DALHOUSIE UNIVERSITY

Faculty of Science Course Syllabus
Department of Earth and Environmental Sciences
ERTH 6400 and ERTH 4460
Geochronology and Thermochronology
Winter Term 2026

Dalhousie University acknowledges that we are in Mi'kma'ki, the ancestral and unceded territory of the Mi'kmaq People and pays respect to the Indigenous knowledges held by the Mi'kmaq People, and to the wisdom of their Elders past and present. The Mi'kmaq People signed Peace and Friendship Treaties with the Crown, and section 35 of the Constitution Act, 1982 recognizes and affirms Aboriginal and Treaty rights. We are all Treaty people.

Dalhousie University also acknowledges the histories, contributions, and legacies of African Nova Scotians, who have been here for over 400 years.

Main Instructor: Isabelle Coutand icoutand@dal.ca (Dalhousie University)

Co-Instructors:

John Gosse	john.gosse@dal.ca	(Dalhousie University)
Djordje Grujic	dgrujic@dal.ca	(Dalhousie University)
Dawn Kellett	dawn.kellett@canada.ca	(Geological Survey of Canada)
Catherine Mottram	catherine.mottram@port.ac.uk	(University of Portsmouth)
Dave Whipp	david.whipp@helsinki.fi	(University of Helsinki)

Lectures: 3 hours per week - Synchronous online (2:35-5:25PM – Atlantic Standard Time Time) – on Mondays.

Laboratories: n/a

Tutorials: Synchronous online and recorded when required as mutually agreed between the participants and the teachers

Credits: 3 credit-hour course

Course Description
Earth and Planetary Sciences extensively use the radioactive decay and growth of naturally occurring nuclides to quantify the timing and rates of geological processes. This course introduces the fundamentals of Geochronology and Thermochronology including the principles, analytical methods, and application of several of the most widely applied geo- and thermochronometers. This course is restricted to Earth Science Majors.

Course Prerequisites
ERTH2001 Mineralogy, ERTH2380 Geochemistry, ERTH2001 mineralogy, ERTH2002 Introduction to Petrology. One course out of MATH1000, PHYC1190 or PHYC1290.

Note: Students cannot receive credit for both ERTH4460 and ERTH6400.

Course Objectives/Learning Outcomes

- Understand the theoretical foundation of different dating methods.
- Learn how to calculate age data.
- Learn to evaluate the errors and uncertainties associated with geo/thermochronological measurements.

- Learn the geological significance of different types of radiometric ages and how to select appropriate methods to answer a given geological problem.
- Acquire a basic understand of numerical methods for data interpretation.
- Learn how to evaluate and interpret age data in the scientific literature.

Required Course Materials

- Readings assigned each week – material will be posted on Brightspace
- Labs: n/a

Platforms:

Please note that you have access to all these platforms through Dalhousie University once your registration is completed.

Brightspace is our learning management system and serves as our virtual classroom. This is where you will find class announcements, weekly modules, recorded lectures, course readings, discussion boards for questions and assignments, and where you will submit your assignments.

Dalhousie email is the University's primary communication tool.

Teams - We will use the video-communication tool Teams for online lectures and tutorials – Invitations for each lectures will be sent before the start of the semester.

Zoom – We will use Zoom as a backup in case Teams does not work – please have Zoom handy in case we need to shift quickly – this is available at Zoom.us and registration is free.

Technical Requirements

- Laptop, desktop computer, or tablet with microphone and webcam.
- Internet with fast connection. During the lectures do not use other applications using internet. Reduce background noise and distractions.
- Software: Microsoft Office (https://libraries.dal.ca/help/software-downloads.html).
- Google Earth Pro software for computers (free download at http://google.com)

Technology Support

If you require support for the course or university technologies (Brightspace, email, Microsoft products) you can contact Information Technology Services (ITS) at support@dal.ca

Course Assessment

Assignment 1 (Grujic)	*5%*
Assignment 2 (Coutand)	*10%*
Assignment 3 (Gosse)	*10%*
Assignment 4 (Mottram)	*10%*
Assignment 5 (Kellett)	*10%*
Term paper (written)	*35%*
Term paper (oral defense)	*20%*

Conversion of numerical grades to Final Letter Grades follows the Dalhousie Common Grade Scale

A+ (90-100)	**B+** (77-79)	**C+** (65-69)	**D** (50-54)
A (85-89)	**B** (73-76)	**C** (60-64)	**F** (0-49)
A- (80-84)	**B-** (70-72)	**C-** (55-59)	

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Passing mark undergraduate students: D
Passing mark graduate students: B-

Course Policies

- Late assignments and final term paper will result in a 10% penalty per day late. Too similar papers will be considered as plagiarism.
- Students cannot receive credits for both ERTH6400 and ERTH4460.

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Date	Lectures	Teachers
Mon 12 January	‣ Syllabus ‣ History of Geochronology ‣ Foundations of radioisotopic dating	I. Coutand D. Kellett I. Coutand
Mon 19 January	‣ Introduction to Thermochronology ‣ (U-Th)/He Thermochronology ‣ **Release assignment 1**	I. Coutand D. Grujic D. Grujic
Fri 23 January	**Submission deadline: assignment 1 (online, 11 PM)**	D. Grujic
Mon 26 January	‣ Fission-track Thermochronology	I. Coutand
Mon 02 February	‣ K/Ar, Ar/Ar Thermochronology ‣ Assignment 1 returned	D. Kellett D. Grujic
Mon 09 February	‣ Numerical modeling of thermochronological data - general concepts ‣ **Release assignment 2**	D. Whipp I. Coutand
Fri 13 FEBRUARY (or date TBD that week)	‣ Numerical modeling of multi-thermochronometric datasets & geological interpretations — 2-hour modeling tutorial - (Make-up session for the 30 March timeslot)	I. Coutand
Mon 16 February	STUDY BREAK (no class)	
Mon 23 February	‣ Terrestrial cosmogenic nuclides: theory and exposure dating	J. Gosse
Mon 02 March	‣ Cosmogenic isotopes, erosion rates, burial dating, and other applications ‣ **Release assignment 3**	J. Gosse J. Gosse
Fri 06 March	**Submission deadline: assignment 2 (online, 11 PM)**	I. Coutand
Mon 09 March	U-Pb Geochronology 1 Assignment 2 returned	C. Mottram I. Coutand
Fri 13 March	**Submission deadline: assignment 3 (online, 11 PM)**	J. Gosse
Mon 16 March	‣ U-Pb Geochronology 2 ‣ **Release Assignment 4**	C. Mottram C. Mottram
Fri 20 March	**Submission deadline: assignment 4 (online, 11 PM)**	C. Mottram
Mon 23 March	‣ Beta-Decay Chronometers (Lu–Hf, Rb–Sr, Re–Os, K–Ca) and Ore deposit dating ‣ **Release Assignment 5** ‣ Assignment 3 returned	D. Kellett D. Kellett J. Gosse
Fri 27 March	**Submission dealine Assignment 5 (online 11 PM)**	D. Kellett
Mon 30 March	‣ Teachings for this timeslot will be offered on Feb 13 or date TBD that week ‣ Assignment 4 returned	Opened C. Mottram
Fri 03 April	‣ Assignment 5 returned	D. Kellett
Sun 05 April	**Submission deadline: term paper (online, 11 PM)**	
Mon 06 April	**In-class oral presentations of term papers**	I. Coutand + teaching team

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University Policies and Statements

Recognition of Mi'kmaq Territory

Dalhousie University would like to acknowledge that the University is on Traditional Mi'kmaq Territory. The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit or e-mail the Indigenous Student Centre at 1321 Edward St or elders@dal.ca. Additional information regarding the Indigenous Student Centre can be found at: https://www.dal.ca/campus_life/communities/indigenous.html

Internationalization

At Dalhousie, 'thinking and acting globally' enhances the quality and impact of education, supporting learning that is "interdisciplinary, cross-cultural, global in reach, and orientated toward solving problems that extend across national borders." Additional internationalization information can be found at: https://www.dal.ca/about-dal/internationalization.html

Academic Integrity

At Dalhousie University, we are guided in all our work by the values of academic integrity: honesty, trust, fairness, responsibility, and respect. As a student, you are required to demonstrate these values in all the work you do. The University provides policies and procedures that every member of the university community is required to follow to ensure academic integrity. Additional academic integrity information can be found at: https://www.dal.ca/dept/university_secretariat/academic-integrity.html

Accessibility

The Student Accessibility Centre is Dalhousie's centre of expertise for matters related to student accessibility and accommodation. If there are aspects of the design, instruction, and/or experiences within this course (online or in-person) that result in barriers to your inclusion, please contact the Student Accessibility Centre (https://www.dal.ca/campus_life/academic-support/accessibility.html) for all courses offered by Dalhousie with the exception of Truro. For courses offered by the Faculty of Agriculture, please contact the Student Success Centre in Truro (https://www.dal.ca/about-dal/agricultural-campus/student-success-centre.html)

Conduct in the Classroom – Culture of Respect

Substantial and constructive dialogue on challenging issues is an important part of academic inquiry and exchange. It requires willingness to listen and tolerance of opposing points of view. Consideration of individual differences and alternative viewpoints is required of all class members, towards each other, towards instructors, and towards guest speakers. While expressions of differing perspectives are welcome and encouraged, the words and language used should remain within acceptable bounds of civility and respect.

Diversity and Inclusion – Culture of Respect

Every person at Dalhousie has a right to be respected and safe. We believe inclusiveness is fundamental to education. We stand for equality. Dalhousie is strengthened in our diversity. We are a respectful and inclusive community. We are committed to being a place where everyone feels welcome and supported, which is why our Strategic Direction prioritizes fostering a culture of diversity and inclusiveness (Strategic Priority 5.2). Additional diversity and inclusion information can be found at: http://www.dal.ca/cultureofrespect.html

Student Code of Conduct

Everyone at Dalhousie is expected to treat others with dignity and respect. The Code of Student Conduct allows Dalhousie to take disciplinary action if students don't follow this community expectation. When appropriate, violations of the code can be resolved in a reasonable and informal manner - perhaps through a restorative justice process. If an informal resolution can't be reached, or would be inappropriate, procedures exist for

formal dispute resolution. The full Code of Student Conduct can be found at:
https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html

Fair Dealing Policy

The Dalhousie University Fair Dealing Policy provides guidance for the limited use of copyright protected material without the risk of infringement and without having to seek the permission of copyright owners. It is intended to provide a balance between the rights of creators and the rights of users at Dalhousie. Additional information regarding the Fair Dealing Policy can be found at:
https://www.dal.ca/dept/university_secretariat/policies/academic/fair-dealing-policy-.html

Originality Checking Software

The course instructor may use Dalhousie's approved originality checking software and Google to check the originality of any work submitted for credit, in accordance with the Student Submission of Assignments and Use of Originality Checking Software Policy. Students are free, without penalty of grade, to choose an alternative method of attesting to the authenticity of their work and must inform the instructor no later than the last day to add/drop classes of their intent to choose an alternate method. Additional information regarding Originality Checking Software can be found at:
https://www.dal.ca/dept/university_secretariat/policies/academic/student-submission-of-assignments-and-use-of-originality-checking-software-policy-.html

Student Use of Course Materials

Course materials are designed for use as part of this course at Dalhousie University and are the property of the instructor unless otherwise stated. Third party copyrighted materials (such as books, journal articles, music, videos, etc.) have either been licensed for use in this course or fall under an exception or limitation in Canadian Copyright law. Copying this course material for distribution (e.g. uploading to a commercial third-party website) may lead to a violation of Copyright law.

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Faculty of Science
Student Resources and Support

University Policies and Programs

Important Dates in the Academic Year (including add/drop dates): http://www.dal.ca/academics/important_dates.html
Classroom Recording Protocol: https://www.dal.ca/dept/university_secretariat/policies/academic/classroom-recording-protocol.html
Dalhousie Grading Practices Policies: https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html
Grade Appeal Process: https://www.dal.ca/campus_life/academic-support/grades-and-student-records/appealing-a-grade.html
Sexualized Violence Policy: https://www.dal.ca/dept/university_secretariat/policies/health-and-safety/sexualized-violence-policy.html
Scent-Free Program: https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html

Learning and Support Resources

General Academic Support – Advising (Halifax): https://www.dal.ca/campus_life/academic-support/advising.html
General Academic Support – Advising (Truro): https://www.dal.ca/about-dal/agricultural-campus/ssc/academic-support/advising.html
Student Health & Wellness Centre: https://www.dal.ca/campus_life/health-and-wellness.html
On Track (helps you transition into university, and supports you through your first year at Dalhousie and beyond): https://www.dal.ca/campus_life/academic-support/On-track.html
Indigenous Student Centre: https://www.dal.ca/campus_life/communities/indigenous.html
Indigenous Connection: https://www.dal.ca/about-dal/indigenous-connection.html
Elders-in-Residence (The Elders in Residence program provides students with access to First Nations elders for guidance, counsel, and support. Visit the office in the Indigenous Student Centre or contact the program at elders@dal.ca or 902-494-6803: https://cdn.dal.ca/content/dam/dalhousie/pdf/academics/UG/indigenous-studies/Elder-Protocol-July2018.pdf
Black Student Advising Centre: https://www.dal.ca/campus_life/communities/black-student-advising.html
International Centre: https://www.dal.ca/campus_life/international-centre.html
South House Sexual and Gender Resource Centre: https://southhousehalifax.ca/about/
LGBTQ2SIA+ Collaborative: https://www.dal.ca/dept/vpei/edia/education/community-specific-spaces/LGBTQ2SIA-collaborative.html
Dalhousie Libraries: http://libraries.dal.ca/
Copyright Office: https://libraries.dal.ca/services/copyright-office.html
Dalhousie Student Advocacy Services: https://www.dsu.ca/dsas?rq=student%20advocacy
Dalhousie Ombudsperson: https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html
Human Rights and Equity Services: https://www.dal.ca/dept/hres.html
Writing Centre: https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html
Study Skills/Tutoring: http://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html
Faculty of Science Advising Support: https://www.dal.ca/faculty/science/current-students/undergrad-students/degree-planning.html

Safety

Biosafety: http://www.dal.ca/dept/safety/programs-services/biosafety.html
Chemical Safety: https://www.dal.ca/dept/safety/programs-services/chemical-safety.html
Radiation Safety: http://www.dal.ca/dept/safety/programs-services/radiation-safety.html

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Laser Safety: https://www.dal.ca/dept/safety/programs-services/radiation-safety/laser-safety.html