

**EAS 105A The Dynamic Earth Through Time**

*3 Credits, 16 weeks, 3 Hours Lecture, 3 Hours Lab per week*

The plate framework of a dynamic earth as it relates to the origin of major groups of minerals and rocks. Earthquakes, structural geology, and the origin of mountain belts. Surface processes and their sedimentary products. History of life and extinctions.

*Prerequisite: EAS 100 or EAS 102.*

**Instructor**

Neil O'Donnell

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**Office Hours (Winter 2015)**

Monday 12:30 – 1:30

Tuesday 1:00 – 3:00

Thursday 1:00 – 3:00

**Hours of Instruction**

Monday 8:00 – 10:50 (Lab)

Wednesday 1:00 – 1:50

Thursday 3:00 – 3:50

Friday 12:00 – 12:50

**Required Resources**

**The Changing Earth**, 7<sup>th</sup> edition, ISBN-13: 978-1-285-73341-8  
**Geological Highway Map of Alberta**

**Course Outcomes**

The successful student will be able to:

- Describe the development and significance of plate-tectonic theory; show real examples of the role of tectonics in shaping the Earth; and relate tectonics to the geology of Canada.
- Properly use maps and examples to show geomorphology of tectonic zones and then calculate spreading / subduction rates.
- Learn the overarching classification scheme for minerals; understand the chemical nature of the main mineral groups; and understand the physical and chemical properties of the main rock-forming minerals.
- Develop basic skills in mineral description by investigating and reporting the physical characteristics of the main rock-forming minerals.
- Understand the role of igneous rocks and processes in the context of the rock cycle; describe and link magmatic processes in the context of plate tectonics; and learn the main igneous rock types and their relationship to plate tectonics.

- Develop basic skills in rock description by investigating and reporting the main igneous rock types.
- Learn and understand the range and style of rock deformation; link tectonics and rock deformation; study the range of deformed rock types and their significance in a paleogeographic context; and learn the main metamorphic rock types and their relationship to plate tectonics
- Understand the role of soil / sediment / sedimentary rocks and sedimentary / geomorphological processes in the context of the rock cycle; describe the main weathering and material transport mechanisms observed on Earth's surface; and learn the main sedimentary rock types and their relationship to plate tectonics.
- Learn and understand the geological time scale; review the general geological characteristics of the geological periods; and interpret relative age relationships from geological maps.
- Develop an appreciation of geological time and the relative apportionments of Earth's geological phases with respect to absolute time; also to memorize aspects of the geological time scale.
- Learn and understand the geological character of Precambrian Earth, the paleontological database of ancient life, craton-configuration components, and examples of various shield rocks.
- Learn and understand the evolution of the Earth's surface during the Phanerozoic eon in the context of plate tectonics, the paleontology of time-scale periods, and continent configuration and life.
- Develop basic skills in fossil description by describing and sketching the typical fauna (from fossil examples) of the different periods.

### Evaluation

Labs(9) & Assignments(2)	35%
On-Line Quizzes (by Chapter)	5%
1 <sup>st</sup> Half Exam (February)	10%
2 <sup>nd</sup> Half Exam (April)	10%
Final Exam	40%
Total	100%

*A grade of C- is required for progression or transfer.*

### Grading System

Descriptor	Alpha Grade	4.0 Scale	Percent	Rubric for Letter Grades
Excellent	A+	4.0	> 92.9	Work shows in-depth and critical analysis, well developed ideas, creativity, excellent writing, clarity and proper format.
	A	4.0	85 – 92.9	
	A-	3.7	80 – 84.9	
Good	B+	3.3	77 – 79.9	Work is generally of high quality, well developed, well written, has clarity, and uses proper format.
	B	3.0	74 – 76.9	
	B-	2.7	70 – 73.9	
Satisfactory <b>Progression</b>	C+	2.3	67 – 69.9	Work has some developed ideas but needs more attention to clarity, style and formatting.
	C	2.0	64 – 66.9	
	C-	1.7	60 – 63.9	
Poor <b>Minimum Pass</b>	D+	1.3	55 – 59.9	Work is completed in a general way with minimal support, or is poorly written or did not use proper format.
	D	1.0	50 – 54.9	
Failure	F	0.0	< 50	Responses fail to demonstrate appropriate understanding or are fundamentally incomplete.

**Proposed Schedule of Topics (Lectures)**

1. Introduction
  - Preamble and introduction to the course; study of the Earth as a heat engine.
  - Review rock cycle.
2. Tectonic Framework and the formation of Lithosphere (1 week)
  - Plate boundaries and their characteristic processes
  - Examples of the products of plate tectonics
  - Plate tectonics and the Geology of Canada
3. Minerals (1 week)
  - Main groups and classification of minerals
  - Chemical composition and structures of major mineral groups
  - Physical and chemical properties of rock-forming minerals
4. Igneous processes including intrusive activity and volcanism (1 week)
  - Igneous processes and rocks
  - Magmatic processes and their relationship to tectonic setting
  - Classification and identification of igneous rocks
5. Structural Geology (1 week)
  - Deformation processes
  - Identification and characteristics of major structures: folds, faults, etc.
  - Tectonic interpretation of structures; orogens and orogenic belts
6. Metamorphism and metamorphic rocks (1 week)
  - Causes and types of metamorphism
  - Plate tectonic context of metamorphism
  - Major types of metamorphic rocks and their characteristics
7. Processes at the Earth's surface (2 weeks)
  - Weathering and soil
  - Flow and transport of sediment by air, water, and ice
  - Main types of sediment and sedimentary rock
  - Sedimentary environments and their tectonic setting
  - Unconformities
8. The geological timescale (1 week)
  - Introduce the geological timescale and the main subdivisions of geologic time
  - Review methods of stratigraphic correlation and measuring of geologic time
9. Precambrian Earth and life, Canadian Shield (1 week)
  - Characteristics of the Precambrian Earth
  - Paleontological database of Precambrian life
  - Major elements of the Canadian Shield
10. Paleozoic Earth and life (1 week)
  - Continental margins of North America in the Paleozoic
  - Major groups of fossils from the Paleozoic
11. Mesozoic and Cenozoic Earth and life (1 week)
  - History of North America in the Mesozoic and Cenozoic; Rocky Mountains
  - Major groups of Mesozoic fossils: dinosaurs, invertebrates
  - Major Cenozoic fossils: mammals
  - History of Glaciation

**Proposed Schedule of Topics (Laboratory classes)**

- Week 1. Introduction in lab. Ensure all students have Keyano-specific WHMIS certification.
- Week 2. Plate tectonics: Use maps and examples to show geomorphology of tectonic zones and then calculate spreading / subduction rates.
- Week 3. Minerals and their atomic structure: Develop basic skills in mineral description by investigating and reporting the physical characteristics of the main rock-forming minerals.

- Week 4. Igneous processes and rocks: Learn the scale and morphology of igneous processes through geological map interpretation exercises and air-photo interpretation; also develop basic skills in rock description by investigating and reporting the main igneous rock types.
- Week 5. Structural Geology: build structural block diagrams and interpret maps. Include Earth Surface Processes: Learn the scale and morphology of sedimentary processes through geological map interpretation exercises; also develop basic skills in rock description by investigating and reporting the main sedimentary rock types.
- Week 6. Metamorphism and metamorphic rocks: Mapping metamorphic zones (e.g. Barrovian sequence); develop basic skills in rock description by investigating and reporting the main metamorphic rock types.
- Week 7. NO LAB. Family Day holiday.
- Week 8. NO LAB. Reading Week.
- Week 9. The Geological Time scale: Develop an appreciation of geological time and the relative apportionments of Earth's geological phases with respect to absolute time; also to memorize aspects of the geological time scale.
- Week 10. Precambrian Earth and life, Canadian Shield: Precambrian fossils, configuration of cratons, examples of shield rocks.
- Week 11. Paleozoic Earth and life; the Paleozoic of North America: Develop basic skills in fossil description by describing and sketching the typical fauna (from fossil examples) of the periods.
- Week 12. Mesozoic Earth and life; the Mesozoic of North America: Develop basic skills in fossil description by describing and sketching the typical fauna (from fossil examples) of the periods.
- Week 13. Cenozoic Earth and life; the Cenozoic of North America: Develop basic skills in fossil description by describing and sketching the typical fauna (from fossil examples) of the periods. Includes Pleistocene and Holocene Earth and life. Glaciation.
- Week 14. NO LAB. Easter Monday holiday.
- Week 15. Catch up & review lab.

**Please Note:**

Date and time allotted to each topic is subject to change. It is your responsibility as a student to contact the Office of the Registrar to complete the forms for Withdrawal or Change of Registration, and any other forms. Please refer to the list of important dates as noted in the Academic Schedule in the Keyano College Credit Calendar.

**Performance Requirements**

Laboratory work will be conducted weekly starting the first week of classes. Labs will be graded. Completion of the labs and a passing grade on that component of the course are considered mandatory to pass EAS 105.

The labs will run 3 hours per week. Attendance is mandatory. Students may hand in completed assignments before the end or at the end of **that** lab session, or no later than one week following, with no penalty. Ordinarily, after one week, a late penalty will be assessed, as outlined below.

**Due Dates**

- Due Dates usually are set for one week following a lab, video assignment, report, field trip, or presentation.
- Unless specified differently by instructor, labs, reports, and assignments will be submitted electronically via Moodle.
- If submitted on or before the Due Date – full marks; *may be extended another 7 days for reasonable cause approved by instructor.*
- Otherwise, if submitted within one week (7 days) after the Due Date – 50% of regular mark.

- More than one week late – must be handed in, but will not be marked – zero assigned.
- Any changes due to special circumstances will be communicated by instructor via Moodle.

**Term Mark**

- Will be determined from all the labs, reports, and assignments.
- Mark will be weighted average of all submissions.
- If 20% or more of submissions (labs, reports, and assignments) are missing, student will not be allowed to write the final exam.

**Laboratory Safety**

In the science laboratories, safety is important.

Students must complete the *WHMIS for Students* online training course on Moodle before entering the science laboratories.

Students must comply with the mandatory laboratory safety rules for this course as provided in the laboratory manual. Failure to do so will result in progressive discipline such as a verbal warning, refused entry into the laboratory, or suspension from the College.

**Student Attendance**

Class attendance is useful for two reasons. First, class attendance maximizes a student's learning experience. Second, attending class is a good way to keep informed of matters relating to the administration of the course (e.g., the timing of assignments and exams). Ultimately, you are responsible for your own learning and performance in this course.

It is the responsibility of each student to be prepared for all classes. Students who miss classes are responsible for the material covered in those classes and for ensuring that they are prepared for the next class, including the completion of any assignments and / or notes that may be due.

**Academic Misconduct**

Students are considered to be responsible adults and should adhere to principles of intellectual integrity. Intellectual dishonesty may take many forms, such as:

- Plagiarism or the submission of another person's work as one's own
- The use of unauthorized aids in assignments or examinations (cheating)
- Collusion or the unauthorized collaboration with others in preparing work
- The deliberate misrepresentation of qualifications
- The willful distortion of results or data
- Substitution in an examination by another person
- Handing in the same unchanged work as submitted for another assignment

Penalties for academic offences range from a verbal reprimand to dismissal from the College, and in certain circumstances may involve legal action.

**Specialized Supports****Counselling and Disability Services**

Counselling Services provides a wide range of specialized counselling services to prospective and registered students, including personal, career and academic counselling.

**SKILL Centre**

The SKILL Centre is a learning space in the Clearwater Campus at Keyano College where students can gather to share ideas, collaborate on projects and get new perspectives on learning from our tutorial staff.

The SKILL Centre, through a variety of delivery methods, provides assistance in skill development to Keyano students. Assistance is provided by instructors, staff and student tutors. Individuals wishing to improve their mathematics, writing, grammar, study, or other skills, can take advantage of this unique service.

**Authorization**

This course outline has been reviewed and approved by the Program Chair.

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Neil O'Donnell, Instructor

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Louis Dingley, Chair

Date Authorized

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Guy Harmer, Dean

Date Authorized

**Signed copies to be delivered to:**

Instructor

Registrar's Office