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OUR DYNAMIC PLANET EARTH
ERTH 1010
Summer 2019

Course Outline

Why should you want to take a course in Earth Science? Here's why: nearly everything that we do is connected in some way to the physical Earth; its lands, oceans, atmosphere, plants and animals. The materials used for our homes and offices, the clothes that we wear, our sources of energy, our drinking water, the air that we breathe, and the food that we eat, are all in some way derived from our planet. The Earth Sciences offer an integrated and interdisciplinary approach to understanding Earth, and apply knowledge from biology, chemistry, physics, ecology and mathematics to tackle complex issues. As our human population approaches 8 billion people, and if we wish to maintain and improve the quality of life on this planet, then we are required to understand and appreciate the complex processes that control our planet.

Earth science benefits everyone! Sedimentologists and ocean geochemists study climate patterns of the past in order to understand the causes of our current global warming event. Seismologists monitor earthquake activity in order to evaluate earthquake risk in populated areas and understand how and why faults occur. Hydrologists and geochemists study water quality and the availability of clean, long-term water sources. Volcanologists investigate the current and past activity of volcanoes to determine the risk to local populations that inhabit the fertile slopes of these edifices and to explore how the interior of the Earth melts to form the lavas erupted at volcanoes. Paleontologists study the record of life on Earth recorded as fossils in rocks, providing fundamental information on the condition of the planet and its effect on life through time. Resource specialists focus on finding and extracting the raw materials needed for modern industry and society, such as petroleum products, iron, copper, zinc, silicon, and talc.

Understanding Earth science empowers you to think globally and act locally. Only if you understand the Earth system can you make informed decisions about issues that effect our daily lives. Should I buy a house built along the shore of a river? If I am buying a car, should I get a diesel, gasoline, hybrid or electric vehicle? Where will the electrical power of the future come from? Why should I recycle plastic containers? If we have so much water in Canada, why are sources of drinking water difficult to find? Why is the mining of tar sands in Alberta such a controversial issue?

In December 2004, a huge earthquake ripped through the northwestern part of Indonesia, causing a tsunami (commonly but incorrectly called a tidal wave) that inundated the shores of Thailand, Sumatra, and India, among other countries. Tourists and local inhabitants alike ran to the beaches as the water receded from the shore just prior to the arrival of the 10-metre high wave. Ignorance of the fact that sea level drops locally in advance of a tsunami cost thousands of people their lives. In the March, 2011, earthquake off the coast of Japan, a tsunami much larger

than imagined inundated a nuclear power plant, shutting down power supplies for cooling water and exposing the radioactive core of the plant. Ignorance of, or misjudging, how the Earth works is the norm in North America and elsewhere in the world, placing many of us at risk.

This course will provide you with a broad overview of the Earth system. We will discuss the origin of the Solar System, the Earth and Moon, and how meteorites retain a record of the composition of the early Earth and planets; the Earth as a layered planet; geologic time and radiometric dating of rocks and minerals; minerals and how they form; the evidence for the theories of continental drift, seafloor spreading and plate tectonics, or "Why our Planet is Mobile"; rocks, including the major igneous, sedimentary and metamorphic rock types; earth resources, including metals, and energy, their extent and limitations, and potential resources of the future; and finally, the geology of Canada.

The course includes TWO major components. Instruction consists of three hours of lectures per week via CUOL (T section: all lectures released at once, video in Loeb D299, or *Video-On-Demand*). The second component involves weekly assignments that will be available via cuLearn. These assignments will primarily be based on new advances in Earth Sciences or major events occurring around the globe, and *may not be directly tied to the lectures*. The goal of the assignments is to demonstrate how Earth Sciences are important in our daily lives.

TEXTS AND REQUIRED MATERIALS

"**Physical Geology:** by Plummer, Carlson and Hammersley, 16th edition. Available at the Bookstore. A used copy of an earlier edition (14-15) of this book is acceptable.

EVALUATION

Theory: 60% 1 Mid-term Exam (20% each), Final Exam (40%).
Assignments: 40% Weekly Assignments (5 worth 8% each)

The **mid-term exam** will be held OUTSIDE OF CLASS TIME, on Saturday June 1st from 12:00 – 2:00PM, since students are taking this course through CUOL. The **final exam** will be scheduled during the June exam period and will be cumulative.

LEARNING OUTCOMES

By the end of the course, each successful student will acquire the following skills and knowledge sets in the lecture sessions:

• Each student will demonstrate an understanding of the process of Earth formation and differentiation, the internal structure of Earth, and the origin of meteorites.

• Each student will demonstrate the ability to characterize fundamental earth materials, including minerals and rocks, and to understand the physical, chemical and biological processes by which they formed.

• Each student will demonstrate a knowledge of how faults form, why motion on faults produces energy, the links between energy, seismic waves and earthquakes, and how seismic waves are used to investigate Earth's internal structure.

• Each student will demonstrate an understanding of gravity, magnetism and heat flow on Earth, why the Earth's gravitational and magnetic fields vary over the Earth's surface, and why these geophysical properties are useful in describing deep geological structures in the crust, mantle and core.

• Each student will demonstrate an understanding of the theories of continental drift and plate tectonics, the geophysical evidence supporting plate tectonics, and be able to describe how plate tectonics operates.

• Each student will demonstrate an understanding about Earth's natural systems (lithosphere, atmosphere, hydrosphere) and its resources, and how the geology and resources impact the economy of Canada.

Conflicts with Examinations or Assignments

Students with conflicts for any examination must have a note from an employer or a medical certificate (see below) in order to write the exam at another date. Unless caused by illness, all conflicts **MUST** be reported to the instructor **PRIOR** to the exam date. If an assignment is missed for a valid reason, contact the ERTH1010 Teaching Assistant immediately. In the case of a serious illness, see **http://carleton.ca/registrar/special-requests/deferral/** for the rules concerning deferral of an exam or assignment.

No outside study aids (calculators, notes) will be allowed for any lecture-based exams. Any materials required for the lecture-based exams will be provided by the instructor.

STUDENT ACCOMMODATIONS

Requests for Academic Accommodation
You may need special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

Pregnancy obligation
Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: **carleton.ca/equity/wpcontent/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Religious obligation
Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: **carleton.ca/equity/wpcontent/uploads/Student-Guide-to-Academic-Accommodation.pdf**

Academic Accommodations for Students with Disabilities
If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made.
carleton.ca/pmc

Survivors of Sexual Violence
As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: **carleton.ca/sexual-violence-support**

Accommodation for Student Activities
Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist.
https://carleton.ca/senate/wpcontent/uploads/Accommodation-for-Student-Activities-1.pdf
For more information on academic accommodation, please contact the departmental administrator or visit: **students.carleton.ca/course-outline**

Medical Certificates
Please note, that in this course, on all occasions that call for a medical certificate you must use (or furnish the information demanded in**): http://carleton.ca/registrar/wpcontent/uploads/med_cert.pdf**

PLAGIARISM
The University's Senate defines plagiarism in the regulations on instructional offences as: "to use and pass off as one's own idea or product work of another without expressly giving credit to another". ***This includes copying of material from websites or other publications that is incorporated into assignments, reports, or other submissions for grading.*** Borrowing someone else's answers, unauthorized possession of tests or answers to tests, or possession of material designed in answering exam questions, are all subject to university policy regarding instructional offences. For this course (and all other courses at Carleton), it is extremely important to understand that you cannot copy and paste material from websites or publications into the assignment answer boxes on cuLearn. This is plagiarism, and it is easy to spot during grading of weekly assignments. When formulating an answer to an assignment question, be sure to reword the material from websites or publications into your own words, then type that into the answer boxes. Identification of copied material in an assignment answer will result in an automatic zero

points for that question. I encourage students to work together on assignments. HOWEVER, each student must submit answers to questions in *their own words*, not the words used by another student that you are working with. *Be sure that you and your co-worker word your submitted answers differently.* If the answers submitted by one student for an assignment are identical to those submitted by another student, both students will be assigned a grade of zero for the question. Details regarding the Carleton University Academic Integrity policy can be found at: **http://carleton.ca/senate/wp-content/uploads/Academic-Integrity-Policy1.pdf**

LECTURE TOPIC SCHEDULE

Lecture	Suggested Dates	Topics	Text Chapter
1	05/06	Course Intro; Solar System	1, 8
2	05/08	Planetary Geology, Earth Formation, The Continents, Geochronology	1, 8
3	05/13	Minerals	2
4	05/13	Minerals	2
5	05/15	Igneous Rocks	3, 4
6	05/15	Volcanoes	3, 4
7	05/17	Sedimentary Rocks	6
8	05/21	Metamorphic Rocks	7
9	05/23	Earth Interior, Seismology	16, 17
10	05/27	Seismology, Earthquakes	16, 17
11	05/29	Gravity, Isostacy	17
	06/01	**Midterm Exam**	
12	06/03	Heat Flow	17
13	06/05	Geomagnetism	17
14	06/07	Plate Tectonics	17, 18, 19
15	06/07	Plate Tectonics	17, 18, 19
16	06/10	Rock Deformation	15
17	06/10	Rock Deformation	15, 20
18	06/12	Resources; Water, Metals	11, 22
19	06/12	Resources; Energy	22
20	06/14	Geology of Canada	PDF
21	06/14	Geology of Canada	PDF
22	06/17	Careers in Earth Science	
23	06/18	Review	
24	06/18	Review	