EESB15H3 F - Earth History

Fall 2023 Syllabus

**Prerequisites**: EESA06H3

**Corequisites**: None

**Exclusions:** None

**Recommended Preparation**: None

**Credit Value:** 0.5

| **Section** | **Date & Time** | **Delivery Mode & Location** |
| --- | --- | --- |
| **LEC01** | Wednesday, 4:00 PM - 5:00 PM Thursday, 7:00 PM - 8:00 PM | In Person: HW 216 In Person: HW 216 |
| **TUT0001** | Monday, 8:00 AM - 10:00 AM | In Person: IC 120 |
| **TUT0002** | Tuesday, 9:00 AM - 11:00 AM | In Person: IC 326 |
| **TUT0003** | Friday, 8:00 AM - 10:00 AM | In Person: IC 320 |

**First lecture is on: Wednesday Sept. 6, 2023 at  4-5 pm   (HW216)**

**First lab starts the week of Sept. 11.**

## Course Contacts

**Course Website:** <https://q.utoronto.ca/courses/313015>

**Instructor:** Prof. Heidi Daxberger

**Email:** [heidi.daxberger@utoronto.ca](mailto:heidi.daxberger@utoronto.ca)

**Phone:** 416 208-5136

**Office Hours and Location:** Thursday 12 pm - 1 pm, in EV224 lab or EV466 office

**Additional Notes:** Teaching Assistants: Phillip Rusica, Syed Bukhari, Edina Illyes, Lava Chandran

## Course Overview

Planet Earth is at least 4,400 million years old, and a geological record exists for at least the last 3,900 million years in the form of igneous, metamorphic, and sedimentary rocks. The changing dynamics of convection deep within the Earth's mantle and associated supercontinent assembly and breakup along with meteorite impacts, are now recognized as the major controls on development of the planet's atmosphere, oceans, biology, climate, and geo-chemical cycles. This course reviews this long history and the methods and techniques used by geologists to identify ancient environments.

During this Earth History course, we will utilize in-person lectures, online modules (accessible via links on Quercus), in-person labs and field trips, discussion board posts, online quizzes as well as online glossaries to learn about our planet’s development and evolution.

In the first half of this course, you will learn about the building blocks of our planet and the most important geological processes and concepts that underlie Earth’s formation and evolution. Then we will move on to learning about the 4.56 billion year-long evolution of our planet during which we will hear about global events and processes, but often will focus on the evolution of the North American Continent in a bit more detail.

We will be starting with the tiniest building blocks of our planet, chemical elements and minerals, and move on to how and where rocks (e.g. igneous, sedimentary and metamorphic rocks) are formed and how these can help us deciphering Earth’s historical record of the past 4.56 billion years. We will discuss how the study of plate tectonics emerged and how this process constantly reshapes our planet’s surface. Preservation of long dead organisms (fossils) and rock records help us to delineate exactly these plate tectonic movements and therefore the evolution of Earth’s continental masses we all live on today.

The rock record and accumulated knowledge of short- and long-term geological processes, as well as rock and sediment properties, becomes more and more important as the human population grows. We are in dire need of a clear understanding of processes such as plate tectonics/rock deformation process (e.g. earthquakes), formation of natural resources (e.g. minerals, oil/gas), fresh water reservoir formation (porous rock). All this we can learn from our planet's past, so we hopefully use and protect all resources as efficiently as possible and most importantly are more informed on how to protect our environment for future generations.

One of the lab exercises in this course will be a **mandatory In-Person field trip to Port Colborne (Niagara Region, Ontario),** where we will practice the learned skills such as rock and fossil description and identification. At this field site one can see that the rocks provide us information regarding paleo-environments and possible plate tectonic events that took place in NE-Northern America during the Devonian time period.

My biggest course goal is to make you all more aware of your environment and what it can tell you. Our planet is beautiful, and its development is one big riddle. And everywhere are clues in the form of minerals, rocks, fossils (etc.) for you to investigate. With their help we can figure out what happened in the most recent past or even billions of years ago.

### Course Learning Outcomes

This course aims to introduce and develop the basic geo-scientific and soft skills so you as a student will be able to/has developed:

* **use** geology specific terminology
* **explain** basic geologic concepts and processes (e.g. rock formation, plate tectonics…)
* **apply** the learned knowledge about geological concepts and methods during lab exercises and a (virtual) field trip.
* **describe, identify, and differentiate** between important minerals, rock types and fossils, as well as drawing conclusions about their formation (lab exercises, field trip).
* **retrieve and interpret** basic geologic information from geological maps, cross-sections, and 3D box models (lectures, lab exercises)
* **relate** given data (e.g. fossil occurrence, rock type) to respective geologic processes, environments or historical events (lectures, lab exercises, field trip)
* **work** in a team during lab exercise

## Course Materials

**Text Recommended:**        **H. Levin, The Earth Through Time, newest edition, Wiley** (11-10th editions ok, available as **e-books, course reserve**)

**Open Access Texts:**        see Quercus Home Page for more information!

**Other** **good sources:**       St. M. Stanley & J.A. Luczaj, Earth System History, Freeman (course reserve)

**Study Questions – Group or Individual Work:**

I will post a set of study questions on each course topic, which should help you to identify the important course information, study for the quizzes and exams, prepare you for the field trip and to keep on top of the material.

## Marking Scheme

| **Assessment** | **%** | **Details** | **Due Date** |
| --- | --- | --- | --- |
| **10x Laboratories** | 30% | Ten Lab exercises during which attendance will be taken. Each lab is worth 3 % of final grade (total 30%). During the lab time you will work in a group and/or individually but the submission is for each student individually.  For Lab 1 to Lab 5, the assignments will include the description and identification of hand samples. Your results are to be submitted in the form of a Quercus online quiz (mandatory: submission by end of lab time). The lab online quiz submission depends on the availability of a smartphone or laptop during the lab time. Please contact me if this is not possible so other arrangements can be made.  Lab 6 to Lab 8 are done on paper and will be handed in individually or in pairs by the end of 2 hours. | See schedule |
| **Field Trip (Port Colborne)** | 4% | This field trip (Oct. 21, Oct. 22, 2023) is mandatory for all students. A fee for transportation will arise, which we will keep as low as possible.  During the field trip groups of 2-4 students (best 4) will look at the local fossils and rocks (field trip participation 1%). Field trip assignment (report) will be available on Quercus at the date of the trip and must be completed & submitted by Monday October 23 at 5 pm in the course drop box in EV building 2nd floor or during your Monday’s lab (or Thursday/Friday lab the week before the deadline). This assignment sheet (report) is a group assignment and is worth 3% of final grade.  Furthermore, we are outdoors and therefore some preparations are needed:  - Be prepared for any kind of weather (sun vs. rain: rain jacket, sun screen, hat)  - Sturdy footwear (at least running shoes, preferably hiking boots)  -> NO open-toed shoes, sandals, or heels!!!  - Adequate clothing (long pants, layers, rain cloth)  - Safety goggles or light tinted sunglasses  - Daypack with an adequate amount of water and lunch (+ smaller snack)  - If possible small camera, field book (e.g. small notebook), pencil & pen  - See “Intro to field safety” PDF on quercus.  Additional required safety equipment (e.g. hard hats, additional safety goggles) will be supplied by the department. | 2023-10-21,  2023-10-22 |
| **6x Online Quizzes** | 12% | 6 online quizzes will be posted. Each quiz will consist of roughly 15-25 questions and is worth 2 % (12% total) of final grade.  These quizzes will test the knowledge and skills practiced in the respective module or module section.  **Quiz Schedule & Topics (preliminary) Dates:**  Quiz 1 Module 1 + 2: **Minerals + Igneous Rocks**  Friday - Sunday, Sept. 22 - 24 (midnight)  Quiz 2 Module 3.A. + 3.B: **Sedimentary Rocks + Fossils**  Friday - Sunday, Sept. 29 - Oct. 1 (midnight)  Quiz 3 Module 4 + 5: **Metamorphic Rocks + Earth’s Pro. Geol. Processes, Plate Tect.**  Friday - Sunday, Oct. 6 - 8 (midnight)  Quiz 4 Module 6 + 7: **Geologic Principles & Geol. Time + Hadean, Archean, Proterozoic**  Friday - Sunday, Oct.27 - 29 or Nov. 3-5 (midnight)  -> depends on Mid term Date!  Quiz 5 Module 8.A. + 8.B.: **Early + Late Paleozoic + Field Trip**  Friday - Sunday, Nov. 17 - 19 (midnight)  Quiz 6 Module 9 + 10: **Mesozoic times + Cenozoic times**  Friday - Sunday, Dec. 1 - 3 (midnight) | See schedule + here |
| **Course Participation** | 3% | ALL students are expected to attend ALL lectures. It is the responsibility of the student to ensure that notes are obtained for any classes missed.  Your active course participation is worth 3% of the final grade (grade is not based on the correct answer, but participation). You can miss up to 25% of the (live - recorded lecture) activities without losing grades, hence if your participation is between 100-75% off all lectures, you will get the full 3%. If your participation is between 75 and 50% you will get 1.5% of the participation mark. If your participation is below 50% no participation marks will be given (0%). | 2023-12-04 |
| **Glossary Entries** | 3% | Part of the course work is to create **SIX glossary posts (each 0.5%, total 3%)**. The glossary (make your own geo-dictionary) is hosted on Quercus and will include the most important new terminology of the course. You can select **six terms** from the glossary list on Quercus. Student contributions will be monitored by the TAs and instructor throughout and by the end of the term (grade based on quality of term definition – figure/diagram if applicable).  **THREE of the posts have to be finished by October 23, and the second set of THREE posts by December 4, 2022!** | 2023-10-23  2023-12-04 |
| **Bell Ringer Test** | 2% | At the end of the term a Bell Ringer Test will be held (during week 12, Nov. 28-Dec. 1) in preparation for the final exam in the beginning of the lab. This c. 20 min test will test your mineral, rock and fossil ID skills and is based on the lab samples. | Lab time – last week |
| **Mid Term Test** | 20% | Mid Term Test:  The Mid Term Test is cumulative up to the by the Registrar’s Office scheduled date. The exam will be a 2-hour In Person Test. This may include multiple choice/matching and short answer questions, as well as potentially open-ended questions, critical thinking, drawing of graphs/diagrams, geological data (etc.). More information will be distributed closer to the end of the term. | TBD by Reg. Office |
| **Final Exam** | 26% | The final examination is cumulative and will be scheduled by the University and held during the December examination period. The exam will be a 3-hour In Person Test. This may include multiple choice/matching, short answer questions, open ended questions, critical thinking, drawing of graphs/diagrams, geological data (etc.). More information will be distributed closer to the end of the term. | Final Exam Period |

### Late Assessment Submissions Policy

The dates for each lab assignment and course quizzes (mostly done in form of Quercus quizzes, lab assignments mostly due at the end of each lab) are provided on the course website (see due dates of quizzes) and are shown in the course schedule. Most of the assignments are automatically graded upon submission by Quercus.

All other deadlines that have to be adhered to are mentioned in each section (e.g. Glossary).

If a student submits the assignment late, Quercus Gradebook will automatically apply late submission policies. For example, the late submission policies for this course are **a 5% deduction per day**.

## Course Schedule

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Week** | **Lect Nr.** | **Day** | **Lect. Date** | **Course Topics** | **Module** | **Lecture topic** | **Lab topic** | **Quiz topic** | **Other** |
| 1 | 1 | Wednesday | Sept. 6 | Intro to Geology | Mod. 1. Minerals | Intro + Minerals | **NO LAB** |  | no TA office hour |
| 2 | Thursday | Sept. 7 | Elements & Minerals |
| 2 | 3 | Wednesday | Sept. 13 | Mod.2. Igneous Rocks | Igneous Rocks | **In Person Lab Module 1:** Minerals |  |  |
| 4 | Thursday | Sept. 14 | Mod. 3A. Sedimentary Rocks | Igneous rocks & Sediments - Sed. Rocks, Weathering |
| 3 | 5 | Wednesday | Sept. 20 | Sediments - Sed. Rocks: Erosion & Transport | **In Person Lab Module 2:** Igneous Rocks + Minerals | Friday to Sunday, **Quiz Mod.1 + 2:** Minerals & Igneous R (Sept. 22-24) |  |
| 6 | Thursday | Sept. 21 | Sediments - Sed. Rocks: Classification & Structures |
| 4 | 7 | Wednesday | Sept. 27 | Mod. 3.B. Fossils | Sediment Structures - fossils | **In Person Lab Module 3.A:** Sedimentary Rocks + Minerals | Friday to Sunday, **Quiz 3A + 3.B:** Sedimentary Rocks & Fossils etc. (Sept. 29 - Oct 1) |  |
| 8 | Thursday | Sept. 28 | Mod. 4: Metamorphic Rocks | Fossils + Metamorphic Rocks |
| 5 | 9 | Wednesday | Oct. 4 | Mod. 5: Earth's Prop, Geo. Processes, Plate Tectonics | Metamorphic Rocks + Earth's Properties | **In Person Lab Module 3.B.**: Fossils | Friday to Sunday, **Quiz Mod. 4 + 5**: Metam. Rocks, Geol. Proces., Plate Tect. (Oct. 6 - 8) |  |
| 10 | Thursday | Oct. 5 | Mod. 5: Earth's Prop., Geol. processes, Plate Tectonics | Plate Tectonics / Deformation |
| **Reading Week: Oct. 9 – 13, 2023** | | | | | | | | |  |
| 6 | 11 | Wednesday | Oct. 18 |  | Mod. 6. Geologic Principles & Time: | Plate Tectonics + Time | **In Person Lab Module 4:** Metamorphic Rocks + Minerals | **Field Trip to Port Colborne: Sat. + Sun. (Oct. 21 + 22)** |  |
| 12 | Thursday | Oct. 19 | Earth History | Module 7: Hadean – Proterozoic Times | Geologic Time + Hadean - Archean |
| 7 | 13 | Wednesday | Oct. 25 | Proterozoic | **In Person Lab Module 6:** Fossils, Geol. Time and Principles | **Potential Midterm : in person (TBA by Reg. Office) - ideal date: Friday?** | Friday to Sunday, **Quiz Mod. 6 + 7 (either weekend of Oct. 27 or Nov. 3):** Geol. Princ., Geol. Time, Hadean - Prot. |
| 14 | Thursday | Oct. 26 | Proterozoic Life |
| 8 | 15 | Wednesday | Nov. 1 | Mod. 8: Paleozoic Times | Early Paleozoic Processes | **Online Lab Module 7:** Google Earth - Precambrian | **Potential Midterm : in person (TBA by Reg. Office) - Friday?** |
| 16 | Thursday | Nov. 2 | Early Paleozoic Processes & Life |
| 9 | 17 | Wednesday | Nov. 8 | Late Paleozoic Processes | **In-Person Lab 8 Module 7-9:** The Paleozoic & The Grand Canyon | **Potential Midterm : in person (TBA by Reg. Office) - Friday ?** |  |
| 18 | Thursday | Nov. 9 | Late Paleozoic Life |
| 10 | 19 | Wednesday | Nov. 15 | Mod. 9: Mesozoic Times | Mesozoic processes | **NO LAB** | Friday to Sunday: **Quiz Mod. 8.A+B.**: Entire Paleozoic + Field Trip |  |
| 20 | Thursday | Nov. 16 | Mesozoic processes + Life |
| 11 | 21 | Wednesday | Nov. 22 | Mesozoic life | **Online Lab Module 9**: Google Earth – Investigate Real Geology |  | **TA office hours (2 h)** |
| 22 | Thursday | Nov. 23 | Mod. 10: Cenozoic Times | Cenozoic Geol. Processes |
| 12 | 23 | Wednesday | Nov. 29 | Cenozoic Geol. Processes & Life | **IN PERSON: Bell Ringer + Online Lab Module 10**: Google Earth - Inv. Cenozoic geology | Friday-Sunday, **Quiz Mod 9+10:** Mesozoic + Cenozoic | during lab times (bell ringer) - 4 x 30 min time slots + TA office hours (2 h) |
| 24 | Thursday | Nov. 30 |
| 13 | Dec 5-6 | | | | Study Break | | | | |
|  |
|  | **Exam Period** | | | | **3h - In Person Final Exam** | | | | |  |

## Policies & Statements

### Plagiarism Detection Tool

Normally, students will be required to submit their course essays to the University's plagiarism detection tool for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation website (<https://uoft.me/pdt-faq>).

### Academic Integrity

The University treats cases of cheating and plagiarism very seriously. The University of Toronto's Code of Behaviour on Academic Matters (<http://www.governingcouncil.utoronto.ca/policies/behaveac.htm>) outlines the behaviours that constitute academic dishonesty and the processes for addressing academic offences.  
  
Potential offences in papers and assignments include using someone else's ideas or words without appropriate acknowledgement, submitting your own work in more than one course without the permission of the instructor, making up sources or facts, obtaining or providing unauthorized assistance on any assignment.  
  
On tests and exams, cheating includes using or possessing unauthorized aids, looking at someone else's answers during an exam or test, misrepresenting your identity, or falsifying or altering any documentation required by the University.

### Equity, Diversity and Inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. U of T does not condone discrimination or harassment against any persons or communities.  
  
The University of Toronto is a richly diverse community and as such is committed to providing an environment free of any form of harassment, misconduct, or discrimination. In this course, I seek to foster a civil, respectful, and open-minded climate in which we can all work together to develop a better understanding of key questions and debates through meaningful dialogue. As such, I expect all involved with this course to refrain from actions or behaviours that intimidate, humiliate, or demean persons or groups or that undermine their security or self-esteem based on traits related to race, religion, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, disability, receipt of public assistance or record of offences.

### University Land Acknowledgement

I wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

### Accommodations

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible.  
  
AccessAbility Services staff (located in Rm AA142, Arts and Administration Building) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations 416-287-7560 or email [ability.utsc@utoronto.ca](mailto:ability.utsc@utoronto.ca). The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

### Use of Generative Artificial Intelligence Tools

Students may use artificial intelligence tools, including generative AI, in this course as learning aids or to help produce assignments. However, students are ultimately accountable for the work they submit.  
  
Students may not use artificial intelligence tools for taking tests, writing research papers, creating computer code, or completing major course assignments. However, these tools may be useful when gathering information from across sources and assimilating it for understanding.  
  
The knowing use of generative artificial intelligence tools, including ChatGPT and other AI writing and coding assistants, for the completion of, or to support the completion of, an examination, term test, assignment, or any other form of academic assessment, may be considered an academic offense in this course.