

HYDROGEOPHYSICS

Course unique number: GEO 391 – 27915
GEO 371C – 27635

Meeting time – 2:00 – 4:00 PM Thursdays in EPS 2.104

Instructors: Jack Holt & Jeff Paine & Jack Sharp

This Fall 2012 graduate/upper level undergraduate course surveys the major geophysical methods that are applied in hydrogeological investigations. The class is intended for hydrogeology, geophysics, or engineering students with an interest in practical interpretations. The class will consist of modules including:

- Use of the Total Station and GPS for precise location of the test site(s)
- Electrical resistivity (ER)
- Ground penetrating radar (GPR)
- Electromagnetic surveying (EM)
- Gravity methods

Each module includes: 1) lecture method theory and its hydrogeological applications (1-3 lecture hours), 2) using the instruments in the field, and 3) analysis of the data, interpretation, and hydrogeological insights. Grades will be based on participation in classes and field exercises, written field exercise summaries, field notebook content, literature reviews, a report on the application of a geophysical method or methods to a hydrogeologic study, and a final report/presentation on the hydrogeology of the site(s). Hopefully, the last will be publishable. Several sites are now under consideration including a cave site (Flint Ridge Cave) and a possible in-filled sinkhole site.

Prerequisites: Graduate standing, undergraduates need permission from one of the faculty. A background in hydrogeology or geophysics is necessary. A background in both fields is ideal.

Text: No text is required, but the students should refer to one of the following texts for general background information. Please note the reading dates in the syllabus

References:

Burger, H.R., 1992, Exploration Geophysics of the Shallow Subsurface: Prentice-Hall, Englewood Cliffs, NJ, 489p.

Dobrin, M.B., 1960, introduction to geophysical prospecting (2nd ed.): McGraw-Hill Book Co., New York, 446p. [*an old "classic"*]

Kirsch, R. (ed.), 2009, Groundwater Geophysics – A Tool for Hydrogeology (2nd ed.): Springer-Verlag, Berlin, 548p.

Rubin, Y., and Hubbard, S.S., (eds.), 2005, Hydrogeophysics: Water Science and Technology Library, Springer, Berlin, v. 50, 523p.

Sharma, P.V., 1997, Environmental and Engineering Geophysics: Cambridge University Press, Cambridge, UK, 475p.

Grading:

Field participation and field reports	40%
Field notebooks	10%
Literature reviews	25%
Individual projects	25%

For more information, contact:

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 Jeff Paine at jeff.paine@beg.utexas.edu, or
 Jack Sharp at jmsharp@jsg.utexas.edu .

WEEK OF:	MODULE	READINGS
Aug, 29	Introduction, requirements Set field trip dates	Kirsch, Ch. 1 Rubin & Hubbard, Ch. 1
Sep. 5		
12	EM Literature review paper	Kirsch, Ch, 4, 5, & 6 Rubin & Hubbard, Ch. 1 Sharma, Ch. 7& 12
19	TOTAL station – GPS Planning field investigations	Kirsch, Ch. 14 Rubin & Hubbard, Ch. 2, 12, 13, & 14 Burger, Ch. 1

26	Gravity Literature review paper	Sharma, Ch. 1 Kirsch, Ch. 11 Burger, Ch. 6 Sharma, Ch. 2
Oct. 3	Seismic refraction Literature review paper	Kirsch, Ch.2 Rubin & Hubbard, Ch. 8 Burger, Ch. 2 & 3 Sharma, Ch. 4
10	Seismic reflection Literature review paper	Rubin & Hubbard, Ch. 9 Burger, Ch.4
17	ER Literature review paper	Kirsch, Ch. 3 Rubin & Hubbard, Ch. 4 & 5 Burger, Ch. 5 Sharma, Ch. 6 & 12
24	GPR Literature review paper	Kirsch, Ch. 7 Rubin & Hubbard, Ch. 7 Sharma, Ch. 8
31	Airborne geophysics Literature review paper	Kirsch, Ch. 5& 6 (again) Rubin & Hubbard, Ch. 1
Nov. 7	<i>No class – GSA</i>	
14	Other methods Literature review paper Individual class report on method (depending upon class size)	Kirsch, Ch. 8. 9. 10 Rubin & Hubbard, Ch. 16 & 17 Burger, Ch. 7
21	Individual class report on method	Rubin & Hubbard, Ch. 3
28	Class final report Arrange for preparation of paper for scientific journal.	
Dec. 5	Class final report Arrange for preparation of paper for scientific journal.	

FIELD TRIP DATES (there will 4 weekend days in the field to be arranged)

Other: (We all know or can infer these but there are UT directives that you are to be informed of the following):

1) *The honor code* (how it applies to each class, and develop a more thorough description of what constitutes acceptable practices in our classrooms.)

“The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity and responsibility. Each member of The University is expected to hold these values through integrity, honest [*sic*], trust, fairness, and respect toward peers and community.”

No plagiarism or copying of others work for tests, term papers, pop quizzes, or laboratory problem sets is acceptable. Plagiarism or copying is subject to dismissal from the class with a zero grade. An explanation of plagiarism can be found at <http://registrar.utexas.edu/catalogs/gi09-10/index.html>.

Group learning can be beneficial, so I encourage you to work with each other on occasion, and not always in isolation. However, if it 3 of your team up to analyze, for example, the data from a Guelph permeameter or the Theis curve matching, you owe it to yourself to do the calculations yourself again from scratch.

2) *Students with disabilities:*

The University of Texas provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, <http://www.utexas.edu/diversity/ddce/ssd/>.”

3) *Classroom etiquette:* (Chana Lee, reported in the Chronicle of Higher Education, 27 March 1998): “Please do not hold conversations with classmates when the professor or another student is speaking. Also refrain from passing notes, reading ...[The Daily Texan], or participating in disruptive classroom behavior. Your undivided attention is a must. An atmosphere of mutual respect is in order...”

4) *Religious holidays:* “By UT Austin policy, you must notify your instructor(s) of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.”