PTE 504 – Geophysics for Petroleum Engineers

Instructor: Dr. Martin Karrenbach
Course credit: 3 units
Class Hours: Fri 11:30am – 2:40pm
Class Location: OHE 100 C
Office Hours: after lecture or by email

This course is designed to give petroleum engineering students a basic understanding of current geophysical techniques used to evaluate and monitor subsurface reservoirs. An overview of methods is given and particular emphasis is placed on understanding of various aspects of the seismic methods including 4D time-lapse and microseismic monitoring methods. At the end of this course petroleum engineering students will know how to practically use various geophysical methods and will be able to assess resulting images, models and derived subsurface reservoir properties.

Prerequisites:

The material in this course requires basic familiarity with linear algebra, differential and integral calculus and physics. Familiarity with Matlab, Seismic Unix, SEPlib is useful but not essential.

Textbooks:

There is no required textbook for the course. Relevant reading material will be assigned. The following is a list of books that are closely related to the topics covered in the course.

Aminzadeh, F., Dasgupta, S., and D. Hill, 2014, Geophysics for petroleum engineers (v. 7 in Handbook of Petroleum Exploration and Production): Elsevier Science.

Lines, L.R., and R.T. Newrick, 2004, Fundamentals of Geophysical Exploration (no. 13 in Geophysical Monograph Series): Society of Exploration Geophysics.

Sheriff, R.E and Geldart, L.P., 1995, Exploration Seismology, University Press.

Telford, W.M, Geldart, L.P., Sheriff, R.E., 1990, Applied Geophysics, Cambridge University Press.

Lectures are scheduled on Fridays 11:30am – 02:40pm.

Grading:

Homework	20%
Midterm	20%
Term Project	30%
Final	30%

Expectations for Assignments, Exams, and Projects:

Homework assignments will be given on a weekly basis [3-4 hrs/week].

The Midterm and Final will consist of a written exam which is designed to be completed in 90 minutes.

The Term project will be a collaborative analysis among team members of an integrated case study requiring the application of a variety of methods commonly used in exploration/development/reservoir geophysics. The project grade will be based on a report to be submitted by the team at the end of the course, as well as an oral presentation by each team member summarizing the results. Details to follow.

Course Schedule

Lecture #	Date	Topic
1	**05/23/2014**	**Overview of applied geophysics with a focus on petroleum engineering applications**
2	**05/30/2014**	**Gravity, Magnetics, Electrical and EM methods**
3	**06/06/2014**	**Overview of seismic method; theory of seismic wave propagation**
4	**06/13/2014**	**Seismic signals and data acquisition methods**
5	**06/20/2014**	**Digital signal processing and time series analysis**
6	**06/27/2014**	**Midterm Exam**
7	**07/04/2014**	**Seismic data processing and imaging**
8	**07/11/2014**	**Seismic interpretation**
9	**07/18/2014**	**Seismic reservoir characterization, modeling and inversion**
10	**07/26/2014**	**4D time-lapse seismic method / Microseismic Monitoring**
11	**08/01/2014**	**Special topics: seismic pore pressure prediction, tomography, VSPs, drill-bit sources, passive monitoring, multi-component seismology**
12	**08/08/2014**	**Final Exam**

Academic Integrity Syllabus Statement

Students are expected to adhere to the USC Student Conduct Code. Students are encouraged to consult with the instructor when in doubt about the violating the Conduct Code.

Disabilities Services and Program (ASP) Policy Statement

Any student requesting academic accommodations based on a disability is required to register with Disability Services and Programs (DSP) each semester. A letter of verification for approved accommodations can be obtained from DSP. Please be sure the letter is delivered to me or the TA as early in the semester as possible. DSP is located in STU 301 and is open 8:30 a.m. – 5:00 p.m., Monday through Friday. The phone number for DSP is (213) 740-0776.

Coursework Copyright Statement

All the materials generated for this course are copyrighted. These materials include, but not limited to, syllabi, quizzes, exams, lab problems, in-class materials, review sheets, and additional problem sets. You are not allowed to copy this material without obtaining prior permission from the instructor.

Statement on Academic Integrity

USC seeks to maintain an optimal learning environment. General principles of academic honesty include the concept of respect for the intellectual property of others, the expectation that individual work will be submitted unless otherwise allowed by an instructor, and the obligations both to protect one's own academic work from misuse by others as well as to avoid using another's work as one's own. All students are expected to understand and abide by these principles. *Scampus,* the Student Guidebook, contains the Student Conduct Code in Section 11.00, while the recommended sanctions are located in Appendix A: http://www.usc.edu/dept/publications/SCAMPUS/gov/. Students will be referred to the Office of Student Judicial Affairs and Community Standards for further review, should there be any suspicion of academic dishonesty. The Review process can be found at: http://www.usc.edu/student-affairs/SJACS/.

Statement for Students with Disabilities

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