

Geology 442 - Structural Geology, Fall 2022
Lecture: Mon and Wed 2:30-3:45pm, WRI C235
Lab: T or Th 2:30-5:15; LFG 103

PROFESSOR

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REQUIRED TEXTBOOK AND LAB MANUAL:

Lecture: Structural Geology, Haakon Fossen, 2nd Edition
Lab: Structural Analysis and Synthesis, Rowland, S., and Duebendorfer, E., Schiefelbien, I., 2006

SUPPLEMENTARY TEXTBOOKS AND LABORATORY MANUALS:

Structural Geology, Twiss, R.J., and Moores, E.M., 1992
Principles of Structural Geology, Suppe, J., 1985
Basic Methods of Structural Geology, Marshak, S., and Mitra, G., 1988

Purpose of Class

This course is an introduction to deformation of the lithosphere, from the atomic scale to the scale of mountain belts. We will consider the diverse mechanisms by which rocks deform, the resultant geologic features, and where specific deformation processes operate and geologic structures are developed, with respect to the fundamental types of lithospheric plate boundaries.

Learning Outcomes

This course aims to provide students with the material and opportunity to learn general structural geology as used in many areas of geoscience. After successfully completing the lecture part of this course, students will have knowledge of the basics of faults, folds, deformation mechanisms, stress, strain, joints, structural associations, regional tectonics, and the relationship between structures and plate tectonics. Completing the lab part of this course will give students proficiency in standard map analysis techniques, stereographic projection construction and interpretation, cross section construction and interpretation, the concepts of stress, strain, and rheology, and will enable students to recognize structures in hand samples and thus the field.

Logistics and Policies

Class Policy

The textbook and lab manual are required for the course. Reading assignments for the lecture are listed by date on the accompanying course outline. Please read the appropriate assignments before coming to the lecture. Material will be presented in lecture that is not

covered in the textbook, so don't miss class! Please be aware that make-up lectures and make-up exams cannot be scheduled.

Field Trips

There will be two required field trips that will support the lab and lecture content in this class: a one-day trip to investigate structural styles of normal faults in the El Dorado Mountains and a two-day trip to investigate a ductile shear zone in the Whipple Mountains, CA. The aim of the trips is to examine the structural record of Cenozoic extensional tectonics in the southwestern United States, and outcrop-scale study of mesoscopic structural features that we will then continue to analyze in laboratory.

Assessment (grading)

Your course grade in GEOL 442 is based on the following criteria:

Quizzes, lecture assignments	10%
Lab Work	35%
Participation and professionalism	5%
Two 1-hour exams	30%
Final exam	20%

Material for the 1-hour lecture exams will focus on lecture and textbook information covered since the previous exam. The final exam is comprehensive but will emphasize the last block of material covered since exam II. There will be 6 quizzes in class, given about every other week. The lowest quiz grade will be dropped.

Grade Assignment

Final grades will be assigned according to the following schedule. The instructor may elect to curve the final grades in the students favor.

<u>Grade</u>	<u>Total %</u>	<u>Grade</u>	<u>Total %</u>
A	93-100	C	73-76
A-	90-92	C-	70-72
B+	87-89	D+	67-69
B	83-86	D	63-66
B-	80-82	D-	60-62
C+	77-79	F	0-59

Lab Policy

Lab assignments will be due at the beginning of the lab period, the week following the lab exercise. Please, no late labs! Labs will be returned, graded, during our next lab period. Please read the background material in each assigned chapter before coming to lab. Use the time in lab to work on assigned problems, not to read the chapter. You will probably not have time to complete written assignments in lab. Outside work is expected, so use lab time wisely.

Lab supplies – The nature of structural geology means that some supplies are needed for use with maps, stereographic projections, etc. The supplies needed for the lab part of the course are as follows, with the items in bold needed for the first lab:

- Protractor
- Ruler – transparent is best
- Paper
- Graph paper (10 squares to the inch is best)
- Tracing paper
- Eraser
- Mechanical pencil – 0.5 mm or less (0.5 and 0.3 mm pencils are both useful, but 0.7 mm or larger are NOT acceptable)
- 000 (or 00) & 2 technical pens (disposable or refillable) (We will explain pens in class)
- Colored pencils
- Masking or drafting tape
- White out (the pen type is easiest for correcting small areas)
- Calculator (scientific, needs to do trig)
- Something to hold all the above

Accessibility and Inclusion

University of Nevada, Las Vegas goal is to provide students with effective accommodations based on law and current best practices and to promote individual growth and self-determination. I encourage full participation of all students within the university community. If there are particular things you need to help your learning in this course, I'd like to discuss it with you as soon as we can, so we can talk about arrangements and support. I am committed to access for all of our students so if you need particular accommodation in this course, please let me know and also contact Disability Resource Center to get the process started.

As an institution of higher learning, UNLV represents a rich diversity of human beings among its faculty, staff, and students, and is committed to aspiring to maintain a Campus environment that values that diversity. Accordingly, the University supports understanding and appreciation of all members of its community, regardless of race, sex, age, color, national origin, ethnicity, creed, religion, disability, sexual orientation, gender, gender identity, marital status, pregnancy, genetic information, veteran status, or political affiliation. Accordingly, the instructor asks that students be willing to listen to one another's points of view, acknowledging that there may be disagreements, keep discussion and comments on topic and respectful, and use first person, positive language when expressing their perspectives.

Field Conduct

For your safety and the safety of others, and for maintaining the high-quality standard of UNLV field experiences, you must understand that your participation in a field experience requires following the rules below in regard to conduct while on the trip:

- Following the instructions of trip leaders at all times and never leaving the group or the camp unless you have the permission of trip leaders.
- Never initiating or being involved in any activity that is dangerous to yourself or others, which includes:
 - Not possessing or using any illegal drugs while on the trip, and
 - Not possessing weapons, including firearms.
- Not participating in sexual misconduct of any form. Sexual harassment is a form of discrimination and is unlawful. If sexual harassment is occurring to you, or if you witness sexual harassment occurring to others on the trip, you should report this behavior to the trip leader, a UNLV representative, and/or to law enforcement.
- Respecting the properties, structures, areas, and vehicles at and on which activities occur, and observing all rules and regulations of the properties, structures, areas and vehicles. (No Geo-Vandalizing)
- Showing respect to others, including non-participants and the general public, at all times. Always have appropriate behavior, including in the evening hours.
- Students are not allowed to bring guests, including children and pets, on course activities.

Lecture Course Outline (subject to change as necessary)

Lec. #	Date	Topic	Reading
			Ch., pages
1	8/29	Introduction to Structural Geology	1, 1-23
2	8/31	Strain I	2, 25-55
	9/5	No Class – Labor Day Holiday	
3	9/7	Strain II	2, 25-55
4	9/12	Strain Measurement	3, 59-70
5*	9/14	Stress I	4, 73-80
6	9/19	Stress II	5, 83-98
7	9/26	Fault and Fracture mechanics	7, 123-150
8	9/28	Faults	9&10, 177-188, 221-232
	10/1	El Dorado Field trip (Saturday all day)	
9	10/3	Joints and Veins	8, 153-175
10	10/5	Exam I	6, 101-120
	10-11 & 10-12	No Class – Geologic Society of America	
11	10/17	Rheology	6, 101-120
12	10/19	Deformation Mechanisms	11, 235-255
13*	10/24	Normal Faulting I/MCCs	18, 377-396
		Whipple Mountain Field trip (22-23 October)	
14	10/26	Normal Faulting II	18, 377-396
15	10/31	Thrust Faulting I	17, 355-374
16	11/2	Thrust Faulting II	17, 355-374
17	11/7	Strike Slip Faulting I	19, 401-414
	11/9	Exam II	
18	11/14	Strike Slip Faulting II	19, 401-414
20*	11/16	Folds	12, 257-280
21	11/21	Planar Minor Structures	13, 283-299
	11/23	No lecture- Thanksgiving	
22	11/28	Linear and Planar Minor Structures	13&14, 283-299, 301-312
23	11/30	Linear structures, Boudinage	14, 301-312, 15, 315-326
24	12/5	Ductile Shear Zones	16, 329-352
25	12/7	Ductile Shear Zones	16, 329-352

Week of 12/12-16 Final Exam

* Quiz

Lab Schedule (subject to change as necessary)

<u>Lab Event</u>		<u>Lab Topic</u>	<u>Reading</u>
1	Aug 30	No labs this week	
2	Sept 6, 8	Geologic Maps	RD 2, 3
3	Sept 13, 15	Strain	RD 14
4	Sept 20, 22	Stereographic projects and stereonet	RD 5
5	Sept 27, 29	Stress and Mohr circles	RD 13
<i>El Dorado Field trip (10-1)</i>			
6	Oct 4, 6	El Dorado lab	
7	Oct. 11, 13	<i>No Class or labs, GSA Conference</i>	
8	Oct. 18, 20	Geologic cross sections	RD 4
<i>Whipple Mountain Field trip (22-23 Oct)</i>			
9	Oct. 25, 27	Geologic cross sections	RD 4
10	Nov. 1, 3	Faults	RD 9
11	Nov. 8, 10	Folds and stereographic analysis	RD 6, 7
12	<i>Nov. 15, 17</i>	Small scale structures	RD 8, 16
13	Nov 22, 24	<i>No lab, Thanksgiving Week</i>	
14	Nov. 29, Dec 1	Final project work session	
15	Dec. 6, 8	Final project presentations	

Changes to Syllabus: The above lecture and lab schedule is tentative; adjustments to the schedule of topics and reading assignments may be made in accordance with the rate of progress in the classroom. The instructor also reserves the right to change a lecture topic as needed. Students will be provided with an updated syllabus if significant changes are necessary.

University Policies:***Public Health Directives***

Face coverings are currently optional for all faculty and students in the classroom. Students must follow all active UNLV public health directives while enrolled in this class. UNLV public health directives are found at Health Requirements for Returning to Campus, <https://www.unlv.edu/coronavirus/health-requirements>. Students who do not comply with these directives may be asked to leave the classroom. Refusal to follow the guidelines may result in further disciplinary action according to the UNLV Student Conduct Code, https://www.unlv.edu/sites/default/files/page_files/27/StudentConduct-Code.pdf, including being administratively withdrawn from the course.

Academic Misconduct

Academic integrity is a legitimate concern for every member of the University community. We all share in upholding the fundamental values of honesty, trust, respect, fairness, responsibility, and professionalism. By choosing to join the UNLV community, students accept the expectations of the Student Academic Misconduct Policy, and are encouraged to always take the ethical path whenever faced with choices. Students enrolling at UNLV assume the obligation to conduct themselves in a manner compatible with UNLV's educational mission. An example of academic misconduct is plagiarism. Plagiarism is using the words or ideas of another person, from the Internet or any other source without proper citation of the source(s). See the Student Conduct Code, <https://www.unlv.edu/studentconduct/student-conduct>.

Auditing a Course

Auditing a course allows a student to continue attending the lectures and/or laboratories and discussion sessions associated with the course, but the student will not earn a grade for any component of the course. Students who audit a course receive the same educational experience as students taking the course for a grade, but will be excused from exams, assessments, and other evaluative measures that serve the primary purpose of assigning a grade.

Classroom Conduct

Students have a responsibility to conduct themselves in class and in the libraries in ways that do not interfere with the rights of other students to learn, or of instructors to teach. Use of devices such as cellular phones and pagers, or other potentially disruptive activities are only permitted with the prior explicit consent of the instructor. Students are specifically prohibited to record classes without instructor authorization, including online/remote classes (either audio only, or video and audio). The instructor may rescind permission at any time during the class. If a student does not comply with established requirements or obstructs the functioning of the class, the instructor may initiate an administrative withdrawal of the student from the course. Since the COVID-19 pandemic forced some instruction to be delivered remotely starting in Spring 2020, numerous students have asked instructors to record their synchronous classes, so that they can access them at their convenience. Instructors who agree to record their classes (audio only, or video and audio) should inform students in advance. Recorded lectures may not be broadly released to anyone, but made available exclusively to those students enrolled in the class during the particular academic term. Recorded lectures must be stored securely, and are subject to the Nevada System of Higher Education's Records Retention Policy, meaning that the recordings can only be deleted 120 days after the end of class (i.e., after grades are posted). Once this requirement is met, the recordings should be deleted. Class recordings are protected from disclosure, as they are

deemed part of an educational record under the Family Educational Rights and Privacy Act (FERPA).

Copyright

The University requires all members of the University Community to familiarize themselves with, and to follow copyright and fair use requirements. You are individually and solely responsible for violations of copyright and fair use laws. The University will neither protect nor defend you, nor assume any responsibility for student or employee violations of fair use laws. Violations of copyright laws could subject you to federal and state civil penalties and criminal liability, as well as disciplinary action under University policies. Additional copyright policy information is available at <https://www.unlv.edu/provost/copyright>.

Disability Resource Center (DRC)

The UNLV Disability Resource Center (Student Services Complex, SSC-A, Room 143, <https://www.unlv.edu/drc>, telephone 702-895-0866) provides resources for students with disabilities. Students who believe that they may need academic accommodations due to a permanent disability, temporary or permanent medical need, or academic support due to pregnancy are encouraged to contact the DRC as early as possible in the academic term. A Disabilities Specialist will discuss what options may be available to you. Students who are already registered with the DRC should request their accommodations online each semester, and make an appointment to discuss their accommodations with their instructors.

Final Examinations

The University requires that final exams given at the end of a course occur on the date and at the time specified in the Final Exam schedule. The Final Exam schedule is typically available at the start of the semester, and the classroom locations are available approximately one month before the end of the semester. See the Final Exam Schedule, <https://www.unlv.edu/registrar/calendars>.

Identity Verification and Online Course Requirements

All UNLV students must use their Campus-issued ACE ID and password to log in to WebCampus-Canvas. UNLV students enrolled in online or hybrid courses are expected to read and adhere to the Student Academic Misconduct Policy, <https://www.unlv.edu/studentconduct/misconduct/policy>, which states that “acting or attempting to act as a substitute for another, or using or attempting to use a substitute, in any academic evaluation or assignment” is a form of academic misconduct. Intentionally sharing ACE login credentials with another person may be considered an attempt to use a substitute, and could result in investigation and sanctions, as outlined in the Student Academic Misconduct Policy. UNLV students enrolled in online courses are also expected to read and adhere to the Acceptable Use of Computing and Information Technology Resources Policy, <https://www.it.unlv.edu/policies/acceptable-use-computing-and-information-technology-resources-policy>, which prohibits sharing university accounts with other persons without authorization. To the greatest extent possible, all graded assignments and assessments in UNLV online courses should be hosted in WebCampus-Canvas or another UNLV-managed platform that requires ACE login credentials for access.

Incomplete Grades

The grade of “I” (Incomplete) may be granted when a student has satisfactorily completed three-fourths of course work for that semester/session, but cannot complete the last part of the course for reason(s) beyond the student’s control and acceptable to the instructor, and the instructor believes that the student can finish the course without

repeating it. For undergraduate courses, the incomplete work must be made up before the end of the following regular semester. Graduate students receiving “I” grades in 500-, 600-, or 700-level courses have up to one calendar year to complete the work, at the discretion of the instructor. If course requirements are not completed within the period indicated, a grade of “F” will be recorded, and the student’s GPA will be adjusted accordingly. Students who are fulfilling an Incomplete grade do not register for the course, but make individual arrangements with the instructor who assigned the “I” grade.

Library Resources

Librarians are available to consult with students on research needs, including developing research topics, finding information, and evaluating sources. To make an appointment with a subject expert for this class, please visit the Libraries’ Research Consultation website, <https://guides.library.unlv.edu/appointments/librarian>. You can also ask the library staff questions via chat and text message at <https://ask.library.unlv.edu/>.

Missed Classwork

Any student missing class, quizzes, examinations, or any other class or laboratory work because of observance of religious holidays will be given an opportunity during that semester to make up the missed work. The make-up opportunity will apply to the religious holiday absence only. It is the responsibility of the student to notify the instructor within the first 14 calendar days of the course for Fall and Spring courses (except for modular courses), or within the first 7 calendar days of the course for Summer and modular courses, of their intention to participate in religious holidays which do not fall on state holidays or periods of class recess. For additional information, please visit the Missed Classwork policy, under Registration Policies, on the Academic Policies webpage, <https://catalog.unlv.edu/content.php?catoid=39&navoid=10666>.

In accordance with the policy approved by the Faculty Senate regarding missed class time and assignments, students who represent UNLV in any official extracurricular activity will also have the opportunity to make up assignments, provided that the student submits official written notification to the instructor no less than one week prior to the missed class(es).

The spirit and intent of the policy for missed classwork is to offer fair and equitable assessment opportunities to all students, including those representing the University in extracurricular activities. Instructors should consider, for example, that in courses which offer a “Drop one” option for the lowest assignment, quiz, or exam, assigning the student a grade of zero for an excused absence for extracurricular activity is both contrary to the intent of the Faculty Senate’s policy, and an infringement on the student’s right to complete all work for the course.

This policy will not apply in the event that completing the assignment or administering the examination at an alternate time would impose an undue hardship on the instructor or the University that could be reasonably avoided. There should be a good faith effort by both the instructor and the student to agree to a reasonable resolution. When disagreements regarding this policy arise, decisions can be appealed to the Department Chair/School Director, College/School Dean, and/or the Faculty Senate Academic Standards Committee.

For purposes of definition, extracurricular activities may include, but are not limited to academic recruitment activities, competitive intercollegiate athletics, fine arts activities, liberal arts competitions, science and engineering competitions, and any other event or activity sanctioned by a College/School Dean, and/or by the Executive Vice President and Provost.

Rebelmail

Rebelmail is UNLV's official email system for students and by University policy, instructors and staff should only send emails to students' Rebelmail accounts. Rebelmail is one of the primary ways in which students receive official University communications, information about deadlines, major Campus events, and announcements. All UNLV students receive a Rebelmail account after they have been admitted to the University. Sending emails within WebCampus-Canvas is also acceptable. 4

Title IX

UNLV is committed to providing an environment free of all forms of unlawful discrimination including sexual and gender-based discrimination, harassment, and violence like sexual assault, intimate partner violence, and stalking. If you, or someone you know, has experienced or is experiencing these types of behaviors, know that you are not alone. Resources and support are available. To learn more or to report an incident, please visit the Office of Equal Employment and Title IX website at <https://www.unlv.edu/compliance>. Please be aware that as an instructor, I am not a confidential resource, and I will need to report incidents of sexual misconduct to UNLV's Title IX Coordinator. You can also report concerns directly using the online reporting form, at https://cm.maxient.com/reportingform.php?UnivofNevadaLasVegas&layout_id=18, or via email at titleixcoordinator@unlv.edu or 702-895-4055. For confidential support in matters of sexual violence, relationship/family violence, or stalking, contact the Care Center at <https://www.unlv.edu/carecenter> or 702-895- 0602.

Tutoring and Coaching

The Academic Success Center (ASC), at the Claude I. Howard Building, provides tutoring, academic success coaching, and other academic assistance for all UNLV undergraduate students. For information regarding tutoring subjects, tutoring times, and other ASC programs and services, please visit the ASC website, <https://www.unlv.edu/asc>, or call 702-895-3177. The ASC is located across from the Student Services Complex (SSC). Academic success coaching is located on the second floor of SSC A, Room 254. Drop-in tutoring is located on the second floor of the Lied Library, and on the second floor of the College of Engineering building (TBE A 207).

UNLV Writing Center

One-on-one or small group assistance with writing is available free of charge to UNLV students at the Writing Center, <https://writingcenter.unlv.edu/>, located in the Central Desert Complex, Building 3, Room 301 (CDC 3–301). Walk-in consultations are sometimes available, but students with appointments receive priority assistance. Students may make appointments in person or by calling the Center, telephone 702-895-3908. Students are requested to bring to their appointments their Rebel ID Card, a copy of the instructions for their assignment, and two copies of any writing they have completed on their assignment.

988 FREE 24/7 SUICIDE & CRISIS LIFELINE

In addition to campus resources such as the Counseling and Psychological Services (CAPS) website at <https://www.unlv.edu/caps>, visiting the YOU@UNLV website at <https://you.unlv.edu/>, and Early Alert (for graduate students, at <https://www.unlv.edu/graduatecollege/academy/early-alert>), you may now call or text 988 or chat at 988lifeline.org if you or someone you know is in crisis and in need of support.

Diversity Statement

As an institution of higher learning, UNLV represents a rich diversity of human beings among its faculty, staff, and students, and is committed to aspiring to maintain a Campus environment that values that diversity. Accordingly, the University supports understanding and appreciation of all members of its community, regardless of race, sex, age, color, national origin, ethnicity, creed, religion, disability, sexual orientation, gender, gender identity, marital status, pregnancy, genetic information, veteran status, or political affiliation. Please see University Statements and Compliance, <https://www.unlv.edu/about/statements-compliance>.

A successful learning experience requires mutual respect and trust between the students and the instructor. Accordingly, the instructor asks that students be willing to listen to one another's points of view, acknowledging that there may be disagreements, keep discussion and comments on topic, and use first person, positive language when expressing their perspectives.

UNLV Land Acknowledgement

UNLV is situated on the traditional homelands of Indigenous groups, including the Nuwu or Nuwuvi, Southern Paiute People, descendants of the Tudu, or Desert People. We honor and offer gratitude for those who have stewarded the land; for the land itself; and for the opportunity to cultivate a thriving, diverse, inclusive, and just scholarly community here today that works for a better tomorrow for all.