



UNIVERSITY OF CALGARY

DEPARTMENT OF GEOSCIENCE COURSE OUTLINE WINTER 2016

1. **Course:** GOPH 457, Physical Properties of Ricks

Lecture Sections:

L01: MoWeFr, 11:00 – 11:50, ENA 03

For a listing of all lab sections corresponding with this course, please see the following link:

http://geoscience.ucalgary.ca/geoscience_info/courses/w16

Instructor: Dr. Rachel Lauer, Office: ES 276, Ph. 403-220-7923, rachel.lauer@ucalgary.ca, Office Hours: Tu, 11:00 a.m.–1:00 p.m.

Teaching Assistants: Anton Biryukov; Sidney Dills; Alana Kent; Andrew Mills

Geoscience Department ES 118, 403-220-5841, geoscience.ucalgary.ca, geoscience@ucalgary.ca

2. **Prerequisites:** Geophysics 351, or 355 or 359; Mathematics 331; Physics 321. See [Course Descriptions](#) in the University Calendar.

3. **Grading:** The University policy on grading and related matters is described in sections [F.1](#) and [F.2](#) of the online University Calendar. In determining the overall grade in the course the following weights will be used:

Lab reports (5-6) 25%
Assignments/Quizzes(~8) 25%
Midterm test 20%
Final Examination 30% (To be scheduled by the Registrar)

The Midterm and Final Exam will be short answer, or multiple-choice format, with a focus on problem solving and demonstrating an understanding of the concepts developed in the course. A passing grade on the Final Exam is required to pass the course as a whole (minimum of 50% on final exam is required). An estimated 8 assignments will be given throughout the semester, and 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 points deducted for each day the work exceeds the deadline. 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, or lab portion of the course. The conversion between course percentage and letter grade is given below: 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

**A passing grade for the course will be D+ (minimum passing grade is 55%) Students must achieve a passing grade (minimum of 50%) in both the lecture portion of the course (average of exam grades) and the laboratory portion of the course to qualify for a passing grade overall.

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](#). It is the student's responsibility to familiarize himself/herself with these regulations. See also [Section E.6](#) of the University Calendar.
5. **Course Materials:** *Y. Gueguen and V. Palciauskas, Introduction to the physics of rocks, Princeton University Press, 1994.*
6. **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. Take-home exams or quizzes are open book. Students should also read the Calendar, [Section G](#), on Examinations.
7. **Writing across the curriculum statement:** In this course, the quality and completeness of the student's writing in lab reports will be a factor in the evaluation of those reports. See also Section E.2 of the University Calendar.

8. OTHER IMPORTANT INFORMATION FOR STUDENTS:

- (a) **Misconduct:** 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 [Section K](#). Student Misconduct 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 on [assembly points](#).
- (c) **Student Accommodations:** Students needing an Accommodation because of a Disability or medical condition should contact Student Accessibility Services in accordance with the Procedure for Accommodations for Students with Disabilities available at http://www.ucalgary.ca/policies/files/policies/procedure-for-accommodations-for-students-with-disabilities_0.pdf. Students needing an Accommodation in relation to their coursework or to fulfil requirements for a graduate degree, based on a Protected Ground other than Disability, should communicate this need, preferably in writing, to the Associate Head of Geoscience, Dr. E.S. Krebs by email krebs@ucalgary.ca or phone 403-220-5850.
- (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 (FOIPP). 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: 403 220-3911 Email: suvpaca@ucalgary.ca
SU Faculty Rep. Phone: 403 220-3913 Email: science1@su.ucalgary.ca, science2@su.ucalgary.ca and science3@su.ucalgary.ca;
Student Ombuds Office: 403-220-6420 Email: ombuds@ucalgary.ca; <http://ucalgary.ca/provost/students/ombuds>
- (g) **Internet and Electronic Device Information:** You can assume that in all classes that you attend, your cell phone should be turned off unless instructed otherwise. 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.
- (h) **U.S.R.I.:** At the University of Calgary, feedback provided by students through the Universal Student Ratings of Instruction (USRI) survey provides valuable information to help with evaluating instruction, enhancing learning and teaching, and selecting courses (www.ucalgary.ca/usri). Your responses make a difference – please participate in USRI Surveys.



DEPARTMENT OF GEOSCIENCE
COURSE OUTLINE
GEOPHYSICS 457
PHYSICAL PROPERTIES OF ROCKS

TERM: Winter 2016

PREREQUISITES: Geophysics 355, 359, Mathematics 331, and Physics 321.

LECTURER: Dr. Rachel Lauer

LECTURE: L01 MWF 11:00-11:50 ENA 03

LAB: B01 R 08:00-10:50 ES 002C
B02 R 11:00-13:50 ES 002C
B03 R 14:00-16:50 ES 002C
B04 R 17:00-19:50 ES 002C

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

OTHER RESOURCE MATERIALS: The course D2L site contains supplementary handouts for some 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):

- 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.

MARK DISTRIBUTION:

A. Composition of Final Grade:

Lab Reports (5-6)	25%
Assignments/Quizzes (~8)	25%
Midterm (50 minutes)	20% (week of February 22)
Final Examination (2 hours—covers all course material)	30% (scheduled by 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. Essential components of course to achieve a Passing Grade

Students must achieve a passing grade (minimum of 50%) in both the lecture portion of the course (average of exam grades) 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 AND OBJECTIVES:

The primary course objective is to learn about rock physics, by connecting the physical properties of rocks and minerals to their geophysical measurements obtained during surveys. The course will provide a basis for understanding the various rock properties, and how they vary as a function of rock type, and history. The first half of the course focuses 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 is underway.

Proposed Lecture Schedule:

Week	Date	Lecture Topics	Related Chapter(s)
1	Jan. 11	Intro/Course Info/Rocks/Porous media	1,2
2	Jan. 18	Heterogeneous Media	3
3	Jan. 25	Mechanical Behavior of Dry Rocks	4
4	Feb. 1	Circulation of fluid-permeability	5
5	Feb. 8	Mechanical Behavior of fluid saturated Rocks	6
	Feb. 15	Reading Week	
6	Feb. 22	Midterm, start Acoustic Properties	7
7	Feb. 29	Acoustic Properties	7
8	Mar. 7	Electrical Conductivity	8
9	Mar. 14	Dielectric Properties	9
10	Mar. 21	Thermal Properties	10
11	Mar. 28	Magnetic Properties	11
12	Apr. 4	Well log measurements-drilling parameters	
13	Apr.11	Review for Final	

Proposed Lab Schedule: Labs will meet each week, to conduct experimental measurements, or work through assignments during the lab time slot.

Week	Date	Lab Topics
3	Jan. 28	Density and Porosity
5	Feb.11	Electrical Resistivity and Formation Factor
7	Feb. 25	Static Measurements of Rock Mechanical Properties
9	Mar. 10	Dynamic measurements of Rock Mechanical Properties
11	Mar. 24	Permeability Measurements

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.