geophysics reports.
<b>Final</b>	<i>Have a great</i>					

hydro-geophysics report due 5pm	<i>summer!</i>					
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**Field Sites and Logistics:** Field site outside of El Paso, TX area will be Flagstaff, AZ and areas nearby. We are planning to stay in the Northern Arizona University dormitories.

**Equipment and Safety Please be prepared when we go outdoors! Wear a hat, drink lots of water.** A water bladder/ bottle 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, 1-cm grid graph paper, sharp mechanical pencils, fine-tipped ink pens, a metric scale ruler, a protractor, colored pencils, and a calculator.**

**Geologic maps will be prepared digitally. You will need to use a portable device in the field (cell phone or tablet) and Strabospot software (both iOS and Android are supported; download from the app store for free and also make a free account at strabospot.org) to collect data. Data will be compiled using QGIS software on your own laptop computers. If you do not have a device or laptop of your own, contact Dr. Hurtado ASAP.**

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 other 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, hat, sunglasses 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.
- 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 and others while in the field for this class.

**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). 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.

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.