GEOL 3005: Principles of Geophysics

Fall 2017, 4 units

Meeting Times: MWF 9:00- 9:50 AM, / Labs: Tu 11 – 12:50, Th 11 – 12:50/1:10 – 3
Meeting Location: *Class* Classroom Building CR215 *Lab* ESB1006, -or- at 9th/Ivinson

Instructors: Prof. Andrew Parsekian

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Course description:

The goal of this course is to introduce you to the properties and processes of the physical Earth. Topics to be covered include seismology, electrical and electromagnetic methods, gravity, magnetism, heat flow, and plate tectonics. We will take a largely practical approach, using hands-on data acquisition with modern geophysical instruments as a means to convey geophysical methods.

Intended learning outcomes:

Upon completion of this course, students will be able to:

1. communicate geophysical concepts with acceptable precision and accuracy;
2. explain fundamental concepts underling common exploration geophysics methods;
3. describe the Earth processes related to several large-scale geophysical phenomena;
4. work through common geophysical problems using computer-based mathematical tools;
5. describe the core field practices associated with geophysical measurements.

Lectures:

Lectures for this class are recorded in advance for you to listen to prior to class in conjunction with the assigned reading. The philosophy of the lectures will not be to cover every single detail of the material or textbook, but rather to (1) convey key concepts, (2) supplement the textbook with interesting examples from our experience, and (3) establish the theory behind the instruments you'll be using in the labs. A short quiz based on the lecture and reading is required to be completed on WyoCourses before the beginning of each class. You will be invited to ask questions on the lecture at the beginning of each class meeting.

Team Based Learning:

At the beginning of the semester, each student will be assigned to a small team that they will work with for the duration of the course. In-class exercises will be completed and graded as a team. In most meeting periods, you will have >40 min to work on the team activity; you need to get to work immediately and work efficiently because the exercises are designed to fill this time. Still, you may not always get to finish the work – you are not penalized for incomplete team activities *as long as you have shown a concerted, reasonable effort to make progress*. You must submit the team activity at the end of each class period. These are essential for the instructor and TA to gauge progress towards mastery of the material. As long as you have made a concerted, reasonable effort to complete the exercises, your grade will be based on correct use of **units** and **significant figures** only. The grade will be on a 0 to 2 point scale:

- 2 points: no substantial errors
- 1 point: good effort, but units are missing or sig. figs are incorrect.
- 0 points: insufficient progress made, all units missing, sig figs not used correctly.

I will randomly draw one person's worksheet from the group to grade; everyone in the group will receive the same grade based on the randomly selected sheet. Grades are only awarded to those who hand in the exercise sheet by the end of the class period. It is not possible to get points anytime after the class period, though you are welcome to work through missed assignments for your own benefit.

To alleviate any concern with variable effort of team members given that a random submission will be chosen for grading, you will complete a peer-evaluation at the end of the semester. The rankings calculated from that evaluation will be used as to individually weight the Team Exercises portion of your grade (see *Grades* below for details).

Labs:

The two-hour labs will alternate between field use of geophysical equipment and computer-based analysis of those data. At UW we are fortunate to have a world-class facility of geophysical equipment, including seismic, resistivity, ground-penetrating radar, magnetometers, gravimeters, and electromagnetic induction instruments. You'll learn to use all of them, and to analyze the data from them. We think you'll enjoy this hands-on approach to geophysics. Due to weather restrictions, we will likely front-load the semester with outdoor data acquisition activities, so there may be several weeks between the acquisition of a data set and its analysis in the lab. (We'll do our best to keep things coordinated.) Be aware that it can be cold in Wyoming even in September or October, so **please dress accordingly**. When we are having field-based labs, we will announce the meeting place in advance (e.g., the Old Main lawn). Do NOT meet in the lab classroom on field days unless otherwise instructed.

Data analysis labs will take place in the computer lab (ESB 1006). Each lab writeup is due one week after the lab, at the beginning of the lab period, e.g. if you have lab on Wednesday afternoon starting at 1pm, you lab is due the next Wednesday that lab is held, at 1pm.

Reading Materials:

The required textbook for this class is *Looking Into the Earth*, by A.E. Mussett and M.A. Khan, published by Cambridge University Press. It is available at the University bookstore and on amazon.com (including as a Kindle e-book). Reading assignments from the book will be given in class; you will be responsible for completing the reading and knowing the material in the assigned chapters (we will not cover every chapter in the book).

In addition, lecture notes and supplementary reading materials may be handed out occasionally. You are responsible for reading all handouts and knowing the material in them, unless otherwise instructed in class.

Course requirements:

Attendance. There is no explicit attendance taken, however you must attend class meetings in order to engage in team exercises that form the core of the course. Lab attendance is mandatory in order to conduct the planned experiments and prepare lab reports.

Missed or Late Work. You will only be able to make up missed quizzes, exams, and homework if you have a valid Authorized Absence (granted by the Dean of Students, according to Unireg 6-713; see http://www.uwyo.edu/dos/absences/). Work turned in late (without prior consent of the instructor) will be docked points at a rate of 10% per day.

Grades. Grading will be on the straight 100%-90% = A/89.9% - 80% = B/79.9% - 70% = C/69.9% - 60% = D/ <59.9% = F scale (that is, no "plus" or "minus" grades). Your grade will be based on four components: quizzes, tests, homework/lab reports, and the final exam. Grades will be weighted in the following proportions:

Quizes	=	10%
Team Exercises	=	10%
Three tests	=	8, 12, 15% of grade
Comprehensive Final	=	20%
Lab work	=	25%

To calculate the final grade, I will tabulate all scores for the class and "curve" the grade relative to the average maximum performance. The average of the top five semester grades will be used as a scaling factor for the rest of the class. For example if the top five grades average out to be a 93.4%, then all grades in the class with have 6.6% added to them.

Quizzes. Quizzes will be completed on WyoCourses before class.

Tests and Final Exam. The three test scores will be weighted according to your performance -- i.e., your lowest score will only count 8%, while your best score will count for 15% of your final grade. Each midterm will only test the material covered since the previous midterm. You may bring one 8.5" x 11" sheet of notes to the final, but you may write notes on only one side of that sheet. There will be no make-up tests during the semester unless you have a University Authorized Absence; if you have to miss a class due to a medical emergency, please contact the instructor as soon as possible.

The final examination will be comprehensive and will be held on December 15, 8am – 10am. Please double-check the date and **make your end-of-semester travel plans accordingly**; no early or make-up final exam will be given without a University excused absence. You will be permitted to bring one 8.5" x 11" sheet of notes to the final, and you may write notes on both sides of that sheet.

Other Information:

Disabilities. If you have a physical, learning, or psychological disability and require accommodations, please let us know as soon as possible. You will need to register with, and provide documentation of your disability to, University Disability Support Services (UDSS) in SEO, Room 330, Knight Hall, 766-6189, TTY: 766-3073.

Students and Teachers Working Together. The College of Arts & Sciences has produced a document called "Students and Teachers Working Together" that describes expectations of both students and faculty regarding such issues as classroom deportment, academic honesty, attendance, office hours, and advising. We encourage you to download this document from the URL listed below and read it carefully.
http://uwadmnweb.uwyo.edu/a&s/Current/2005Stud&TeachersWorking%20Together(7-29-05).doc
Here is the first paragraph of that document, which describes the basic philosophy we will adhere to:

> *"At a good university, good student/teacher relationships come from mutual respect, trust, and honesty. Learning takes place when teachers and students treat each other with politeness and civility, rather than with anger, ridicule, or confrontation. Indeed, a*

classroom conducive to teaching and learning is the right of all University of Wyoming students and faculty, and it is the responsibility of both parties to achieve and maintain it even though specifics will vary from course to course."

Exam Schedule:

- 27 Sept. **Exam 1**
- 25 Oct. **Exam 2**
- 20 Nov. **Exam 3**
- 15 Dec. **Final Exam**