

Faculty of Science Course Syllabus  
Department of Earth and Environmental Sciences  
**ERTH 3140 Structural Geology**  
Winter Term 2022

<b>Course Instructor:</b>	<i>Djordje Grujic</i>	<i>dgrujic@dal.ca</i>	<i>LSC E&amp;E 3045</i>
<b>TA:</b>	<i>Marina Dottore Stagna</i>	<i>m.dottorestagna@dal.ca</i>	
<b>Lectures:</b>	<i>We, Th, Fr (1:35-2:25 pm)</i>	<b>Synchronous Online Classes / LSC C238</b>	
<b>Laboratories:</b>	<i>We (2:35-5:25 pm)</i>	<b>Synchronous Online Classes / LSC B2030</b>	
<b>Office time:</b>	<i>Tuesdays 10:00-11:30 am</i>		

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### **Course Description**

*According to the principles of modern, detailed structural analysis each topic in Structural Geology class is though in three levels, corresponding to three fundamental strategies: (a) Descriptive, (b) Kinematic, and (c) Dynamic analysis.*

*(a) Descriptive analysis uses geometrical principles to identify, describe, and interpret common types of structures in outcrop and hand sample and measure their orientation. Descriptive analysis results in facts regarding the physical properties, orientation, and internal configuration of structures. The basis for descriptive analysis is broad ranging: direct observation of field relationships; examination of rocks deformed experimentally in the laboratory; drilling into the surface; geophysical monitoring; and studying the stratigraphy and/or petrography of the rocks in which the structures occur.*

*(b) Kinematic analysis focuses on interpreting the deformational movements responsible for the development of structures. Evaluating the changes in a body that result from distortion and dilation is the focus of strain analysis.*

*(c) Dynamic analysis interprets deformational movements in terms of forces and stresses responsible for formation of structures. The major aim of the analysis is to describe the relative magnitudes and the absolute orientation of the stresses that were responsible for the deformation. For dynamic analysis to be meaningful, it must explain the kinematic movement plan, and the physical and geometric characteristics of the structures.*

*Finally, we interpret the mechanical properties of rocks based on their microstructure and texture, and interpret the crustal rheological structure based on these principles.*

*In the lab exercises students perform common, and sometimes specific, measurements involved in collecting data about the earth and describe the results in visual representations appropriate to Earth Sciences. Apply basic construction and plotting techniques to calculate and interpret stress and strain in deformed rocks. Generalize large sets of structural measurements and observations and infer first-order features.*

### **Course Prerequisites**

**ERTH 2002, ERTH 2110 Field Methods, ERTH 3000. Mathematics and Physics highly recommended**

**Related Courses: ERTH 4350 (Tectonics) requires this class**

### Course Objectives/Learning Outcomes

- Use geometrical principles to identify, describe, and interpret common types of structures in outcrop and hand sample. Interpret the mechanical properties of rocks based on their microstructure and texture.
- Apply basic construction and plotting techniques to calculate and interpret stress and strain in deformed rocks. Generalize large sets of structural measurements and observations and infer first-order features.
- Apply modern techniques to assess structures (from hand sample to regional scale), discuss their geohazard, and write a technical report on the results.
- Associate different categories of structures to geological settings of their formation. Examine the relation of structures to localisation of resources or geohazard.
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### Required Course Materials

- Textbook: *Structural Geology* (Haakon Fossen, Cambridge University Press, 2016)
- Labs: tracing paper, graph paper, pencils, ruler, Laptop with MS Office.
- Course website: *BrightSpace*

### Course Assessment

Component	Weight (% of final grade)	Date
Midterm exam	30%	On-line, multiple choice
Final exam	33%	On-line, review questions
Labs	35%	Each to be submitted within one week

### 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	(<50)
A- (80-84)	B- (70-72)	C- (55-59)		

### Course Policies

- All labs to be done: Late submission or no submission is an F
- Missed exams: F, No alternative dates
- Failed exams: No catch-up exams
- Weather-related cancelled classes: according to the Dalhousie Announcements.
- Missed lectures will be recorded and posted on the MS Teams.

We'll be using the following platforms in the course:



**Brightspace** - The learning management system, Brightspace, is our classroom space! This is where you'll find the class announcements, weekly modules, video lectures, course readings, dropbox for submitting assignments, and discussion boards for questions and assignments.



**Microsoft Teams** - The lecturing platform

- Dalhousie email is the University's primary communication tool.

#### Technical Requirements for on-line lectures

- Laptop, desktop computer or tablet with microphone and webcam
- Internet with fast connection. During the lectures do not run other applications using internet. Reduce background noise and distractions.
- Software: Microsoft Office

#### 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](mailto:support@dal.ca)

#### Course Structure

Our course is organized into 13 weekly modules:

1	January 3	<i>Introduction to the Structural Geology</i>
2	January 10	<i>Force and Stress</i>
3	January 17	<i>Faults</i>
4	January 24	<i>Joints</i>
5	January 31	<i>Fault Regimes</i>
6	February 7	<i>Mohr Diagram</i>
7	February 14	<i>Mechanics of Faulting</i>
	February 21	<b>Study break</b>
8	March 1	<b>Midterm Exam / Rheology and Strain</b>
9	March 7	<i>Folds and Fold Mechanisms</i>
10	March 14	<i>Foliation and Fold-Cleavage</i>
11	March 21	<i>Lineation and Boudinage</i>
12	March 28	<i>Shear Zones</i>
13	April 4	<i>Microstructures</i>

## University Policies and Statements

**This course is governed by the academic rules and regulations set forth in the University Calendar and by Senate**

### Academic Integrity

At Dalhousie University, we are guided in all of our work by the values of academic integrity: honesty, trust, fairness, responsibility and respect (The Center for Academic Integrity, Duke University, 1999). As a student, you are required to demonstrate these values in all of 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.

**Information:** [https://www.dal.ca/dept/university\\_secretariat/academic-integrity.html](https://www.dal.ca/dept/university_secretariat/academic-integrity.html)

### Accessibility

The Advising and Access Services Centre is Dalhousie's centre of expertise for student accessibility and accommodation. The advising team works with students who request accommodation as a result of a disability, religious obligation, or any barrier related to any other characteristic protected under Human Rights legislation (Canada and Nova Scotia).

**Information:** [https://www.dal.ca/campus\\_life/academic-support/accessibility.html](https://www.dal.ca/campus_life/academic-support/accessibility.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.

**Code:** [https://www.dal.ca/dept/university\\_secretariat/policies/student-life/code-of-student-conduct.html](https://www.dal.ca/dept/university_secretariat/policies/student-life/code-of-student-conduct.html)

### 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

**Statement:** <http://www.dal.ca/cultureofrespect.html>

### 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 (1321 Edward St) ([elders@dal.ca](mailto:elders@dal.ca)).

**Information:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

### Important Dates in the Academic Year (including add/drop dates)

[https://www.dal.ca/academics/important\\_dates.html](https://www.dal.ca/academics/important_dates.html)

### University Grading Practices

[https://www.dal.ca/dept/university\\_secretariat/policies/academic/grading-practices-policy.html](https://www.dal.ca/dept/university_secretariat/policies/academic/grading-practices-policy.html)

## Student Resources and Support

### Advising

**General Advising** [https://www.dal.ca/campus\\_life/academic-support/advising.html](https://www.dal.ca/campus_life/academic-support/advising.html)

**Science Program Advisors:** <https://www.dal.ca/faculty/science/current-students/academic-advising.html>

**Indigenous Student Centre:** [https://www.dal.ca/campus\\_life/communities/indigenous.html](https://www.dal.ca/campus_life/communities/indigenous.html)

**Black Advising Centre:** [https://www.dal.ca/campus\\_life/communities/black-student-advising.html](https://www.dal.ca/campus_life/communities/black-student-advising.html)

**International Centre:** [https://www.dal.ca/campus\\_life/international-centre/current-students.html](https://www.dal.ca/campus_life/international-centre/current-students.html)

### Academic supports

**Library:** <https://libraries.dal.ca/>

**Writing Centre:** [https://www.dal.ca/campus\\_life/academic-support/writing-and-study-skills.html](https://www.dal.ca/campus_life/academic-support/writing-and-study-skills.html)

**Studying for Success:** [https://www.dal.ca/campus\\_life/academic-support/study-skills-and-tutoring.html](https://www.dal.ca/campus_life/academic-support/study-skills-and-tutoring.html)

**Copyright Office:** <https://libraries.dal.ca/services/copyright-office.html>

**Fair Dealing Guidelines** <https://libraries.dal.ca/services/copyright-office/fair-dealing.html>

### Other supports and services

**Student Health & Wellness Centre:** [https://www.dal.ca/campus\\_life/health-and-wellness/services-support/student-health-and-wellness.html](https://www.dal.ca/campus_life/health-and-wellness/services-support/student-health-and-wellness.html)

**Student Advocacy:** <https://dsu.ca/dsas>

**Ombudsperson:** [https://www.dal.ca/campus\\_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html](https://www.dal.ca/campus_life/safety-respect/student-rights-and-responsibilities/where-to-get-help/ombudsperson.html)

### Safety

**Research Lab Safety** [https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab\\_policy\\_manual\\_2007.pdf](https://www.dal.ca/content/dam/dalhousie/pdf/dept/safety/lab_policy_manual_2007.pdf)

**Biosafety:** <https://www.dal.ca/dept/safety/programs-services/biosafety.html>

**Chemical Safety:** <https://www.dal.ca/dept/safety/programs-services/chemical-safety.html>

**Radiation Safety:** <https://www.dal.ca/dept/safety/programs-services/radiation-safety.html>

**Scent-Free Program:** <https://www.dal.ca/dept/safety/programs-services/occupational-safety/scent-free.html>