GEO 465K: Exploration Seismology
Unique IDs. 27580, 27585
GEO 384C: Seismology I—Exploration Geophysics
Unique IDs. 27775, 27780

Fall 2012 Syllabus

Lectures: Monday, Wednesday, and Friday, 1:00–1:50 pm; JGB 3.222
Laboratory Sections: Wednesday, 2:00–4:00 pm; or Thursday, 2:00–4:00 pm
Room: JGB 2.312 and (sometimes) JGB 3.218

Instructor: Kyle Spikes
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Office Hours: Monday 2–3:30 pm, Tuesday 10:30am–12:00 pm, and by appointment

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Office Hours: TBD

University of Texas Honor Code
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 uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.

Objectives: Geo 384C and Geo 465K provide an introduction to exploration seismology intended for first year graduate students with a minimal exposure to exploration geophysics, and as a key component of the undergraduate curriculum in the B.S. geophysics option. The course covers seismic methods and their applications to exploration and development of mineral resources, particularly oil and gas. Labs will consist of a mixture of practical and computer exercises, plus student presentations reviewing selected articles in the recent geophysical literature.

Prerequisites: For undergraduate students: The following courses with a grade of C or better: Math 427K, 427L, Physics 315, 115L. (Students may register for Math 427L concurrently.) For graduate students: graduate standing.

Assignments, Assessment, and Evaluation: Most weeks a homework problem set will be assigned in the laboratory section. Additional assignments may be given in lecture. These homework sets and assignments, their issue dates, and their due dates will be posted on Blackboard and mentioned in class or lab. Each assignment will be due at the beginning of the laboratory or lecture period on the day that it is due. For each day an assignment is late, the grade for that assignment will be dropped 10%, down to a minimum of 50% as long as the assignment is submitted before the graded assignments are returned. After the graded assignments are returned, no credit will be given. Short quizzes will be given at the discretion of the instructor. These quizzes cannot be retaken nor made up at a later time.

Two in-class midterm exams and a final exam will be given. A midterm exam may be made up at the discretion of the instructor if the student can provide valid and substantiated reasons for the absence *prior* to the exam. Each midterm exam will take place during lecture. The final cannot be rescheduled.

Midterm Exam 1 Date: Friday, September 28th, in class.
Midterm Exam 2 Date: Monday, November 5th, in class.
Final Exam: Wednesday, December 12th, 9 am -12 pm.

Grades: The grading for the class is based on the following criteria.

Grade Percentage Basis	
Two midterm exams at 15% each	30%
Final (Cumulative) exam	30%
Oral Report	10%
Lab and Homework exercises and Participation	30%

Final: Cumulative exam on entire course, with additional weight on last third of the course. Plus and minus designations are included in final grading.

Each student will make a ten minute oral presentation to the class, and class members will evaluate each presentation. Topics will be determined at a later date, and they will be selected from the recent literature of exploration geophysics.

Attendance and Classroom policies: Attendance is required for both lecture and laboratory. Active participation is expected in lecture and laboratory activities. If you must miss a laboratory session, it is your responsibility to arrange, with the teaching assistant, to attend another section covering that material. This arrangement must be made prior to the absence. Student with disabilities may request appropriate academic accommodations from the Service for Students with Disabilities, 471-6259.

Texts:

Required:

Kearey, P., M. Brooks, and I. Hill, 2002, An Introduction to Geophysical Exploration, Third edition: Blackwell Science Ltd., Oxford, 2002, 262 p.

Sheriff, R. E. and L. P. Geldart, 1995, Exploration Seismology: Cambridge University Press, Cambridge, England. 592 p.

Suggested:

Lillie, R. J., 1999, Whole Earth Geophysics, Prentice Hall, Upper Saddle River, N.J., 361 p.

Reading list of relevant technical papers for the technical presentations will be provided.

A class web-site is available on BlackBoard, and will include supplemental material.

Scholastic dishonesty: Collaboration in studying, class and lab exercises is encouraged. Inappropriate collaboration on exams and individual assignments (Including lab reports) will NOT be tolerated, and will be dealt with in an appropriate manner for academic dishonesty.

Plagiarism. Plagiarism will not be tolerated. See the University of Texas guidelines for plagiarism:
http://deanofstudents.utexas.edu/sjs/scholdis_plagiarism.php

Use of E-Mail for Official Correspondence to Students
E-mail is recognized as an official mode of university correspondence; therefore, you are responsible for reading your e-mail for university and course-related information and announcements. You are responsible to keep the university informed about changes to your e-mail address. You should check your e-mail regularly and frequently—I recommend daily, but at minimum twice a week—to stay current with university-related communications, some of which may be time-critical. You can find UT Austin's policies and instructions for updating your e-mail address at **http://www.utexas.edu/its/policies/emailnotify.php**

Documented Disability Statement
The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 471-6259 (voice) or 232-2937 (video phone) or **http://www.utexas.edu/diversity/ddce/ssd**

Religious Holy Days
By UT Austin policy, you must notify me 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, I will give you an opportunity to complete the missed work within a reasonable time after the absence.

Behavior Concerns Advice Line (BCAL)
If you are worried about someone who is acting differently, you may use the Behavior Concerns Advice Line to discuss by phone your concerns about another individual's behavior. This service is provided through a partnership among the Office of the Dean of Students, the Counseling and Mental Health Center (CMHC), the Employee Assistance Program (EAP), and The University of Texas Police Department (UTPD). Call 512-232-5050 or visit **http://www.utexas.edu/safety/bcal**

Resources for Learning & Life at UT Austin. The University of Texas has numerous resources for students to provide assistance and support for your learning.

The UT Learning Center: **http://www.utexas.edu/student/utlc/**
Undergraduate Writing Center: **http://uwc.utexas.edu/**
Counseling & Mental Health Center**: http://cmhc.utexas.edu/**
Career Exploration Center: **http://www.utexas.edu/student/careercenter/**
Student Emergency Services: **http://deanofstudents.utexas.edu/emergency/**

Subject-to-change notice
Ground rules for participation in discussions or activities
A statement about plagiarism and the consequences of plagiarizing.
http://www.lib.utexas.edu/services/instruction/faculty/plagiarism/preventing.html
http://www.lib.utexas.edu/services/instruction/learningmodules/plagiarism
Assignments, Assessment, and Evaluation

Texts:
Sheriff and Geldart (S&G)
Keary, Brooks and Hill (KBH)
Robert J. Lillie (RJL)
additional *Supplemental* readings (Available on bb)
Supplemental material indicated by *italic* type.

Week	**Topic**	**Reading**	**Lab**
Lecture # / Day, Date			
Week 1	**Topic**	**Reading**	**Lab**
1. W 8/29	Introduction to Exploration Seismology	S&G Ch. 1 KBH Ch. 1 RJL Ch. 1	
2. F 8/31	Intro. to Elasticity Define Stress	**S&G p. 33-38** KBH p. 21-24 RJL p. 45-49. ***T&M p. 24-34***	***No Lab this Week***
Week 2	**Topic**	**Reading**	**Lab**
M 9/3	**Labor Day Holiday – No Class**	***T&M p.28-30***	
3. W 9/5	Define Strain	**S&G p. 36-38** ***T&M p. 24-34***	
4. F 9/7	Hooke's Law and Elastic Constants	***T&M p. 23-34*** **S&G p. 33-40** ***MM&D (18-19) 17-24, 14-16*** ***Sheriff, Elastic Constants***	**Elastic Constants Exercise I**
Week 3	**Topic**	**Reading**	**Lab**
5. M 9 /10	Define Wave Equations	***T&M p. 23-34*** **S&G p. 33-40** KBH p. 22-26 RJL p. 49-55	**Velocities and Elastic Constants**
6. W 9/12	Polarization, Anisotropy of Body Waves VTI, HTI. SV, SH, S1, S2	***T&M p. 13-18*** **S&G p. 55-57** KBH p. 43-52 **RJL Ch. 5 (p. 100-135)**	**Exercise II**

Week 3 (Cont.)	Topic	Reading	
7. F 9/14	Body, surface and Interface Waves	**S&G p. 49-55** **KBH p. 23-26** RJL p. 45-52	

Week 4	Topic	Reading	Lab
8. M 9/17	Interfaces-Reflection, Refraction and Mode-Conversion	**S&G p. 62-63, Ch. 3 (73-84)** ***T&M p. 18-23*** KBH 28-32	
9. W 9/19	"THE" Seismic Experiment, Geometry of Seismic Reflections, velocity estimations	**KBH p. 43-52** **S&G Ch. 4 (85-95)** **RJL p. 64-66; 105-119** ***Sheriff, Velocity Definitions***	**Seismic Velocity**
10. F 9/21	Introduction to Refraction methods: Flat layers, Single Interface, multiple interfaces	**KBH 99-104** **RJL 73-78**	

Week 5	Topic	Reading	Lab
11. M 9/24	Seismic Refractions dipping layers, Various methods of Refraction Surveying	**KBH 105-108** **RJL 78-85** **S&G Ch. 11 (425-446)**	
12 W 9/26	"The" Seismic Experiment Summary	Summary of all methods discussed in class	**Seismic Acquisition Lab.**
13. F 9/28	**First Midterm Exam**		**(Reflection Acquisition Geometry)**

Week 6	Topic	Reading	Lab
14. M 10/1	Acquisition—Layout for 2D and 3D acquisition Common shot, receiver and Midpoint gathers	**S&G Ch. 8 (239-253)** KBH 43-52 **RJL 102-113**	

15.	W 10/3	Seismic Field Methods and Equipment: Sources, Receivers and Arrays	KBH 33-42 72-81, **53-57** RJL 102-106 **120-122** **S&G 191-236** 239-375	**Seismic Acquisition Field Lab I (Field Trip)**
16.	F 10/5	Seismic Field Methods and Equipment: Receivers Field procedures and design Receivers (Cont'd) and Receiver Arrays	KBH 33-42 72-81, **53-57** RJL 102-106 **120-122** **S&G 191-236** 239-375 **S&G 241-260** KBH 72-92	

Week 7		**Topic**	**Reading**	**Lab**
17.	M 10/8	Seismic Field Methods: Acquisition Geometry 1D, 2D, 3D and 4D	**S&G** Ch. 8 (239-275) **243-245** KBH 72-81	
18.	W 10/10	Seismic Velocity from Rock Properties	S&G Ch. 5 (107-143)	**Seismic Acquisition Field Lab II (Field Trip)**
19.	F 10/12	Seismic Velocity from Rock Properties (Continued)	S&G Ch. 5 (107-143)	

Week 8		**Topic**	**Reading**	**Lab**
20.	M 10/15	Seismic Velocity ratios and Rock Properties	**S&G 113-119** ***T&M 47-59***	
21.	W 10/17	Convolution Model and Synthetic Seismograms	**KBH 48-49** **S&G 146-150** RJL 122-127	**Refraction Analysis of Field Experiment**
22.	F 10/19	Thin Bed Effects and Vertical Resolution	***Neidel & Poggiogliomi, 1977, p. 409-411*** **S&G 172-180** RJL 130-134	

Week 9	**Topic**	**Reading**	**Lab**

23.	M 10/22	Seismic Data Processing	**S&G Ch. 9**	
24.	W 10/24	Seismic Data Processing	**S&G Ch. 9**	**Data Processing I**
25.	F 10/26	Seismic Data Processing	**S&G Ch. 9**	

Week 10		**Topic**	**Reading**	**Lab**
26.	M 10/29	Review of Processing Corrections for Land Data	***Processing Overview*** **S&G 261—266** RJL 108-113	
27.	W 10/31	Horizontal Resolution	***Neidel & Poggiogliomi, 1977, p. 396-397*** ***RHT-Fresnel*** **S&G 152-155** **KBH 52-53**	**Data Processing II**
28.	F 11/2	Inversion of Reflection Data	**S&G 135-139** ***Lindseth (1979)***	

Week 11		**Topic**	**Reading**	**Lab**
29.	M 11/5	**Second Midterm Exam**		**SEG Week – No Labs**
30.	W 11/7	Fluid Substitution	**S&G 121-125; 110-113** ***T&M 53-63***	
31.	F 11/9	AVO (Amplitude vs. Offset, Class I, II and III Gas Sands	**S&G 77-81** ***Rutherford & Williams 1989*** ***Ostrander 1986***	

Week 12		**Topic**	**Reading**	**Lab**
32.	M 11/12	Displays of Seismic Data	**S&G 459-467, Color Plates between 465-465** **KBH Color plates between 70-71**	
33.	W 11/14	Direct Hydrocarbon Indicators, Bright Spots, AVO and others. Seismic Attributes?	**S&G 415-418** **KBH 84-85** Brown, Ch. 5, AAPG Memoir 42	**Synthetic seismograms and thin-bed effects**

34.	F 11/16	Migration	S&G 326-335 KBH 67-76) RJL 137-158 Problems 6.1, 6.2, 6.3	
Week 13		**Topic**	**Reading**	**Lab**
35.	M 11/19	Migration (Continued)	S&G 326-335 KBH 67-76) RJL 137-158 Problems 6.1, 6.2, 6.3	**Thanksgiving Day Holiday Week No Lab**
36.	W 11/21	Interpretation	S&G Ch. 10	
	F 11/23	**No Class. Thanksgiving Holiday**		
Week 14		**Topic**	**Reading**	**Lab**
37.	M 11/26	Interpretation	S&G Ch. 10	
38.	W 11/28	Review—Students' Evaluation of class		**Interpretation / Migration**
39.	M 11/30	Class Presentations		
Week 15			**Reading**	**Lab**
40.	M 12/3	Class Presentations		
41.	W 12/5	Class Presentations		**Use lab time for Presentations, if necessary**
42.	F 12/7	Class Presentations		
Final Exam		**Wednesday, December 12, 9:00 am–12:00 PM**		