



UNIVERSITY OF CALGARY

DEPARTMENT OF GEOSCIENCE COURSE OUTLINE FALL 2015

1. Course: Geophysics 351 (GOPH 351), Introduction to Geophysics

Lecture Sections:

L01: MoWeFr, 13:00-13:50, ST 148

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

http://geoscience.ucalgary.ca/geoscience_info/courses/f15

Dr. D. Eaton, Office: ES 214, Ph. 403-220-4233, eatond@ucalgary.ca

Office Hours: Tu Th 2:30-3:30 pm or by appointment

Desire 2 Learn (D2L) course name: F2015GOPH351L01

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

2. Prerequisites: Geology 201, and 202 or 203; Mathematics 253 or 267 or 277 or 283 or Applied Mathematics 219; Physics 211 or 221, and 223. See also Geology [Course Descriptions](#) of the University Calendar.

Antirequisites: Credit for both Geophysics 351 and 359 will not be allowed.

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 Assignments (11)	30%
Midterm exam	20% (Monday November 9, in class)
Final Examination	50% (To be scheduled by the Registrar)

Each piece of work, e.g., assignment or exam(s), submitted by the student will be assigned a percentage score. The score for the exam(s) and the average score for the assignments will be combined with the weights indicated above to produce an overall percentage for the course, which will be used to determine the course letter grade. The conversion between course percentage and letter grade is given below. The lower number P in the A to D+ percent ranges below can be determined from the formula $P = 10 * GPV + 43$, where GPV is the grade point value of the letter grade.

Letter Grade	GPV	Percent	Letter Grade	GPV	Percent
A+	4.0	90-100	C+	2.3	66-70
A	4.0	83-90	C	2.0	63-66
A-	3.7	80-83	C-	1.7	60-63
B+	3.3	76-80	D+	1.3	56-60
B	3.0	73-76	D	1.0	50-56
B-	2.7	70-73	F	0.0	0-50

Scores within 0.5% of the upper boundary of a Percent range (e.g., 79.5%) may or may not be rounded up at the discretion of the instructor (a decision will be made based on the student's performance in the course). For percent grades on a boundary, the higher grade will be chosen (e.g., 73% is a B, not a B-).

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: Fowler, C.M.R. (2005). *The Solid Earth: An Introduction to Global Geophysics*, 2nd edition. Required. Available at the bookstore.

Mussett, A.E. and Khan, M.A. (2000). *Looking into the Earth: An Introduction to Geological Geophysics*, Recommended. On reserve in the Gallagher Library.
Other materials: documents posted on D2L.

6. **Examination Policy:** Students are permitted to bring a single-sided, hand-written crib sheet on standard letter-sized paper into the midterm and final exams. Students should also read the Calendar, [Section G](#), on Examinations.
7. **Writing across the curriculum statement:** In this course, the quality of the student's writing in laboratory reports and exams 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: Approval ORIGINAL SIGNED

Date: August 21, 2015

TENTATIVE LECTURE SCHEDULE

Week of:	Topics
Sept. 7	Introduction. The physical basis for geophysical properties. How Earth's interior is inferred from geophysical methods. Forward and inverse geophysical modeling.
Sept. 14	Tectonics on a sphere. Rotation vectors and rotation poles. Past and present-day plate motions. Plate boundaries and their evolution over time.
Sept. 21	Gravity and geodesy. Newton's Universal Law of gravitation. Gravitational potential and Earth's gravitational field. Geodesy and lithospheric flexure.
Sept. 28	Geomagnetism. Origin of Earth's magnetic field. Magnetic potential and dipole field strength. Rock magnetism. Paleomagnetism and past plate motions.
Oct. 5	Applications of potential-field data. Instruments for measuring gravitational and magnetic field strength. Basic data processing. Forward modeling and inversion.
Oct. 12	Radioactivity and geochronology. Nuclear decay and radioactivity. General theory for radiometric age dating. Overview of geochronology methods. Age of the Earth.
Oct. 19	Terrestrial heat flow. Conductive heat flow. Calculation of simple geotherms. Global heat flow, continents versus oceans.
Oct. 26	Applications of heat flow measurements. The adiabat and melting in the mantle. Metamorphism: geotherms in the continental crust.
Nov. 2	Deep interior of the Earth. Internal structure of the Earth. Convection in the mantle. Earth's core.
Nov. 9	Midterm + Reading Days
Nov. 16	Seismic waves. Linear elasticity. Stress and strain. Basic principles of seismology: waves, rays, Snell's law, Huygens' principle. Reflection and refraction. Surface and body waves.
Nov. 23	Earthquakes and global seismology. Anderson's theory of faulting. Earthquake magnitude scales. Probing Earth's deep interior using seismic waves.
Nov. 30	Applied seismology. Seismic reflection method: data acquisition and basic processing. Seismic refraction method to estimate velocity models.
Dec. 7	Review

TENTATIVE LAB SCHEDULE

Week of:	Topics
Sept. 7	No lab.
Sept. 14	Basic math exercises. Error propagation. Great circle distances. Least-squares method.
Sept. 21	Plate motions.
Sept. 28	Gravity problems. Gravity modelling.
Oct. 5	Geodesy and lithospheric flexure.
Oct. 12	Geomagnetism and paleomagnetism.
Oct. 19	Geochronology problems (computing ages of rock samples).
Oct. 26	Computing heat flux and temperature profiles in the Earth.
Nov. 2	Calculating density, gravity and pressure profiles inside the Earth.
Nov. 9	No lab
Nov. 16	Seismic absorption. Other facets of the seismic method.
Nov. 23	Earthquake magnitude, location, traveltimes.
Nov. 30	Seismic reflection and refraction.