

## GEOL 3402– STRUCTURAL GEOLOGY

Sul Ross State University  
SPRING 2025  
Course Syllabus

<b>Professor:</b>	Dr. Jesse Kelsch
<b>Office Hours &amp; location:</b>	Mon & Wed 1:30-4:00pm; WSB 316
<b>Telephone:</b>	432-837-8657
<b>Email Address:</b>	jkelsch@sulross.edu
<b>Class Schedule:</b>	TR 12:30-1:45
<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 plus binder clip or large rubber band Grain-size card (clear plastic) 2 to 3 mechanical pencils, 005 or smaller width Colored pencils
<b>Prerequisite courses:</b>	Physical Geology; Trigonometry (Trig may be taken as a corequisite)

### Section I. Introduction and Course Learning Objectives

Welcome to GEOL 3402 (Structural Geology) at Sul Ross. This is a required class in the Geology BS degree undergraduate curriculum. 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.

Some of the geologic skills learned in this class:

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 in the subsurface
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 II. SACSCOC Student Learning Outcomes

The student completing this course will be able to apply a diverse body of geologic information in the areas of structural geology, tectonics, and field techniques.

## Section III. THECB Marketable Skills

The student completing this course will be able to conduct geologic field work; to use basic geologic field equipment; to use library resources; and to communicate in written format via technical 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	
Big Bend NP map	40	
Big Bend NP cross section	40	
Big Bend NP report	40	
Manzano Mts cross section	30	
Manzano Mts report outline	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 Big Bend NP. 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 an outline of 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. Four 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. Class Policies**

**Attendance.** Regular attendance is expected. Class content and instruction are delivered during the class time and are not stored or re-posted. 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.

**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 VII. University Policies, Programs, and Services**

### ***ADA Statement***

SRSU Accessibility Services. Sul Ross State University (SRSU) is committed to equal access in compliance with the 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 Mrs. Mary Schwartz Grisham, LPC, SRSU's Accessibility Services Director or Ronnie Harris, LPC, Counselor, at 432-837-8203 or email [mschwartz@sulross.edu](mailto:mschwartz@sulross.edu) or [ronnie.harris@sulross.edu](mailto:ronnie.harris@sulross.edu). Their office is located on the first floor of Ferguson Hall, room 112, and their mailing address is P.O. Box C122, Sul Ross State University, Alpine, Texas, 79832.

### ***Student Responsibilities Statement***

All full-time and part-time students are responsible for familiarizing themselves with the Student Handbook and the Undergraduate & Graduate Catalog and for abiding by the University rules and regulations. Additionally, students are responsible for checking their Sul Ross email as an official form of communication from the university. Every student is expected to obey all federal, state and local laws and is expected to familiarize themselves with the requirements of such laws.

### ***Academic Integrity***

Students in this class are expected to demonstrate scholarly behavior and academic honesty in the use of intellectual property. Students should submit work that is their own and avoid the temptation to engage in behaviors that violate academic integrity, such as 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. Students should also avoid using open AI sources unless permission is expressly given for an assignment or course. Violations of academic integrity can result in failing assignments, failing a class, and/or more serious university consequences. These behaviors also erode the value of college degrees and higher education overall.

***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).

**Section VIII. SEMESTER CALENDAR FOR GEOL 3402 (*subject to change*)**

Week	Day	Date	Topic	Reading
1	Thur	16-Jan	What is structure; detailed structural analysis; review of structures.	1.1, 1.2, 1.12, 1.13
2	Tue	21-Jan	Basic structures and geometries; strike and dip; lines and planes; stereonets	
	Thur	23-Jan		
3	Tue	28-Jan	1. Introduction to Strain. 2. Strain ellipse; orientations of deformation	2.1 - 2.3 - 2.11, 2.24 - 2.29
	Thur	30-Jan		
4	Tue	4-Feb	1. Strain analysis	2.13 - 2.17, 3.1, 3.2, boxes 3.1, 3.2
	thur	6-Feb		
5	tue	11-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
	Thur	13-Feb		
6	Tue	18-Feb	1. Anderson's Theory of faulting.	5.6 - 5.8; 9.2, box 9.1
	Thur	20-Feb		
7	Tue	25-Feb	1. Brittle deformation mechanisms and joints. 2. Exam I	7.1-7.2, 7.8; 8.1-8.3, 8.6
	Thur	27-Feb		
8	Tue	4-Mar	1. Normal faults resulting from tensile stress. 2. Introduction to geologic mapping techniques	ch17
	Thur	6-Mar		
		Mar 8-9	Overnight field trip #1: geologic mapping in Black Gap WMA	
9	Tue	11-Mar	1. Technical writing. 2. Thrust faults resulting from compressive stress	ch16
	Thur	13-Mar		
10	Tue Thur		spring break	
11	Tue	25-Mar	Thrust faults, continued. 2. Strike slip faults	Ch.18.
	Thur	27-Mar		
12	Tue	1-Apr	1. Exam II. 2. Folds; stereographic analysis of folds	ch11-ch12
	Thur	3-Apr		
		Apr 5-6	Overnight field trip #2: More geologic mapping in BBNP	
13	Tue	8-Apr	More folds	
	Thur	10-Apr		
14	Tue	15-Apr	1. Tectonites and Shear-sense indicators. 2. In-class exercise: Manzano Mountains cross section	
	Thur	17-Apr		
15	Tue	22-Apr	Plastic deformation mechanisms and microstructures.	10.1-10.6, 14.1-14.2, ch15
	Thur	24-Apr		
16	Tue	29-Apr	Structural geology and regional tectonic studies	ch21

