

## GEOL 3402– STRUCTURAL GEOLOGY

Sul Ross State University  
SPRING 2024  
Course Syllabus

<b>Professor:</b>	Dr. Jesse Kelsch
<b>Office Hours:</b>	MTWR 11-12; MT 2-3
<b>Office Location:</b>	WSB 316
<b>Telephone:</b>	432-837-8657
<b>Email Address:</b>	jkelsch@sulross.edu
<b>Class Schedule:</b>	TR 9:30-10:45
<b>Classroom Location:</b>	WSB 210
<b>Required Textbook:</b>	Fossen: Structural Geology (any edition)
<b>Required free software:</b>	“Stereonet” v.11 by Allmendinger “Strabospot” -install on your computer and smartphone “Google Earth Pro” (the desktop version)
<b>Required equipment for field and lab work:</b>	Combination protractor/scale (clear plastic) Hand lens Clip board Grain-size card (clear plastic) 2 to 3 mechanical pencils, 005 or smaller width Colored pencils

### Section I. Introduction and Course Objectives

This is a core class in the Geology BS degree undergraduate curriculum. **Prerequisites:**  
**Physical Geology; Trigonometry** (Trig may be taken as a corequisite)

The objective of this course is to provide the student with a clear understanding of the features and origins of deformed rocks, including the classification, identification, occurrence, causes and geographic distribution of the common types of rock deformation. This course also intends to verse the student in communicating their interpretation of geologic deformation through the field-standard tools of geologic maps, geologic cross sections, and geologic reports.

### Section II. Student Learning Outcomes

The student will be able to apply a diverse body of geologic information in the area of structural geology and tectonics, by throughout the course developing the ability to:

1. Measure and describe orientations of geologic structures
2. Interpret and construct geologic maps and structural cross sections
3. Apply various projection techniques to graphically and geometrically illustrate geologic structures

4. Demonstrate qualitative and quantitative analytical methods in the laboratory and in the field
5. Evaluate and interpret the origin, extent, timing and causes of rock deformation in Earth's crust

**Section III. Marketable Skills**

The student will be able to conduct geologic field work; to use basic geologic field equipment; and to communicate in written format via geologic reports.

**Section IV. Course Requirements and Grading**

Requirement	Points Possible	Grading Scale
Black Gap map	40	Entire Course A = 895-1000 B = 795-894 C = 695-794 D = 595-694 F = < 595
Black Gap cross section	40	
Black Gap report	40	
Mariscal Mtn map	40	
Mariscal Mtn cross section	40	
Mariscal Mtn report	40	
Manzano Mts cross section	30	
Manzano Mts report	30	
4 concept sketches 20ea	80	
Exam I	100	
Exam II	100	
Exam III	100	
Lecture attendance	50	
Lab Total	250	
<b>Possible Points</b>	<b>1000</b>	

**Section V. Course Assignments**

1. There are two required field trips scheduled for part of this class's work: Black Gap and Mariscal Mountain. Products from these field trips are a completed geologic map and geologic cross section along a designated traverse, and a scientific report describing the geology of the mapping area. See the semester schedule for planned dates.
2. There is a third project using a given geologic map plus structural data: Manzano Mountains. Students will produce a cross section and write a report for this project.
3. Another component of this class's required work is preparation of concept sketches to enhance your learning and to develop spatial communication skills. A concept sketch is a single-page, hand-drawn\* figure with succinct labels and complete-sentence descriptions. Six of these will be assigned through the semester from lecture. (\*The hand-drawing is what enhances your learning.) Examples will be given in class.
4. There will be three section exams through the semester taken during class time. See the semester schedule for dates.

## **Section VI. Policies**

**Attendance.** Regular attendance is expected because being in class is the first step to learning structural geology. Class content and instruction is delivered during the class time and is not stored or re-posted. Good attendance is worth 50 points of your final grade. An excused absence is one documented for illness or for planned college events. Attendance will be taken at the beginning of each class time. Students are also expected to arrive to class on time. Lateness and frequent disappearance from class during class time counts as an absence.

**Academic Integrity.** Students in this class are expected to demonstrate scholarly behavior and academic honesty in the use of intellectual property. A scholar is expected to be punctual, prepared, and focused; meaningful and pertinent participation is appreciated. Examples of academic dishonesty include but are not limited to: Turning in work as original that was used in whole or part for another course and/or professor; turning in another person's work as one's own; copying from professional works or internet sites without citation; collaborating on a course assignment, examination, or quiz when collaboration is forbidden.

**Grading.** See the "Grading Scale" in Section VI.

**Late Work.** Students in this class are expected to submit assignments by the posted due date. Late work will be accepted at a rate of 5% off the earned total for each full day after the due date.

## **Section IX. Notes on University Programs and Services**

**SRSU Disability Services.** SRSU Disability Services. Sul Ross State University (SRSU) is committed to equal access in compliance with Americans with Disabilities Act of 1973. It is SRSU policy to provide reasonable accommodations to students with documented disabilities. It is the student's responsibility to initiate a request each semester for each class. Students seeking accessibility/accommodations services must contact Rebecca Greathouse Wren, LPC-S, SRSU's Accessibility Services Coordinator at 432-837-8203 (please leave a message and we'll get back to you as soon as we can during working hours), or email [rebecca.wren@sulross.edu](mailto:rebecca.wren@sulross.edu). Our office is located on the first floor of Ferguson Hall (Suite 112), and our mailing address is P.O. Box C-122, SUI Ross State University, Alpine, Texas, 79832.

**Technical Support.** SRSU 24/7 Blackboard Technical Support: Toll Free: 888.837.6055.  
Email: [blackboardsupport@sulross.edu](mailto:blackboardsupport@sulross.edu)

### **SRSU Library Services.**

The Bryan Wildenthal Memorial Library in Alpine offers FREE resources and services to the entire SRSU community. Access and borrow books, articles, and more by visiting the library's website, [library.sulross.edu](http://library.sulross.edu). Off-campus access requires your LoboID and password. Check out materials using your photo ID. Librarians are a tremendous resource for your coursework and can be reached in person, by email ([srsulibrary@sulross.edu](mailto:srsulibrary@sulross.edu)), or phone (432-837-8123).

## SEMESTER CALENDAR FOR GEOL 3402 (subject to change)

Week	week of	lecture topic	reading
1	18-Jan	1. What is structure; detailed structural analysis; review of structures. 2. Basic structures and geometries; strike and dip; lines and planes; stereonet	1.1, 1.2, 1.12. 1.13
2	23-Jan	1. Introduction to Strain. 2. Strain ellipse; orientations of deformation	2.1 - 2.3 - 2.11, 2.24 - 2.29
3	30-Jan	1. Strain analysis	2.13 - 2.17, 3.1, 3.2, boxes 3.1 and 3.2
4	6-Feb	1. Stress and compression tests; Mohr circles. 2. Rheology	2.30, 4.1 - 4.4, 4.7, 6.1, 6.2, 6.7 - 6.9, 7.3-7.6
5	13-Feb	1. Anderson's Theory of faulting.	5.6 - 5.8; 9.2, box 9.1
6	20-Feb	1. Brittle deformation mechanisms and joints. 2. Intro to faults. Exam I	7.1-7.2, 7.8; 8.1-8.3, 8.6
7	27-Feb	1. Normal faults resulting from tensile stress	ch17
8	5-Mar	1. Introduction to geologic mapping techniques. 2. Thrust faults resulting from compressive stress	ch16
9		Spring Break; No classes	
10	19-Mar	1. Technical writing. 2. Thrust faults, continued. Exam II	
11	26-Mar	1. Exam II. 2. In-class project: Geologic mapping using satellite data in QGIS	

12	2-Apr	Folds; stereographic analysis of folds	ch11-ch12
13	9-Apr	1. Strike-slip faults. 2. Plastic deformation mechanisms and microstructures. Exam II	1. Ch.18. 2. 10.1-10.6, 14.1-14.2, ch15
14	16-Apr	1. Tectonites. 2. Shear-sense indicators	ch21
15	23-Apr	1. Exam III. 2. Structural geology and regional tectonic studies I	
16	30-Apr	Structural geology and regional tectonic studies II	revisit reading from ch1
	finals week	Exam III	

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1	18-Jan	1. What is structure; detailed structural analysis; review of structures. 2. Basic structures and geometries; strike and dip; lines and planes; stereonet	1.1, 1.2, 1.12. 1.13
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8	5-Mar	1. Introduction to geologic mapping techniques. 2. Thrust faults resulting from compressive stress	ch16
9		Spring Break; No classes	
10	19-Mar	1. Technical writing. 2. Thrust faults, continued. Exam II	
	weekend of March 23	Multi-day field trip to Black Gap WMA; geologic mapping and cross section construction	
11	26-Mar	1. Exam II. 2. Folds	
12	2-Apr	Folds; stereographic analysis of folds	ch11-ch12
	weekend of April 6	multi-day field trip to Mariscal Mountain; co-attended with Field Studies class (Dr. Shiller)	
13	9-Apr	1. Strike-slip faults. 2. Plastic deformation mechanisms and microstructures. Exam II	1. Ch.18. 2. 10.1-10.6, 14.1-14.2, ch15
14	16-Apr	1. Tectonites. 2. Shear-sense indicators	
15	23-Apr	1. Structural geology and regional tectonic studies I	ch21
16	30-Apr	Structural geology and regional tectonic studies II	revisit reading from ch1

finals week

Exam III

