COURSE OUTLINE

University of Victoria
School of Earth and Ocean Sciences
Department of Physics and Astronomy

EOS/PHYS 210
Introductory Geophysics

Fall 2014 (Term 201409, A01)

Class Schedule:

Mondays & Thursdays, 11:30–12:45, Elliot 060.

Instructor:

Dr. Stan Dosso
Office: Room A331, Wright Centre for Ocean, Earth and Atmospheric Sciences
Email: `sdosso@uvic.ca` (Please include "EOS 210" or "PHYS 210" in the subject line)
Office Hours: 3:00–4:00 pm, Mondays and Thursdays (but welcome to check any time or make an appointment)

Teaching Assistant:

Jeremy Gosselin
Office: B313, Wright Centre for Ocean, Earth and Atmospheric Sciences
Email: `jeremyg@uvic.ca` (Please include "EOS 210" or "PHYS 210" in the subject line)

Course Description:

Introduction to seismology, gravity, geomagnetism, paleomagnetism and heat flow, and how they contribute to our understanding of whole Earth structure and plate tectonics.

Prerequisites:

One of PHYS 110, 112, 120 or 122; MATH 100 and 101.

Text:

R. J. Lillie, 1999. *Whole Earth Geophysics: An Introductory Textbook for Geologists and Geophysicists*, Prentice Hall, Toronto. (Selected topics from Chapters 1–10)

Course Website:

The course website is on the UVic CourseSpaces system. Go to `coursespaces.uvic.ca` and enter your UVic NetLink ID and password. You should then find a list of your courses including EOS 210 or PHYS 210.

Class notes, hand-outs, assignments, etc. will be available as pdf files at this site. Handout figures, etc. will be posted at the beginning of the week—please download and bring to class. Class notes will be posted the week after they are given in class as an additional resource. *Please attend classes and take notes!*

Grading:

Weekly Assignments (8 or 9) — 20 %
Midterm Exam (Oct. 20) — 20 %
Final Exam (3 hours) — 60 %

Notes:

- Assignments are due in class one week after they are given out in class.
- All requests for Deferred Status for the final exam must be made at Records Services on a Request for Academic Concession form. No other arrangements are possible.
- No supplemental examinations are offered in this course.
- Marks will be posted at the course website using student numbers. Any student not wanting his/her marks posted must inform the Instructor at the beginning of the course.
- Useful dates: Sept. 16 is the last day to withdraw from courses with 100% return on fees. Oct. 31 is the last day for withdrawal without penalty of failure. Sept. 19 is the last day that students can add courses.
- Any instances of plagiarism or cheating will be reported to the Director of the School of Earth and Ocean Sciences or the Chair of the Department of Physics and Astronomy. Students are advised to refer to the UVic policy on cheating and plagiarism found at `web.uvic.ca/calendar2014/FACS/UnIn/UARe/PoAcI.html`

Percentage	Letter Grade	Num. Grade	Standing
90–100	A+	9	
85–89	A	8	1st Class
80–84	A−	7	
77–79	B+	6	
73–76	B	5	2nd Class
70–72	B−	4	
65–69	C+	3	
66–64	C	2	Pass
50–59	D	1	
< 50	F	0	Fail

Course Outline:

The following is an approximate outline for EOS/PHYS 210. The text will provide a useful reference for most of the material. Note that several topics will be covered that are not in the text, and a number of topics in the text will not be included in the course.

1. **Introduction** (Text pages 14–44; Approx 2 classes)
    - What is Geophysics?
    - Basic Geophysical Approaches
    - Basic Earth Structure (crust/mantle/core; lithosphere/asthenosphere)
    - Basic Plate Tectonics (divergent, convergent, conservative margins, tenets of plate tectonics)
    - Tectonics of the Juan de Fuca Plate system
2. **Seismic Waves in the Earth** (Text pages 45–59; Approx 3 classes)
    - Elastic properties of solids (stress and strain, Hooke's law, bulk modulus, shear modulus, Young's modulus, Poisson's ratio)
    - Body waves (compressional and shear waves)
    - Surface waves (Rayleigh and Love waves)
    - Wave propagation losses (geometric spreading, absorption)
    - Reflection and refraction (wave conversion, Snell's law, critical refraction)
3. **Seismic Refraction** (Text pages 59–96; Approx 3 classes)
    - Critical refractions and head waves
    - Slope-intercept method (single layer, multiple layers, dipping layers, low-velocity layers)
    - Crustal structure and thickness
4. **Seismic Reflection** (Text pages 100-111 ; Approx 2 classes)
    - Reflection time-distance curves (single and multiple layers, Dix inversion)
    - Imaging the subsurface — Seismic data processing (velocity analysis, normal moveout, stacking, migration)
    - Images of geologic/tectonic features
5. **Earthquake Seismology** (Text pages 185–205; Approx 3 classes)
    - Earthquake types and locations (normal/reverse/strike-slip faults, earthquakes at tectonic margins)

- Locating earthquakes (uniform-velocity method, time-distance curves)
- Earthquake magnitude scales (Mercalli intensity, Richter magnitude, surface-wave magnitude, body-wave magnitude, seismic moment, moment magnitude)
- Earthquake seismograms and Earth structure

6. **Gravity and Isostasy** (Text chapter 8; Approx 4 classes)

   - Gravity on the Earth's surface
   - Measuring gravity
   - Gravity corrections and anomalies (latitude adjustment, elevation adjustment, excess mass adjustment, Bouguer gravity anomaly)
   - Isostasy
   - Gravity and geologic/tectonic features
   - Gravity modelling

7. **Heat Flow** (Text chapter 10; Approx 2 classes)

   - Heat sources within the Earth
   - Heat transfer (conduction, convection, radiation, the heat-flow equation)
   - Heat flow measurements
   - Radial temperature variation
   - Oceanic heat flow and evolution of oceanic crust
   - Heat in the earth as a driving force for plate tectonics

8. **Magnetic Methods** (Text chapter 9; Approx 3 classes)

   - Source of magnetic field (geodynamo)
   - Earth's magnetic field (axial dipole model)
   - Magnetic induction and susceptibility
   - Magnetization and magnetic anomalies
   - Paleomagnetism (geomagnetic polarity time scale)
   - Oceanic magnetic anomalies and plate kinematics