

Environmental Geophysics

Instructor

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<http://www.depauw.edu/acad/geosciences/>

Class

1:40-2:40 pm MWF Julian 226

1:40-3:30 pm Th (LAB) Julian 226

Office Hours

Stop in or by appointment.

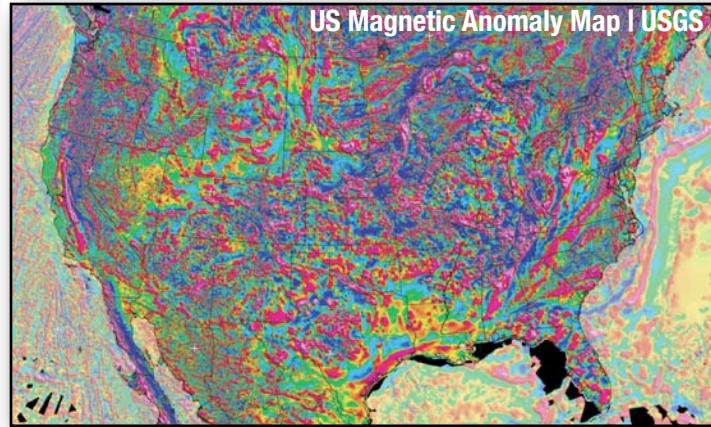
Texts

Introduction to Applied Geophysics,
Burger, Sheehan, & Jones, (Norton, 2006).

Recommended Texts

Basic Exploration Geophysics,
Robinson & Coruh,
(Wiley, 1988).

Available used online (e.g., eBay, Amazon)
and on reserve @ Prevo Library

**Recommended Course Materials**

A pencil (e.g., mech. pencil, 0.5mm, 2H or 2), an eraser, a scientific calculator, a small personal stapler, & a USB flash drive will be needed for this course. Colored pencils, a pen, and a C-Thru™ 6" ruler/protractor combo* also would be useful.

**The Department has some available at cost.*

COURSE GOALS

To develop basic field geophysical skills with an emphasis on the acquisition and interpretation of data from practical field experiments/exercises. Course will include some basic foundation theory to facilitate using various geophysical techniques (e.g., seismic refraction, seismic reflection, ground penetrating radar, electrical resistivity, gravity, magnetics) to solve applied problems in the environmental, resource exploration, geotechnical, and archeology fields. Labs will consist of field experiments/exercises and applied problem sets using computer modeling and interpretation techniques.

Students should leave this course with the ability to...

- 1) select the appropriate geophysical technique(s) for a specific problem,
- 2) understand the strengths and limitations of each geophysical technique,
- 3) develop and implement a basic field survey to acquire geophysical data for some of the most common geophysical techniques, and
- 4) interpret these geophysical data to address applied problems involving the shallow subsurface.

This syllabus is meant to provide an outline for the general flow of the course. At my discretion, I will add or omit topics and/or modify the timetable.

COURSE ORGANIZATION

Class time will be divided between lectures and labs, although the distinction between the two will likely be blurred throughout the semester (in terms of both content and class times; especially dependent on weather and knowledge of background concepts). Lectures typically will involve Apple Keynote computer-based lectures, whereas labs commonly will take the form of field experiments/exercises, applied homework problem sets, and/or simulations using the computer programs that accompany our text. *It is important that you take detailed notes and ask questions about any material that you need clarified.*

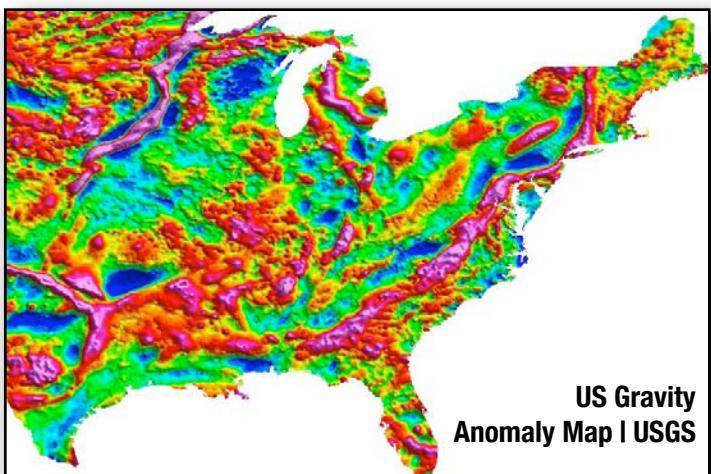
The material in this course is fairly math-intensive, so we will be using Excel spreadsheets throughout the course (if you are not familiar with basic Excel operations and its user interface, you might consult the users manual, try the self-guided tutorials, etc.). We also will be working with the geophysical software packages provided on your textbook CD, and probably Google Earth and Adobe Illustrator to a lesser degree.

Dynamic Excel Tables

Shaded boxes in the chapters provide instructions about working with dynamic tables in Excel in order to develop a deeper understanding of the concepts being covered in that chapter. Please use them while you are reading the chapters.

For our field projects, your final reports will be written following EPA style and format guidelines. Such guidelines not only will help hone your writing skills as a scientist, but also will provide you with applied experience in organizing and preparing reports in the standard format most commonly used in the environmental field.

Cell phones should not be used during class (i.e., no text messaging; *you may certainly answer emergency calls*). Laptops should be used for classroom purposes only (not to surf the Internet, chat with friends, or check email). You also may use the Geosciences Mac computer lab.



GRADES

Final grades will be based on the assignments shown in the table below. All materials to be turned in for a grade must be clearly written/typed and stapled; late/messy/unstapled assignments will not be accepted and will receive a "0". Extensions will not be given unless there is a documented emergency or unless we have arranged an extension in advance because of exceptional circumstances.

Note that grades are based on a weighted average, not a straight average based on points. I calculate your grades automatically and can provide you up-to-date information on your grades at any time. It is important not to wait until the last month of class to become concerned about your grade.

Percent of Final Grade	Grading Scale*
Homeworks	A >90% B 80-89% C 70-79% D 60-69% F <60%
Field Reports (<i>must be present in field</i>)	
Midterm Exam	
Final Exam	

*I reserve the right to adjust the grading scale up slightly (benefitting you!), if warranted by the class grade distribution.

ACADEMIC INTEGRITY

Any attempt to gain an unfair advantage over other students in the class will be handled in accordance with established University procedures as described in the Academic Handbook:

Academic Handbook section on Academic Dishonesty:
[http://www.depauw.edu/univ/handbooks/dpubhandbooks.asp?
ID=101&parentid=100](http://www.depauw.edu/univ/handbooks/dpubhandbooks.asp?ID=101&parentid=100)

Note: From the section on Types of Academic Dishonesty,
"Students are responsible for knowing the academic integrity policy and may not use ignorance of the policy as an excuse for dishonesty."

Writing Center Information Regarding Plagiarism:
<http://www.depauw.edu/admin/arc/Wcenter/plag.asp>

ATTENDANCE

Attendance (and participation) is required and will be monitored.

Excused Absences

Should you know that you will be absent (e.g., health issue regarding yourself or immediate family, athletic obligation, etc.), please contact me BEFORE class to make arrangements about assignments/exams/field activities. **If you are ill, please do not come to class (wait until you are without a fever for 24 hrs without medication).**

Excessive Absences

Should you miss more than 2 weeks of class (for any reason, excused or unexcused), you can (and likely will) be dropped from the course in accordance with procedures described in the Academic Handbook (unless there is an exceptional, well-documented reason not to do so, as determined in consultation with the Office of Academic Affairs).

Academic Handbook section on Attendance:
[http://www.depauw.edu/univ/handbooks/dpubhandbooks.asp?
ID=114&parentid=518](http://www.depauw.edu/univ/handbooks/dpubhandbooks.asp?ID=114&parentid=518)

SELECTED LIST OF OTHER USEFUL BOOKS: (also see <http://libguides.depauw.edu/geosciences>)

Books on Geophysics

- Anstey, N.A., 1982, Simple Seismics, International Human Resources Development Corp, 168 pages.
- Badley, M.E., 1985, Practical Seismic Interpretation, International Human Resources Development Corp, 266 pages.
- Bolt, B.A., 1982, Inside the Earth, W.H. Freeman & Company, 191 pages.
- Dobrin, M.B., 1952, Introduction to Geophysical Prospecting, McGraw-Hill, 435 pages.
- Ferguson, J., 1987, Mathematics in Geology, Allen & Unwin, 299 pages.
- Haeni, F.P., 1988, Chapter D2: Application of Seismic-Refraction Techniques to Hydrologic Studies, Techniques of Water-Resources Investigations of the USGS, 86 pages.
- Kearey, P., and Brooks, M., 1984, An Introduction to Geophysical Exploration, Blackwell Scientific Publications, 296 pages.
- Sharma, P.V., 1986, Geophysical Methods in Geology, Elsevier, 442 pages.
- Sjögren, B., 1984, Shallow Refraction Seismics, Chapman & Hall, 268 pages.
- Slotnick, M. M., 1959, Lessons in Seismic Computing, SEG, 268 pages.
- Stover, C.W., and Coffman, J.L., 1993, Seismicity of the United States, 1568-1989 (Revised), USGS Professional Paper 1527.
- Telford, W.M., Geldart, L.P., and Sheriff, R.E., 1990, Applied Geophysics (2nd Edition), Cambridge Univ. Press, 770 pages.
- Waltham, D., 1994, Mathematics: A Simple Tool for Geologists, Chapman & Hall, 189 pages.
- Waters, K.H., 1981, Reflection Seismology: A Tool for Energy Resource Exploration, John Wiley, 453 pages.
- Wheeler, R.L., Rhea, S., and Tarr, A.C., 1994, Elements of Infrastructure and Seismic Hazard in the Central United States, USGS Professional Paper 1538-M.

Books on geologic report writing

- Copeland, P., 2012, Communicating Rocks, Pearson, 149 pages.

Feedback:

I usually need at minimum of a week to return work (perhaps longer for large assignments). I try to write detailed comments on the papers that I return to you. I will "go over" graded materials with you as needed. Please ask questions in class or stop by my office if a concept is not clear or if you have a question on how I graded your work.

Additionally, you need to give me feedback about how the course is going. It is important that you "rein me in" if I go too fast or if I haven't explained something well enough. **Ask questions!!!**

ORDER OF TOPICS

Week Starting	Lecture & Lab Topics (Last Day to Withdraw 10/28)	Reading
1: 8/22	Syllabus/Course Organization Introduction to Geophysics Seismic Waves	Chapter 1 Chapter 2
2: 8/29	Seismic Waves	Chapter 2
3: 9/5	Seismic Refraction	Chapter 3
4: 9/12	Seismic Refraction	Chapter 3
5: 9/19	Seismic Refraction	Chapter 3
6: 9/26	Seismic Reflection	Chapter 4
7: 10/3	Seismic Reflection	Chapter 4
8: 10/10	Ground Penetrating Radar Midterm Exam GSA Annual Meeting (10/9-10/12)	Chapter 4
9: 10/17	Fall Break (10/15-10/23)	
10: 10/24	Ground Penetrating Radar	Chapter 8
11: 10/31	Magnetics	Chapter 7
12: 11/7	Magnetics	Chapter 7
13: 11/14	Electrical Resistivity	Chapter 5
14: 11/21	Electrical Resistivity Thanksgiving Break (11/23-11/27)	Chapter 5
15: 11/28	Gravity	Chapter 6
16: 12/5	Gravity	Chapter 6
Final Exam: Fri, Dec 16, 8:30-11:30 am, Rm 226, Julian Science & Mathematics Center		
Note: These topics and times are subject to change (especially wrt weather conditions, understanding of basic theory, and equipment availability).		
All students who are 21 years of age are asked to become certified for driving University vehicles. Please visit http://www.depauw.edu/student/safety/driversafety.asp to find out about driver certification classes.		

FAQ:

Are lecture notes from the slides provided? No. Experience has shown that students do better in class when they are engaged in the note-taking process, so I want you to take your own notes during lecture.

Should we copy all the text on the slides? No. It is far better to listen to me and take notes than to copy the slides... Sometimes text on slides is really just to trigger me on a topic and not something to be committed to your notes. In addition, I commonly go more in-depth than what is on the slides, and I expect you to know that detail for the exams.