

Earth Sciences 2201B: Structural Geology

1. Course Information

Schedule:

Lectures	9:30 to 10:30 a.m.	BGSB 1065 on Tuesdays & Thursdays
Labs	2:30 to 5:30 p.m.	BGSB 1015 BGS on Mondays

First Lecture is on Tuesday, January 6

Reading Week: February 14-22

Classes end: April 10

See <https://www.westerncalendar.uwo.ca/SessionalDates.cfm> for a complete list of sessional dates.

Prerequisites: Completion of ES2200A/B

Unless you have either the requisites for this course or written special permission from the Department of Earth Sciences to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

2. Instructor Information

Instructor: Prof. Prof. Dazhi Jiang
Office: Room 0176 BGS
Phone: (519) 661-2111, ext. 83192, djiang3@uwo.ca

Graduate Teaching Assistant (GTA):
Bohan Zhu: bzhu72@uwo.ca

Students must use their Western (@uwo.ca) email addresses when contacting their instructors.

Office Hours: Thursday 2:30-3:30p.m in person (my office or BGS 1055) or at other times through ZOOM by appointment.

3. Course Syllabus, Schedule, and Activity

Description: Structural Geology deals with features such as folds, faults, and shear zones in Earth's lithosphere which are generally called structures. Most structures were produced by tectonic

deformation of the lithosphere. We study structures in order to understand Earth's history, current state, and properties. Knowledge of bedrock structures is also a prerequisite for land use, exploration and extraction of natural resources, preservation of the natural environment, and prevention and mitigation of natural hazards.

This is a first course in Structural Geology. We shall cover 1) the geometrical and kinematic analysis of various structures, 2) the application of mechanical concepts to understand the formation of structures, and 3) the reconstruction of deformation history from structural analysis and synthesis.

Learning Outcomes

Upon completion of this course, students are expected to be able to:

- Recognize and characterize geological structures.
- Interpret geological maps in 3D using cross sections and block diagrams.
- Analyze the geometry of structures using stereographic and equal area projections.
- Understand the general principle of structural analysis and tectonic synthesis.

4. Course Materials

You must have **one** of the following textbooks. Textbooks will be used as an aid. Tests will be based on materials covered in lectures and labs. Reading material listed in the Course Schedule guides you through the use of textbooks. Additional reading material may be posted on the course site (<https://westernu.brightspace.com/>). You are strongly encouraged to read all the suggested materials as they will help you understand the concepts and provide supporting and/or supplemental information.

Davis, G.H., Reynolds, S.J., and Kluth, C.F. 2011. Structural Geology of Rocks and Regions, 3rd edition. John Wiley & Sons, Inc. **This book costs around \$200.00 (Hardcover) or \$88 (Kindle Edition).**

Davis, G.H., and Reynolds, S. J. 1996. Structural Geology of Rocks and Regions, 2nd edition. John Wiley & Sons, Inc.

Hobbs, B. E., Means, W. D. and Williams, P. F. 1976. An Outline of Structural Geology. John Wiley & Sons. New York. [out of print but available from the library; used copies can be found at a reasonable price from online bookstores]

Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If students need assistance with the course OWL site, they can seek support on the OWL Brightspace Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

5. Methods of Evaluation

Grading Scheme and Assessment Dates

The overall course grade will be calculated as listed below:

Lecture and lab activity participation	10%
Lab Assignments (6)	20%
Lab and Midterm Exam	35%
Final Exam	35%

General information about missed coursework

Students must familiarize themselves with the University Policy on Academic Consideration – Undergraduate Students in First Entry Programs posted on the Academic Calendar:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/academic_consideration_Sep24.pdf

This policy does not apply to requests for Academic Consideration submitted for attempted or completed work, whether online or in person.

The policy also does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult Accessible Education.

For procedures on how to submit Academic Consideration requests, please see the information posted on the Office of the Registrar's webpage:

https://registrar.uwo.ca/academics/academic_considerations/

All requests for Academic Consideration must be made within 48 hours after the assessment date or submission deadline.

All Academic Consideration requests normally must include supporting documentation; however, recognizing that formal documentation may not be available in some extenuating circumstances, the policy allows students to make **one** Academic Consideration request without supporting documentation in this course. However, the following assessments are excluded from this, and, therefore, always require formal supporting documentation:

- The Lab and midterm exam
- The final exam, which is scheduled during official examination periods.

When a student mistakenly submits their one allowed Academic Consideration request **without supporting documentation** for the assessments listed above, the request cannot be recalled and reapplied. This privilege is forfeited.

Labs are essential components of the course. All labs are on Monday and each lab assignment is due on the following Monday before the new lab starts (2:30pm). Overdue labs will not be accepted unless with permission.

When a student misses the Final Exam and their Academic Consideration has been granted, they will be allowed to write the Special Examination (the name given by the University for a makeup Final Exam). See the Academic Calendar for details (under Special Examinations), especially for those who miss multiple final exams within one examination period.

6. Additional Statements

Religious Accommodation

When a recognized religious holiday or observance conflicts with an examination, test, or other scheduled academic obligation, students must request accommodation via the University's Student Absence Portal (SAP)). This request should identify the conflict and specify which course component(s) (e.g. test, midterm, exam) are affected.

Students are encouraged to submit the SAP request as early as possible, but no later than two weeks before any examination, or one week before any mid-term test or quiz, to allow sufficient time for adjustment.

The SAP request serves as official notification to both the course instructor and the Academic Advising Office, in accordance with University policy:

https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf

The Faculty of Science considers religious accommodations as scheduling conflicts. Instructors should provide either a make-up exam or an earlier sitting of the same exam to accommodate the student.

For more information on recognized religious holidays, please visit the Diversity Calendar posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca>

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at:

[https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic Accommodation_disabilities.pdf](https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf)

General Academic Policies

The website for Registrarial Services is <https://www.registrar.uwo.ca>.

Use of @uwo.ca email: In accordance with policy,

https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf

the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at their official university address is attended to in a timely manner.

Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site: http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>).

Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on add/drop courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

Students who are in emotional/mental distress should refer to Mental Health@Western (<https://uwo.ca/health/>) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at https://www.uwo.ca/health/student_support/survivor_support/get-help.html.

To connect with a case manager or schedule an appointment, please contact support@uwo.ca.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at http://academicsupport.uwo.ca/accessible_education/index.html

Learning-skills counselors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre and year-round through individual counseling.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/>.

Additional student-run support services are offered by the USC, <https://westernusc.ca/services/>.

Schedule of Activities (tentative)

Week	Date	Activity and Topic
1	6-Jan	<i>Lecture 1: Introduction</i>
	8-Jan	<i>Lecture 2: Primary structures and orientation of planes and lines</i>
2	12-Jan	Lab 1: Orientation of planes and lines
	13-Jan	<i>Lecture 3: Force, stress, and strength</i>
	15-Jan	<i>Lecture 4: Displacement, strain, and rotation</i>
3	19-Jan	Lab 2: Base map and cross-section
	20-Jan	<i>Lecture 5: Fractures and Sealed Fractures I</i>
	22-Jan	<i>Lecture 6: Fractures and Sealed Fractures II</i>
4	26-Jan	Lab 3: Block diagram and stereo net projection
	27-Jan	<i>Lecture 7: Faults I</i>
	29-Jan	<i>Lecture 8: Faults II</i>
5	02-Feb	Lab 4: Stereonet projection
	03-Feb	<i>Lecture 9: Damaged rocks in fault zones</i>
	05-Feb	<i>Lecture 10: Fault systems</i>
6	09-Feb	Lab 5: Map problems 1
	10-Feb	<i>Lecture 11: Mechanical aspects of faulting</i>
	12-Feb	<i>Lecture 12: Summary of fracturing of rocks</i>
	Spring Reading Week Feb 14-22	
7	23-Feb	Lab 6: Map Problems 2
	24-Feb	<i>Lecture 13: Folds 1</i>
	26-Feb	<i>Lecture 14: Folds 2</i>
8	02-Mar	Student review for mid-term and Lab Exam
	03-Mar	<i>Lecture 15: Mechanics of folding</i>
	05-Mar	<i>Lecture 16: Superposition of folds</i>
9	09-Mar	Mid-term and Lab Exam
	10-Mar	<i>Lecture 17: Foliation and Lineation I</i>
	12-Mar	<i>Lecture 18: Foliation and lineation 2</i>
10	17-Mar	<i>Lecture 19: Ductile Shear Zones I</i>
	19-Mar	<i>Lecture 20: Ductile Shear Zones II</i>
11	24-Mar	<i>Lecture 21: Microstructures and deformation mechanisms</i>
	26-Mar	<i>Lecture 22: Introduction to Rheology of the Lithosphere</i>
12	31-Mar	<i>Lecture 23: General principles of structural analysis</i>
	02-Apr	<i>Lecture 24: Tectonic synthesis of structures I</i>
13	07-Apr	<i>Lecture 25: Tectonic synthesis of structures II</i>
	09-Apr	<i>Lecture 26: Introduction to Fieldwork & Summary</i>