EOSC 350

Course Goals, Syllabus and Marking

September 3, 2016

BACKGROUND

When solving environmental, geotechnical or exploration problems, there is a need to obtain information about the earth without direct sampling. A remote sensing or non-invasive method is required. In a geophysical survey, energy is input to the earth and data are recorded. The received data depend upon the distribution of physical properties as well as the details about the field experiment. Processing of the field data yields information about the distribution of a physical property. This information, in turn, can help solve the particular geoscience problem of interest. Central to the success of this methodology is an understanding of how your particular geoscience problem is related to the physical properties of the subsurface. This course will have served its purpose if you are able to decide if, when, and how to use geophysics for a given geologic or geotechnical problem.

It is not enough to simply learn about the physics and the measurements. In this course we focus on the following:

1. The role of applied geophysics
   (a) Explaining **how** geophysics contributes in mineral exploration, geology, water, geotechnical, and related disciplines.
   (b) Discussing **strengths** and **weaknesses** of some geophysical methods in any given context.
   (c) Using a **framework** to help focus your thinking & learning about new geophysical situations not explicitly encountered in this course.

2. Key concepts include:

   (a) how **physical properties** relate to the geoscience task;

   (b) which geophysical **surveys** are appropriate;

   (c) what measurements, or **data**, are obtained;

   (d) how **data** are manipulated (ie processed) to produce useful information;

3. During the course you will develop skills by focusing upon different physical properties and the surveys used to extract information about them.

   (a) **Magnetic susceptibility** (magnetic survey)

   (b) **Density** (gravity, seismic surveys)

   (c) **Elastic parameters** (seismic surveys)

   (d) **Electrical permittivity** (ground penetrating radar)

   (e) **Electrical conductivity** (DC, IP, electromagnetic surveys)

4. Increase your ability to work **professionally**

   (a) Contribute to, and benefit from, the work of a team.

   (b) Assess how well you have accomplished individual and team-based goals.

   (c) Confidently extend your knowledge in the future, based upon foundations established in this course.

5. It is not expected that students who complete EOSC 350 will be "geophysicists". However, you will

   (a) Become familiar with some of the commonly used geophysical surveys

   (b) Understand the crucial step of relating your problem to physical properties

   (c) Be able to make decisions about whether geophysical surveys will help solve your problem.

(d) Be able to talk to geophysical contractors about matters of field acquisition, data processing and final interpretation

(e) Be able to meaningfully integrate geophysical information with your other knowledge (geological/engineering) to help solve your problem

GENERAL SYLLABUS

1. 2wks: Physical properties, fundamentals and a framework for understanding applied geophysics
2. 2wks: Magnetic surveying
3. 2wks: Seismic refraction and reflection
4. 2wks: Ground penetrating radar
5. 2wks: Electromagnetics
6. 2wk: DC resistivity and induced polarization
7. 2wk: Consolidation and review

For each topic there are four modes by which students can learn and interact with the material. These are:

1. Lectures: These provide basic understanding of the particlar survey. Where possible, we use interactive software apps that allow students to ask, and answer, questions that promote physical insight. These apps will become an integral component of lab exercises.
2. Team Based Learning (TBL). This involves working through an assigned case history individually and answering questions. This is done as a homework exercise.One day of class time is then used for addressing additional issues regarding the case history, but these are answered as a team.
3. Laboratory: These have been designed to integrate closely with the Lectures and TBL. The labs have been designed to be completed, and turned in, by the end of the lab period.
4. Quizzes. The multiple choice quizzes at the end of each module are answered individually and also within the TBL environment.

LECTURE AND LAB TIMES

1. Meeting times:
   - Lectures MWF 14:00 - 15:00
   - Lab section L1A Mon 15:00 - 17:00
   - Lab section L1B Wed 15:00 - 17:00
2. Office hours: This will be set up if necessary. Appointments can be made by email.
3. Textbook:
   - The main resource for material is the GPG (Geophysics for Practicing Geoscientists) http://gpg.geosci.xyz
   - Other required readings available through the course website

MARKING METHODOLOGY

1. Labs will be marked on a $\checkmark+, \checkmark, \checkmark-, -$ basis. The answers to the labs will be made available after the lab has been completed by both groups.
2. Individual TBL will be marked on a $\checkmark+, \checkmark, \checkmark-, -, --$ basis. The answers to the TBLs will be made available.

   The grade assigned to the various categories is:

   (a) ($\checkmark+$)...95%
   (b) ($\checkmark$).....80%
   (c) ($\checkmark-$)...65%
   (d) (-) 50%
   (e) (–) 0%

Mark breakdown:

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Final ............... 35%
Midterm ............. 18%
Lab exercises ....... 22%
Individual quizzes ..  8%
Individual TBL ......  7%
Team exercises ...... 10%
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RULES

- A medical note is required if there are medical reasons for not taking a university scheduled exam.

MISSED QUIZ PROCEDURES:

You will receive zero if you miss a quiz without providing warning, or an acceptable medical excuse. If suitable warning is provided, we can try to schedule an alternate time. There are two lab periods. If you cannot attend your regular lab section, coordinate with the TA's to complete your lab by attending the other section.

Ground rules for classroom and laboratory behavior:

- **Since you will be working as a member of a team, attendance is mandatory in all team based exercises.**
- Late arrivals are disruptive to all. Please avoid arriving late.
- **Electronic equipment (smart phones, laptop, tablets etc) are to be used only for items related to the relevant geophysical material.**

CONTACT INFORMATION

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GPG

(Geophysics for Practising Geoscientists) This is an open source resource module that will help elevate the understanding and application of geophysics to a wide variety of geoscience problems.
http://gpg.geosci.xyz