

## Field Geology II: Water in the El Paso Region

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### GEOL 4376 and GEOP (ESCI) 5315

Meets: Maymester 2021, May 17, 2021 to June 6, 2021

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

Dr. Jason Ricketts, Dr. Marianne Karplus, and Dr. Lin Ma with guest instructors: Dr. Mark Engle, Dr. Hugo Gutierrez

TAs: Jessica Kelsch and Eddie Zuniga

Please note that an organizational meeting will be held on Wed., May 12 at 12pm to discuss field trips/field work.

#### **Objective:**

**This course is the second part of your “capstone” class in Geology or Environmental Sciences. 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 address complex earth science problems, and to collect and analyze multi-disciplinary field 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, geologic maps, and geologic cross-sections.
- 3 Use a Brunton compass for navigation and for measuring geologic structures.
- 4 Use (digital) maps and aerial imagery in the field.
- 5 Digitize mapping in QGIS.
- 6 Keep an organized and complete field book.
- 7 Visualize and interpret geologic data and relationships in three-dimensions.
- 8 Understand groundwater systems using geologic, hydrogeologic, and geophysical methods.
- 9 Collect field hydrogeologic and geophysical data.
- 10 Process field hydrogeologic and geophysical data and build a groundwater flow model.
- 11 Interpret and integrate multi-disciplinary datasets and report results and interpretations.
- 12 Estimate uncertainties in results.

13 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 under Geophysics and Hydrology 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)
- 2) Surface water and groundwater systems (ER, seismic, HGCh, IH)
- 3) Surface-groundwater interactions (ER, seismic, HGCh, IH)
- 4) Groundwater flow models
- 5) Bedrock-soil-vegetation (crops) 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

**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 afternoon (times TBA). The course will be organized into 3 projects: 1) geologic field mapping at Cristo Rey, 2) field report from hydrogeological and geophysical surveys at Rio Bosque and Tornillo pecan orchard, 3) data processing, analysis, and interpretation presented in a final report integrating hydrogeological and geophysical data.

**Grading:**

Class participation*	20%
Weekly projects	60%
Oral presentations	20%
Total	100%

Important Dates:

Last day to select pass/fail option:	***
Last day to drop class	***
Final presentations	Friday, June 4, 2021
Last day of classes	Sunday, June 6, 2021

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

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	5/17 - Intro to Field Geology II	5/18 - Cristo Rey Field Mapping	5/19 - Cristo Rey Field Mapping	5/20 - Cristo Rey Field Mapping	5/21 - Cristo Rey Field Mapping	5/22 - Work on mapping projects
<b>5/23 - Mapping projects due 5pm</b>	5/24 - Intro to Hydrogeology and Geophysics concepts and techniques	5/25 - Hydro-geophysics at Rio Bosque	5/26 - Hydro-geophysics at Rio Bosque	5/27 - Hydro-geophysics at Tornillo pecan field	5/28 - Hydro-geophysics at Tornillo pecan field	5/29 - Work on hydro-geophysics field reports
<b>5/30 - Hydro-geophysics field data and reports due 5pm</b>	5/31 - Memorial Day! <i>Optional</i> field geotour to Cloudcroft, NM.	6/1 - Process & interpret hydro-geophysics data	6/2 - Process & interpret hydro-geophysics data	6/3 - Process & interpret hydro-geophysics data	6/4 - Process & interpret hydro-geophysics data; <b>Final presentations due</b>	6/5- Work on final hydro-geophysics reports.
<b>6/6 - Final hydro-geophysics report due 5pm</b>	<i>Have a great summer!</i>					

**Field Sites and Logistics:** All field work will be day trips from El Paso. Field sites include: Cristo Rey, Rio Bosque Wetlands, Tornillo pecan orchard, and optional Cloudcroft, New Mexico.

**Equipment and Safety Please be prepared when we go outdoors! Wear a hat, bring and drink several liters 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.

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.**

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, and may include being excused from the remainder of the course.**

**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 others while in the field for this class.

**Vegetation and critters** – Snakes are present in the desert and are normally active in the early morning and late afternoon. 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.