

APPLIED GEOPHYSICS - GEOL A476/676

Semester: Fall 2019

Credit Hours: 3

Instructor: Dr. Shuvajit Bhattacharya

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Class Location and Schedule: NSB 204; TR 10:00 a.m. - 11:15 a.m.

Office Hours: W 2:00 p.m. - 4:00 p.m. or by appointment

Course Summary

Overview of various geophysical techniques used for subsurface visualization, mapping, and interpretation, with applications to natural resource exploration, geotechnical investigations, and environmental studies. Techniques include gravity, magnetic, electrical, seismic, and well logging. Applications of mathematics and physics-based principles to image shallow and deep subsurface at local and regional scales.

Course Goals

1. Provide students a basic understanding of the principles of different geophysical surveying techniques, such as well logging, seismic, gravity, and magnetic
2. Enable students to apply the fundamental concepts of geophysical techniques to design surveys and analyze subsurface structure, stratigraphy, and rock properties
3. Familiarize students with various research and industry-standard geophysical datasets, using direct analytical and computer-assisted subsurface modeling
4. Engage students in a broader understanding of potential applications, resolution limitations, and non-uniqueness in subsurface interpretations of each geophysical techniques, and how they can be optimized in an integrated approach

Student Learning Outcomes

This course is designed to facilitate the following student learning outcomes. Students are expected to

1. Explain the key concepts of geophysical techniques, including their utilities and limitations
2. Demonstrate a comprehensive understanding of geophysical data acquisition, processing, and interpretation techniques.

3. Analyze and interpret geophysical data using industry-standard software, and assist in geological interpretation
4. Build capacity to select appropriate geophysical exploration techniques and associated parameters for a range of real-world problems, such as natural resource exploration program or hydrologic studies (**for graduate students**).
5. Show familiarity with state-of-the-art techniques used in applied geophysical studies

Prerequisites

Undergraduate - UAA level GEOL A335 Minimum Grade of C and Undergraduate - UAA level MATH A251 Minimum Grade of C and Undergraduate - UAA level PHYS A124 Minimum Grade of C and Undergraduate - UAA level PHYS A124L Minimum Grade of C. Please see the instructor if you have any questions in this regard.

Course Materials

Lectures, including homework, will be provided during the class. You will be able to access the course materials from the Blackboard Learn module for GEOL A476/676. Access Blackboard here: <https://classes.alaska.edu/>

Suggested Textbook

An Introduction to Applied and Environmental Geophysics by John M. Reynolds, 2nd edition, Wiley Press, 2011

Use of Electronic Devices

Computer/laptop/iPad may be used during lectures for note taking and course content purposes only. Use of phone/smart phone is not permitted during lectures, except at emergencies. Please silence your phones before coming to class.

Attendance

You are required to **attend all lectures** (see UAA attendance policy) and participate in class. You are responsible for any material from classes you missed.

Homework Assignments

Homework assignments will be distributed throughout the semester and will be due 1 week later. After a better understanding of fundamental concepts, we will begin to use industry-standard software with real subsurface datasets. Exercises will be designed to reinforce the theory and concepts covered during the lectures.

You should email me your homework. Otherwise, you can put hard copies of your homework on my mailbox. My mailbox is in the Division of Math & Natural Sciences administrative offices corridor on the 1st floor of the CPSB.

Late homework will receive a 20% grade deduction if more than 2 days late, or a 50% deduction if more than 5 days late. No homework will be accepted more than 7 days late unless the instructor has given permission.

Examinations

Mid-term exam will be take-home. Mid-term exam (1st week of October) will be due within one week after distribution.

Final exam will be project-based. For the final term project, you will have to present your work in the classroom and submit a project report written in a professional manner (2nd week of December). You will have to do both to receive a grade for the term project. There may be possibilities of working on the final project as a group (maximum two students are allowed in a group), depending on the number of students, student interests, and the nature of the available geophysical data. Although you may work on a group project, your individual performance will be monitored through weekly updates after the final project materials have been distributed. You can work as a team but learn as an individual. If you work on the final project as a group, you need to submit one final report and give an oral presentation as a group; however, you will explicitly state who worked on what and their contribution. Please follow American Association of Petroleum Geologists (AAPG) or Society of Exploration Geophysicists (SEG) format for citations in the project report.

Keep in mind that the supplied data for quantitative problems in any exams may be different for each student; however, the questions will remain the same for all. You are also encouraged to suggest geophysical data or areas of special interest for my approval. If you are working on your thesis (**graduate students**), you can use your own thesis data for the final term project. However, you will have to show me the data in advance to get my permission to use. I will determine whether the dataset is relevant and sufficient enough for the exam.

NO MAKE-UP EXAMS unless there are extenuating circumstances. Please contact me in advance if such a situation arises.

Grading

Homework:	40%
Mid-term Exam:	20%
Final Term Project Report:	20%
Final Term Project Presentation:	10%
Classroom Participation:	10%

Grading Scale

90% and above: A, 89-80%: B, 79-70%: C, 69-60%: D, below 60%: F

Classroom Location and Accessibility

Lectures will be held in the **Natural Sciences Building (NSB), Room 204 (ConocoPhillips Geoscience Computing Lab)**. NSB is wheelchair accessible. Students with a documented disability who may require assistance to facilitate success in this course, please contact **Disability Support Services** for guidance at the following website:
<https://www.uaa.alaska.edu/students/disability-support-services/>

Student Code of Conduct

Students are expected to know and follow the Student Code of Conduct (<https://www.uaa.alaska.edu/students/dean-of-students/student-conduct/code.cshtml>). If an instructor has reason to believe that plagiarism, cheating, or academic dishonesty, as defined in the Student Code of Conduct, has occurred, the matter will be referred to the Office of the Dean of Students. If there is a finding from the Dean of Students that plagiarism, cheating, or academic dishonesty has occurred, academic sanctions imposed by the instructor may include substantial reduction of the grade for the assignment, 0 (no credit) for the assignment, or a failing grade for the course.

Notice of Nondiscrimination

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