

Introduction to Geophysics
GEOP 3320 (3 credit hours)
Spring 2020

Instructor contact information:

Dr. Marianne Karplus	Dr. Julien Chaput
Office: Geology Building 317	Office: Geology Building 207
Office hours: by appointment	Office hours: by appointment
Email: mkarplus@utep.edu	Email: jachaput@utep.edu
Phone: 915-747-5413	Phone: 915-747-8160

Class Times: MW 3-4:20PM, plus several required field labs will be scheduled during the semester

Recommended Textbook: There will be selected reading assignments posted weekly in Blackboard, but students are also advised to purchase or borrow from the instructors or library: Burger, Sheehan, Jones (2006) *Introduction to Applied Geophysics*, 1st edition, WW Norton & Company, Inc.

Prerequisite: GEOL 3312 Geological Processes, or permission of instructors. **Talk to the instructors if you aren't sure you have the background.**

Course Description: This is a broad introduction to geophysical methods with an emphasis on developing an intuitive grasp of data and its relationship to complex underlying structure. Students will collect, process, and interpret data, design surveys, and learn what information each method can provide and with inherent limitations.

Learning Outcomes: By the end of the course successful students will be able to use a variety of geophysical methods to solve basic exploration problems in the geosciences and environmental sciences. They will furthermore learn to understand fundamental relationships observable in various types of data sets, and develop quantitative skills relevant to their depiction.

Tentative Course Schedule (subject to change):

WEEK	TOPIC
1: 1/20 Both	Introduction: Syllabus, office hours, student surveys, What is geophysics? Why are you here?
2: 1/27 JC	Intro to Waves and Matlab The solid earth, wavefields, basic signal processing. Lab: Can you matlab?
3: 2/3 JC	Learning to listen: Passive seismology. Earthquakes and other discrete events. Lab: Finding some icequakes on a volcano.
4: 2/10 JC	Continuous processes: Wind, ocean waves, and ... GPS satellites? Lab: How does your phone find satellites in orbit?

5: 2/17 MK	Refraction seismology: Snell's law, travel paths, amplitudes, velocities, computer modeling first arrivals for various velocity models; Lab: Possible field trip 2/19 2-5PM or 2/21 9-12 or 2/21 1-4 to perform a hammer seismic survey in Sunland Park, NM.
6: 2/24 MK	Reflection seismology: reflection, impedance contrasts, common midpoint stacking, velocities, normal moveout, designing a survey for different scales Lab: Processing and interpreting hammer seismic data
7: 3/2 SUB 3/2 MK	Reflection seismology: interpretation of seismic reflection and refraction data Lab: Interpreting seismic reflection data
8: 3/9 Both	Tentative: Review of seismology concepts; Midterm Exam
3/16	SPRING BREAK ☺
9: 3/23 JC	Gravity method: introduction to the Earth's gravitational field and how it is used to map changes in density in the subsurface. Lab: to collect gravity data on campus
10: 3/30 JC	Gravity method: processing of gravity data, gravimeters, accuracy and precision, applications of the gravity method and 2- and 3-D modeling – lab will include group analysis of a data set with basic computer modeling Lab: Possible field trip 4/1 2-5PM or 4/3 9-12 or 4/3 1-4 to perform a gravity and magnetics survey in Sunland Park, NM.
11: 4/6 MK	Magnetic method: introduction to the Earth's magnetic field and its general properties. How it can be used to map changes in the subsurface. Lab: Processing and interpreting gravity and magnetics data
12: 4/13 MK	Magnetic method: processing and interpretation of magnetics data. Paleomagnetism, applications and interpretation, impact on the use of magnetic data to interpret subsurface lithology.
13: 4/20 MK	Electrical methods: introduction to the various electrical methods and properties of rocks they measure, design of Resistivity, conductivity, and GPR surveys
14: 4/27 MK	Electrical methods: GPR and processing and interpretation of resistivity/conductivity data
15: 5/4 BOTH	Integration of Geophysical methods —discussion of how the methods can be used together to provide support for individual interpretations and how to combine multiple types of data into a single model
5/11	Final project over the field site where the data was collected will be due during Final's week

Grades:

Quizzes and exams: 25%

Homework and Lab reports: 50%

Final project: 25%

Course Procedures:

Students are expected to take an active role in the class meetings. **Computer and Internet use outside of class are absolutely required for this class.** Students need to have their free UTEP email account activated for this course, and they need to check it regularly.

Process:

Students must check Blackboard at least every other day to make sure they have the latest assignments and information.

This course will be a combination of lectures and labs. A large amount of your learning comes from collecting data in the field or working with datasets in the computer lab and asking questions. You will be learning some computer programming skills, and we will use several different software packages. Remember that when you run into computer or software issues, Googling and checking the software manual can be extremely helpful! We will schedule several extended labs or Friday/ weekend times to collect data during the semester.

Before each class:

- * Read the assigned materials--make sure you have done this *before* class
- * Identify concepts that are central to understanding the topics to be discussed
- * Prepare a list of questions from the reading or previous classes for which you need further clarification and submit them before class begins

During each class:

- * There will sometimes be quizzes and activities throughout the class
- * Take careful notes
- * Be an active participant—including all classroom activities and discussions.

POLICY ON CLASS PARTICIPATION: You are expected to come to class prepared to discuss the assigned topic. You should have a good understanding of the reading and bring a calculator, ruler, and paper to use during class. Arriving late for class and/or coming unprepared may reduce your grade for the class.

DISABILITY STATEMENT: If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at www.sa.utep.edu/cass.

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 me know well in advance.

POLICY ON MAKE-UP EXAMINATIONS: **NO** make-up exams will be given for reasons other than serious illness, absence with the instructor's prior approval, or when a student is on official University business. There are no make ups for quizzes or in class activities unless arrangements are made in advance. If you arrive late and miss something, it is your responsibility to get the information or assignment on your own.

POLICY ON ACADEMIC HONESTY: Students are expected to conduct themselves in a professional and courteous manner, as prescribed by the Standards of Conduct. Students may discuss work assignments and programming exercises in a general way with other students, but the solutions must be done independently. Similarly, groups may discuss group project assignments with other groups, but the solutions must be done by the group itself. Graded work should be unmistakably your own. You may not transcribe or copy a solution taken from another person, book, or other source, e.g., a web page. Professors are required to -- and will -- report academic dishonesty and any other violation of the Standards of Conduct to the Dean of Students.