

## ERTH 4803 - Radiogenic Isotope Geology

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Note: if you have a question, or would like to talk with me, feel free to hang around after the lecture, or send me an e-mail and we will schedule a virtual meeting.

**Prerequisites:** ERTH 3003. Also offered at the graduate level as ERTH 5609, for which additional credit is precluded.

**Lectures:** 3h/week, on Thursdays 8:35-11:25am, in 3120 HP.

First class January 11<sup>th</sup> 2024.

### Welcome to this course!

This course looks at radiogenic isotope systematics applied to the solid Earth, and their use to understand geological processes. Major topics covered include: i) long-lived radiogenic isotope systems, and their application for geochronology and the study crust-mantle dynamics; and ii) short-lived radiogenic isotope systems (e.g.,  $^{146}\text{Sm}$ - $^{142}\text{Nd}$ ,  $^{182}\text{Hf}$ - $^{182}\text{W}$ ) and their application to the study of the early history of terrestrial planets

### Learning outcomes:

By the end of the course, students will be able to:

- Describe different radiogenic isotope systems
- State the advantages and limitations of different geochronological techniques
- Apply geochronological techniques to the understanding of geological processes
- Assess geochronological data, create models and develop interpretations

### Useful Book Resources (most also available online):

- Rink, W. Jack, and Thomson, Jeroen W. Thomson, editors. *Encyclopaedia of Scientific Dating Methods*. Springer Netherlands, 2020.
- White, William M. *Isotope Geochemistry*, John Wiley & Sons, Incorporated, 2015.
- Allègre, Claude. *Isotope Geology*. Cambridge University Press, 2008.
- Dickin, AP. *Radiogenic Isotope Geology*. 3<sup>rd</sup> edition. Cambridge U. Press. 2018.

**Brightspace:** Course lecture slides and labs will be posted on Brightspace. All information concerning the course, including assignments, will also be posted on the site. Note that posting of pdf copies of journal articles on Brightspace is a violation of copyright regulations. However, all students have access to journal articles via the library electronic subscriptions, and each student is allowed one copy for personal use.

## Assessment in this course

- All lectures and reading assignments are mandatory. It is the your responsibility to come to lectures prepared.
- Assignments are to be completed individually. Unless noted by the instructor, you will have one week to hand in completed problem sets. Failing to hand in an assignment by the deadline will result in the decay of your note with a decay constant of  $\lambda = -0.231049/\text{day}$ .
- You must notify the instructor immediately (3 days max.) of any medical issue or other circumstances that causes a delay in completing an assignment. Complete a self-declaration form (SDF) to request a short-term academic consideration, and we will then agree on how to make up for the missed deadline.  
<https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf>

### Grade Breakdown

Midterm Exam (online)	30%
Final Exam (take home)	25%
Problem sets	30%
Debate/Discussion	15%

## Note About COVID-19 & Mental Health

The global pandemic has led to extra stress and uncertainty for everyone, and while we may all be experiencing the same storm, this does not mean that we are all in the same boat! If you are struggling, please do not hesitate to reach out. I am happy to listen, or direct you to resources that might help. In terms of class, if you need extra help or missed a lesson, don't stress! E-mail me and we will set a time to meet. I'll work with you, I promise. Remember that Carleton also offers an array of mental health and well-being resources, which can be found [here](#).

## University Policies

In accordance with the Carleton University Undergraduate Calendar Regulations, the letter grades assigned in this course will have the following percentage equivalents:

A+ = 90-100	B+ = 77-79	C+ = 67-69	D+ = 57-59
A = 85-89	B = 73-76	C = 63-66	D = 53-56
A- = 80-84	B- = 70-72	C- = 60-62	D- = 50-52
F = <50			

WDN = Withdrawn from the course

ABS = Student absent from final exam

DEF = Deferred

FND = (Failed, no Deferred) = student could not pass even with 100% on final exam

## **Academic Accommodations, Regulations, Plagiarism, etc.**

Carleton University is committed to providing access to the educational experience in order to promote academic accessibility for all individuals. Academic accommodation refers to educational practices, systems and support mechanisms designed to accommodate diversity and difference. The purpose of accommodation is to enable students to perform the essential requirements of their academic programs. At no time does academic accommodation undermine or compromise the learning objectives that are established by the academic authorities of the University. More information can be found at: <https://students.carleton.ca/course-outline/>

University rules regarding registration, withdrawal, appealing marks, and most anything else you might need to know can be found on the university's website, here:

<https://calendar.carleton.ca/undergrad/regulations/academicregulationsoftheuniversity/>

## **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](mailto: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. For more details, visit the [Paul Menton Centre website](#).

## **Addressing Human Rights Concerns**

The University and all members of the University community share responsibility for ensuring that the University's educational, work and living environments are free from discrimination and harassment. Should you have concerns about harassment or discrimination relating to your age, ancestry, citizenship, colour, creed (religion), disability, ethnic origin, family status, gender expression, gender identity, marital status, place of origin, race, sex (including pregnancy), or sexual orientation, please contact the Department of Equity and Inclusive Communities at [equity@carleton.ca](mailto:equity@carleton.ca).

## **Religious Obligations**

Please contact me 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, please review the [Student Guide to Academic Accommodation \(PDF, 2.1 MB\)](#).

## **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 where 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: <https://carleton.ca/sexual-violence-support/>

## **Accommodations for Missed Work**

Carleton recognizes that these are unprecedented times during the COVID-19 pandemic, and that students may be experiencing greater stress and other life factors that are not in their control. As a result, Carleton has put into place a protocol for students to apply for accommodations using a self-declaration form in the event of missed work. The form can be found at: <https://carleton.ca/registrar/wp-content/uploads/self-declaration.pdf>

## **For Pregnancy**

Please contact me 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, please review the [Student Guide to Academic Accommodation \(PDF, 2.1 MB\)](#).

## **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 me 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, see the [Senate Policy on Accommodation for Student Activities \(PDF, 25KB\)](#).

## **Academic Integrity**

Academic misconduct undermines the values of honesty, trust, respect, fairness, and responsibility that we expect in this class. Carleton University provides supports such as academic integrity workshops to ensure, as far as possible, that all students understand the norms and standards of academic integrity that we expect you to uphold. Your teaching team has a responsibility to ensure that their application of the Academic Integrity Policy upholds the university's collective commitments to fairness, equity, and integrity. (Adapted from Carleton University's Academic Integrity Policy, 2021).

Examples of actions that do not adhere to Carleton's Academic Integrity Policy include:

- Plagiarism
- Accessing unauthorized sites for assignments or tests
- Unauthorized collaboration on assignment and exams

### **Sanctions for not abiding by Carleton's Academic Integrity Policy**

A student who has not adhered to Carleton's Academic Integrity Policy may be subject to one of several sanctions:

1. If you take full responsibility for your actions, and it is the first time you have violated the policy, you will receive zero on the assessment. If you are found to have violated the policy but do not take responsibility, an additional grade deduction will be applied (e.g. an A- will become a B+)
2. Subsequent violations of the policy may result in more severe sanctions such as failing the course, suspension from all studies and/or expulsion.

### **Process of an Academic Misconduct Investigation**

**Step 1:** The instructor believes misconduct has occurred and submits documentation to the Dean of the Faculty of Science.

**Step 2:** The Dean reviews documentation and can proceed with or dismiss the allegation.

**Step 3:** If sufficient evidence, the student receives an allegation statement by email. Ombuds services is copied on the email.

**Step 4:** The student provides a written response to the evidence provided.

**Step 5:** Either party may request a meeting between student, dean, and the ombudsperson.

**Step 6:** Dean informs the student of the decision.

**Appeal:** Student has the right to appeal the decision.

Additional details about this process can be found on [the Faculty of Science Academic Integrity website](#). Students are expected to familiarize themselves with and follow the Carleton University [Student Academic Integrity Policy](#). The Policy is strictly enforced and is binding on all students.

### **Plagiarism**

Plagiarism is the passing off of someone else's work as your own and is a serious academic offence. For the details of what constitutes plagiarism, refer [the Faculty of Science Academic Integrity website](#). To further understand Academic Integrity, consider attending the [Learning and Support Academic Integrity Workshop](#).

## **What are the Penalties for Plagiarism?**

A student found to have plagiarized an assignment may be subject to one of several penalties including: expulsion; suspension from all studies at Carleton; suspension from full-time studies; and/or a reprimand; a refusal of permission to continue or to register in a specific degree program; academic probation; award of an FNS, Fail, or an ABS.

## **What are the Procedures?**

1. All allegations of plagiarism are reported to the Dean of Faculty of Science. Documentation is prepared by instructors and/or departmental chairs.
2. The Dean writes to the student and the University Ombudsperson about the alleged plagiarism.
3. The Dean reviews the allegation. If it is not resolved at this level then it is referred to a tribunal appointed by the Senate.

Students are expected to familiarize themselves with and follow the Carleton University [Student Academic Integrity Policy](#). The Policy is strictly enforced and is binding on all students.

## **Assistance for Students**

Academic and Career Development Services: <http://carleton.ca/sacds/>

Writing Services: <http://www.carleton.ca/csas/writing-services/>

Peer Assisted Study Sessions (PASS): <https://carleton.ca/csas/group-support/pass/>

Math Tutorial Centre: <https://carleton.ca/math/math-tutorial-centre/>

Science Student Success Centre: <https://sssc.carleton.ca/>