

*Revision F09.01 – 05/17/07*

***The following information is subject to correction and/or change at any time. See Blackboard for the latest information for our course.***

**Instructor**

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Office Hours: Open door policy. Formal hours T,W,R: 1pm-2pm

*We believe. You belong here... And I believe I belong here **to help you**. If you have any questions or problems or issues with our class (or anything else, for that matter), or you just want to drop by and chat – please stop by so I can help!*

**Prerequisite or co-requisite**

PHYS 121 or 201; MATH 147.

*The first semester of College Physics or General Physics is needed as we are going to be applying a number of basic physics concepts. The first semester of Calculus is also needed, though we are going to minimize the theoretical/mathematical discussions as much as possible for this applied course.*

**Required Textbook:**

Looking into the Earth, An Introduction to Geophysical Concepts. Mussett and Khan, Cambridge University Press, 2000. ISBN: 0-521-78574-X

*The textbook has lots of good illustrations and pictures, is easy to read, and contains all the information you need to succeed in this course.*

**Other Required Materials:**

Scientific calculator, safety goggles, field book, and work boots (for lab), pencil/pen, paper.

*You will not be allowed to use cell phones as calculators during quizzes or exams. A decent scientific calculator will be needed to perform some of the exercises. Safety goggles will be a requirement for the lab and if you don't get them from another source, our department sells them for a very nominal cost.*

**Course Description**

Methods of geophysical exploration for natural resources and environmental analysis. Field trips.

*We will be using lectures to cover the foundational concepts of various geophysical methods. The lab periods and field trips will be used to apply our lecture knowledge and gain experience in performing various surveys and in processing/analyzing the resulting data.*

**Course Goals**

This course provides an introduction to geophysical concepts and their application. Throughout the semester, you will:

- Master basic scientific principles and concepts.
- Demonstrate a proficiency in performing field work.

- Learn new problem-solving and thinking skills.
- Understand the nature of scientific inquiry from the perspective of hands-on experience.
- Be exposed to various applied geophysical techniques.

*The goal is not to make you experts in geophysics, but to give you a basic understanding of the concepts and provide field and data analysis experience.*

### Course Outline

1. Introduction
2. Data Acquisition and Processing
  - 2.1. Terminology
  - 2.2. General Process
    - 2.2.1. Data Acquisition
    - 2.2.2. Data Reduction
    - 2.2.3. Noise Reduction
    - 2.2.4. Filtering (Signal Processing)
    - 2.2.5. Modeling
    - 2.2.6. Interpretation
    - 2.2.7. Presentation
3. Seismic Methods
  - 3.1. Waves and Rays Review
  - 3.2. Earth Structure Review
  - 3.3. Refraction Seismology
  - 3.4. Reflection Seismology
4. Gravity Methods
  - 4.1. Basic Physics Review
  - 4.2. Tools
  - 4.3. Analysis
  - 4.4. Microgravity Surveys
  - 4.5. Isostasy Review
  - 4.6. Large Scale Issues
5. Magnetism Methods
  - 5.1. Basic Physics Review
  - 5.2. Earth's Magnetic Field
  - 5.3. Rock Magnetism
  - 5.4. Mineral Magnetism
  - 5.5. Surveying
6. Electrical Methods
  - 6.1. Basic Physics Review
  - 6.2. Resistivity
  - 6.3. IP
  - 6.4. Self-Potential (SP)
  - 6.5. E-M
    - 6.5.1. Basic Concepts
    - 6.5.2. General Methods
    - 6.5.3. GPR
7. Subsurface Methods
  - 7.1. Drilling Overview
  - 7.2. Orientation Logs (Dipmeter, photclinometer, caliper)
  - 7.3. SP
  - 7.4. Resistivity / Induction

- 7.5. Radioactive
  - 7.5.1. Gamma Logs
  - 7.5.2. Neutron Logs
- 7.6. Sonic
- 7.7. Temperature
- 7.8. Cross-Plotting
- 7.9. Magnetic
- 7.10. Induced Polarization
- 7.11. Cross-hole Tomography
- 7.12. Non-borehole techniques

**Course Communication**

Access *Blackboard* at <https://blackboard.olivet.edu> for course information.

*Blackboard is extensively used (and updated regularly) in this course. While some materials will be handed out during class (like this copy of the syllabus), look to Blackboard for a complete collection of material and the latest updates and revisions. A copy of all lecture materials, updated schedules, grades, other course materials, and links to useful external websites will be primarily provided on Blackboard. Some assignments/quizzes/exams will only be provided on Blackboard. Important course announcements will be posted on Blackboard (and sent via email).*

**Attendance Policy**

*It is important that you attend all lectures and labs to get the most out of this course. The attendance policy in this course is established according to the policies of the university. Except in the case of educational leniency, work is not usually eligible for make up. Work turned in late will be dropped in point value. In the case of educational leniency, the student is to inform the instructor *via email* and make any required arrangements before the absence. *Assignments and exams missed due to educational leniency must be taken before the scheduled date of the quiz.**

*Attending the lectures is for your benefit and the expectation is that you will attend all lectures and lab periods. You need to attend all labs as there will be no make-up opportunity. Course material and other information will be provided during those times that may not be communicated / available elsewhere. Please be on-time for each lecture to minimize disruption to the rest of the class.*

**Course Structure:**

- Lecture:* Wednesdays, 2pm to 3pm, Room 210 Reed Hall
- Lab:* Tuesdays from 1pm to 3pm, Room 210 Reed Hall
- Field Trip:* A field trip will be scheduled for late in the semester, as weather dictates.
- Final Examination:* Monday, December 10<sup>th</sup> from 7:30am to 9:20am. University policy states that no deviations from the Final Examination Schedule will be allowed.

**Assesment**

10	Homework Assignments	50	points each	500
5	Field/Labs Reports	50	points each	250
2	Article Reviews	50	points each	100
2	Exams	75	points each	150
TOTAL POINTS =				<b>1000</b>

### Homework Assignments

Ten sets of problems from your textbook will be assigned, collected, and graded. Homework turned in late will be assessed a penalty of 10% per late week-day (i.e., one point per week-day late). The assigned problems, due dates, and submittal rules are posted on *Blackboard*.

*Problem solving is an important aspect of physical science. By working through problems, you can learn important concepts that memorization cannot yield. The problems that are assigned represent only a small portion of the work that may be necessary to be successful in this course. Therefore, each student is encouraged to attempt problems that were not assigned.*

### Field/Lab Reports:

You will be required to keep a details lab/field notebook, as well as write-up your lab/field exercises / data analysis / data interpretation. Specific requirements will be given in-class at the time of assignment.

*It is important that you keep good records of what you did / measured at each lab.*

### Article Reviews:

Over the course of the semester, you will be required to write two article reviews. The article will be from a scientific journal on a topic related to our class. See *Blackboard* for specifics and helps.

*Communication in science is as important as in other non-scientific disciplines. As we will learn in class, written communication is an integral part of how science advances. These reviews will give you a glimpse into the depth, breadth, and variety of scientific publications. Since your performance with each review is weighted similar to an exam, it is important that you plan your work to allow adequate time to read, think, write, and re-write your reviews – Don't wait till the day before the reviews are due to start the assignment!*

### Exams:

There will be 2 take-home exams; each is worth 75 points each. Study guides/objectives will be posted on *Blackboard* prior to each exam.

### Extra Credit:

There will be **no** extra credit opportunities available.

### Grading Scale

Letter Grade	Percentage	Total Points	Letter Grade	Percentage	Total Points
A	93.3 - 100%	933 – 1000+	C	73.3 – 76.6%	733 - 766
A-	90.0 – 93.2%	900 - 932	C-	70.0 – 73.2%	700 - 732
B+	86.7 – 89.9%	867 - 899	D+	66.7 – 69.9%	667 - 699
B	83.3 – 86.6%	833 - 866	D	63.3 – 66.6%	633 - 666
B-	80.0 – 83.2%	800 - 832	D-	60.0 – 63.2%	600 - 632
C+	76.7 – 79.9%	767 - 799	F	00 – 59.9%	000 - 599