

UNIVERSITY OF CALGARY
DEPARTMENT OF GEOSCIENCE
COURSE OUTLINE

1. Course: GEOPHYSICS 457 – PHYSICAL PROPERTIES OF ROCKS

Lecture Section:	L01	MW	15:30-16:45	KNB 133	WINTER 2014
Lab Sections:	B01	R	08:00-10:50	ES002C	
	B02	R	11:00 – 13:50	ES002C	
	B03	R	14:00 – 16:50	ES002C	

Instructor(s): Dr. Alireza Babaie Mahani ES 276 Office Hours: Tuesday 11:00 – 13:00
ababaeim@ucalgary.ca

Teaching Assistants: Kenneth Adebayo e-mail: koadebay@ucalgary.ca
Raul Cova e-mail: rjcova@ucalgary.ca

D2L Course: GOPH 457 L01

Geoscience Department ES 118; (403) 220-5841; geoscience.ucalgary.ca

2. PREREQUISITE(S): Geophysics 355, 359, Mathematics 331 and Physics 321

See section 3.5.C in the Faculty of Science section of the online Calendar (<http://www.ucalgary.ca/pubs/calendar/current/sc-3-5.html>)

3. **GRADING:** The University policy on grading and related matters is described in “Academic Regulations, sections F.1 and F.2” of the online University Calendar (<http://www.ucalgary.ca/pubs/calendar/current/f-1.html> and <http://www.ucalgary.ca/pubs/calendar/current/f-2.html>) In determining the overall grade in the course the following weights will be used:

Lab Reports (4)	20%
Assignments (~8)	20%
Midterm (1 Hour)	20% (February 15 2014)
Final Examination (2 hours – covers all course material)	40% (To be scheduled by the Registrar)

The Midterm and Final examinations will be short-answer or multiple-choice format. Questions will focus on explaining concepts and problem solving. A passing grade on the final exam is necessary to pass the course as a whole (a minimum of 50 percent on the final exam is required). There will be about 8 assignments throughout the term. Students are responsible for downloading the assignments from Blackboard. Assignments should be handed to your TA by the deadline. Any assignments or lab reports handed in after the deadline will have marks deducted. Each piece of work (lab report, assignment, midterm test or final examination) submitted by the student will be assigned a percentage score. The student’s average percentage score for the various components listed above will be combined with the indicated weights to produce an overall percentage for the course, which will be used to determine the course letter grade, bearing in mind that an F grade will result if the student does not pass the Final Examination. The conversion between course percentage and letter grade is given below:

Letter Grade	Percent
A+	95-100
A	86-94
A-	80-85
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	55-59
D	50-54
F	<50

The Passing letter grade for the whole course will be D+ (at least 55 percent).

4. **Missed Components of Term Work.** The regulations of the Faculty of Science pertaining to this matter are found in the Faculty of Science area of the Calendar in section 3.6: <http://www.ucalgary.ca/pubs/calendar/current/sc-3-6.html>. It is the student's responsibility to familiarize himself/herself with these regulations. See also <http://www.ucalgary.ca/pubs/calendar/current/e-3.html>.

Department Approval: **ORIGINAL SIGNED**

Date: **January 7 2014**

5. **EXAMINATION POLICY:** No electronic or written aids (eg. cell phones, tablets, computers, PDAs, notes, textbooks) will be allowed during writing of any exams. Non-programmable calculators will be permitted to answer quantitative questions on exams, if applicable, and permission to do this will be clearly indicated on the examination paper.

Students should also read the Calendar, Section G, on Examinations: <http://www.ucalgary.ca/pubs/calendar/current/g.html>.

6. In this course, the quality of the student's writing in laboratory reports will be a factor in the evaluation of those reports. See also <http://www.ucalgary.ca/pubs/calendar/current/e-2.html>.

7. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **ACADEMIC MISCONDUCT** (cheating, plagiarism, or any other form) is a very serious offence that will be dealt with rigorously in all cases. A single offence may lead to disciplinary probation or suspension or expulsion. The Faculty of Science follows a zero tolerance policy regarding dishonesty. Please read the sections of the University Calendar under K. Student Misconduct (<http://www.ucalgary.ca/pubs/calendar/current/k.html>) to inform yourself of definitions, processes and penalties
- (b) **ASSEMBLY POINTS in case of emergency during class time.** Be sure to **FAMILIARIZE YOURSELF with the information at <http://www.ucalgary.ca/emergencyplan/assemblypoints>.**
- (c) **ACADEMIC ACCOMMODATION POLICY.** Students with documentable disabilities are referred to the following links:
Calendar entry on students with disabilities: <http://www.ucalgary.ca/pubs/calendar/current/b-1.html>
Student Accessibility Services: www.ucalgary.ca/access
- (d) **SAFEWALK:** Campus Security will escort individuals day or night (<http://www.ucalgary.ca/security/safewalk/>). Call **220-5333** for assistance. Use any campus phone, emergency phone or the yellow phones located at most parking lot pay booths.
- (e) **FREEDOM OF INFORMATION AND PRIVACY:** This course is conducted in accordance with the Freedom of Information and Protection of Privacy Act (FOIPPA). As one consequence, **students should identify themselves on all written work by placing their name on the front page and their ID number on each subsequent page.** For more information see also <http://www.ucalgary.ca/secretariat/privacy>.
- (f) **STUDENT UNION INFORMATION:** VP Academic Phone: 220-3911 Email: suypaca@ucalgary.ca.
SU Faculty Rep. Phone: 220-3913 Email: sciencerep@su.ucalgary.ca Website <http://www.su.ucalgary.ca/home/contact.html>.
Student Ombudsman: www.ucalgary.ca/provost/students/ombuds; ombuds@ucalgary.ca 220-6420
- (g) **INTERNET and ELECTRONIC COMMUNICATION DEVICE Information.** You can assume that in all classes that you attend, **your cell phone should be turned off.** Also, communication with other individuals, via laptop computers, Blackberries or other devices connectable to the Internet is not allowed in class time unless specifically permitted by the instructor. If you violate this policy you may be asked to leave the classroom. Repeated abuse may result in a charge of misconduct.

UNIVERSITY OF CALGARY
DEPARTMENT OF GEOSCIENCE
COURSE OUTLINE

GEOPHYSICS 457
PHYSICAL PROPERTIES OF ROCKS

TERM: Winter 2014

PREREQUISITE(S): Geophysics 355, 359, Mathematics 331 and Physics 321

LECTURER(S): Dr. Alireza Mahani

LECTURE : L01 MW 15:30 – 16:45 KNB 133

LAB(S): B01 R 08:00 – 10:50 ES 002C
B02 R 11:00 – 13:50 ES 002C
B03 R 14:00 – 16:50 ES 002C

TEXT: Y. Gueguen and V. Palciauskas, Introduction to the physics of rocks, Princeton University Press, 1994.

OTHER RESOURCE MATERIALS:

The course blackboard site contains supplementary handouts for lectures, all lab experiments and assignments, as well as other resource material that you might find useful. The purpose of the lecture handout is to help students save time copying the diagrams & notes in class; they are NOT intended to be complete. Students are required to attend the lectures and fill in the missing parts. The lectures also provide an interactive environment that embellishes on, and provides a context for, the material in the textbook.

Recommended reference books (available in the Gallagher Library):

- The physical properties of rocks, J.H. Schon, Handbook of Geophysical Exploration series, Elsevier, 1995.
- Seismic and acoustic velocities in reservoir rocks, Vol. 1, experimental studies. Ed. A.M. Nur & Z. Wang, Geophysics reprint series, No. 10, SEG, 1989.
- Applied Geophysics, 2nd Ed., by W.M. Telford, L.P. Geldart & R.E. Sheriff, Cambridge 1990. Chapters 2-3.

The rock physics handbook, G.Mavko, T. Mukerji, J. Dvorkin, Cambridge University Press, 1998.

RESERVE READING ROOM: N/A

MARK DISTRIBUTION: A. Composition of Final Grade

Lab Reports (4)	20%
Assignments (~8)	20%
Midterm (1 Hour)	20% (February 15 2014)
Final Examination (2 hours – covers all course material)	40% (To be scheduled by the Registrar)

Students who are absent from the midterm exam or final laboratory exam because of illness or other unforeseen circumstances may be granted an excused absence by the Course Coordinator (midterm exam) or Lab Coordinator (final laboratory exam) upon presentation of adequate documentation (a completed Physician/Counsellor Report form <http://www.ucalgary.ca/registrar/PDFs/phycoun.pdf> for illness; equivalent documentation for other circumstances). There will be no “make-up” examinations for excused absences. The weight assigned to the midterm examination will be transferred to the final examination.

Similarly, students who are unable to submit laboratory reports or assignments on time because of similar circumstances will be required to submit the same type of documentation to the Lab Coordinator in order to be considered for a time extension.

B. Final Exam

There will be a final examination scheduled by the Registrar's Office.

C. Components of Course for Which a Passing Grade is Essential

Students must achieve a passing grade (minimum of D) on both the lecture portion of the course (average of the midterm and final exams) and the laboratory portion of the course to qualify for a passing grade overall.

D. Grading Scheme

Letter Grade	Percent
A+	95-100
A	86-94
A-	80-85
B+	77-79
B	73-76
B-	70-72
C+	67-69
C	63-66
C-	60-62
D+	55-59
D	50-54
F	<50

COURSE CONTENT, OBJECTIVES AND ORGANIZATION:

The aim of this course is to learn about rock physics, especially the physical properties of rocks and minerals together with their relationship to geophysical measurements and surveys. The first half of the course focuses mainly on the physics of rocks, while the second half deals with specific properties such as acoustic, electrical, thermal and dielectric properties. The lab provides an opportunity for students to obtain hands-on experience measuring some physical properties of rocks. Students will also learn about experimental errors, how to handle errors and prepare a formal lab report. During weeks without an experimental lab, students will be given a mathematically oriented assignment and the lab time slot will be used for a tutorial.

The topics covered in the course are given in the table below. This is intended as a general guideline and the schedule of topics may change slightly as the course transpires.

Schedule of lecture topics:

Week	Date	Lecture Topics	Related Chapter(s)
1	Jan.8	Introduction / Course Information / Rocks / Porous Media	1,2
2	Jan.15	Heterogeneous Media	3
3	Jan.22	Mechanical Behavior of Dry Rocks	4
4	Jan.29	Circulation of Fluids: Permeability	5
5	Feb.5	Mechanical Behavior of Fluid-Saturated Rocks	6
6	Feb.12	Review Class	
6	Feb.15	Midterm Exam	
7	Feb.26	Acoustic Properties	7
8	Mar.5	Electrical Conductivity	8
9	Mar.12	Dielectric Properties	9
10	Mar.19	Thermal Properties	10
11	Mar.26	Magnetic Properties	11
12	Apr.2	Well log measurements	
13	Apr.9	Review Class	

Schedule of labs:

Week	Date	Lab Topics
3	Jan. 23	Density and Porosity
5	Feb. 6	Electrical Resistivity and Formation Factor
8	Mar. 6	Static Measurements of the Mechanical Properties of Rocks
10	Mar. 20	Dynamic Measurements of the Mechanical Properties of Rocks

CLASSROOM CONDUCT:

It is important that the classroom-learning environment is one of mutual respect. Please note the following basic statements below that outline expectations for student conduct:

- Every student has the right to learn as well as the responsibility not to deprive others of their right to learn.
- Please arrive on time and do not schedule other activities during class time. Late arrivals and early departures are disruptive.
- In order to get the most out of this class please attend all scheduled classes, labs and tutorials. The class will be made as interesting, active and informative as possible.
- Please let the instructor know immediately if you have a problem that is preventing you from performing satisfactorily in this class.

Below is what you can expect of the instructor:

- Course expectations will be clear.
- Class will start and end on time.
- The instructor and/or TAs will be available to you for help outside of classroom times should you want to review concepts that you do not understand or learn material beyond the course content.
- Classroom disruptions will be managed so that you have a safe and distraction-free learning environment.