GOL 338: Structural Geology
Spring 2020 Class Syllabus
College of Science and Mathematics - Stephen F. Austin State University

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Lecture Meetings: Monday and Wednesday, 10:00-10:50 AM, Miller Science, Room 330

Laboratory Meetings: Wednesday, 2:30-5:00 PM, Miller Science, Room 330

Course Description: Structural Geology (GOL 338) – Three semester hours (two lecture hours, three laboratory hours per week). Over geologic time scales, due to the application of stresses, Earth materials such as rocks deform through a variety of processes, at scales that range from submicroscopic to regional. This course will present a thorough examination of the mechanisms by which Earth materials deform, and the geologic structures that result from this deformation. An understanding of structural geology is fundamental to multiple geologic fields, including exploration for natural resources such as oil, gas, coal, and precious metals, exploration for groundwater and geothermal energy resources, and evaluation and mitigation of natural geologic hazards. Required field trip. Required lab and field trip fees. Prerequisite: GOL 408. Corequisite: GOL 338L.

Course Materials:

  - I recommend you buy this book used. A cursory glance on google and you can find a used text for < $25 (but make sure you get the 3rd edition)
- You are expected to bring a notebook and/or binder to all class meetings to keep and organize notes and hand-outs for reference. I will provide you a binder that you use to organize and hand in your lab assignments.
- Drafting materials: I sent a link to your SFASU email for a STAEDLER brand geometry kit that should have the drafting materials that you will need in my class. You will also need to buy the following supplies for Field Methods and Field Camp. Most of these materials are available on the endcap display labeled “Geology Supplies” near the information desk in the campus bookstore.
  - Materials in the STAEDLER geometry kit
    - metal pencil compass
    - circular protractor with a straight center divider
    - 6”/15 cm ruler
    - 45 degree set square
    - 30 degree/60 degree set square
  - Drafting paper: One pad of 8.5” x 11” 100% rag vellum paper with 10 x 10 printed grid
  - Tracing paper: One pad inexpensive, thin tracing paper (8.5” x 11” preferred, 9” x 12” okay)
  - Post-It Tape: One roll of 3M Post-It brand “Labeling and Cover-up” tape, 1” width
  - Pencils: Four “4H” pencils with hard lead; two regular soft lead pencils. Mechanical pencils are fine if you can find the refills with appropriate hardnesses. A handheld pencil sharpener is useful if you’re not using a mechanical pencil.
  - Eraser: One good quality eraser; push-up style erasers are usually fine
  - Sharpies: Sharpie brand permanent markers in Extra Fine point, Fine point, and Chisel Tip
  - Colored pencils: Two packages of Crayola brand colored pencils with 24 colors

- Please bring your lab binder, a calculator with trig functions (you’ll need a calculator that is not on your phone for exams), hand lens, and all drafting supplies to all lab meetings. You might want a pencil bag or box to organize all your drafting supplies.
- You will need a field notebook (Geology, Rite in the Rain) for the field trip – you should be able to use the notebook you’re using for Field Methods.

**Program Learning Outcomes:**

PLO 1. Demonstrate knowledge of fundamental geoscience concepts. (Concepts)
PLO 2. Execute geoscience procedures and methods accurately, appropriately, and safely. (Geoscience Skills)
PLO 3. Demonstrate proficiency in interpretation and communication of geoscience information. (Scientific Communication)
PLO 4. Apply concepts, skills, and scientific communication to identify, analyze, and interpret geoscience phenomena. (Research)

**Student Learning Outcomes:** After successful completion of this course, students will be able to:

SLO 1. Identify primary and secondary structures.
SLO 2. Evaluate faults and folds in the context of stress, strain, and tectonic setting.
SLO 3. Analyze geologic maps and create reasonable geologic cross sections.
SLO 4. Evaluate structural data in the context of regional tectonic history.
SLO 5. Construct the regional tectonic history of a field area based on map patterns and structural data.
**Course Format:** Lectures introduce the critical concepts related to understanding deformational processes and to characterizing the resulting structures. Weekly laboratory exercises emphasize the development of skills used to observe and analyze deformed rocks. A required field trip will allow you to apply your knowledge and skills in the field. Your progress during the semester will be assessed through 5-Minute quizzes, laboratory assignments, Attitudes of the Week, Rock of the Week descriptions, and three exams.

**Workload:** You are expected to spend time on this course outside of lecture and lab periods. This time should be spent 1) completing assignments (readings, labs, Rock of the Week descriptions, Attitudes of the Week); 2) reviewing/studying your lecture notes, lecture slides, readings, and assignments on a regular basis; and 3) studying for quizzes and exams.

I really do expect you to read the assigned chapters. Structural geology is a dense subject matter, but you will find the Davis textbook to be more approachable than more math intensive structural geology textbooks. I do not expect you to retain all of the material you read. However, by reading the chapters, then hearing that material explained in lecture, and then reinforcing the concepts in lab you will gain a deeper understanding of structural geology.

**Lectures:** It is your responsibility to take good notes during lectures so that you have a record of concepts, chalkboard sketches, activities, and discussions not included in my PowerPoint slides. The PowerPoint slides are really only for illustrations/photos of concepts and will not be provided to you. You will need to rely on careful notes and sketches you have taken each lecture, as well as the chapter readings to use as a study guide for quizzes and exams.

**5-Minute Quizzes:** While Structural Geology is fascinating, it can also be quite challenging. It is critical that you keep up with your assigned reading and reviewing. To encourage you to do your best in this class this semester, I will start some lecture periods promptly with a 5-Minute quiz. Quizzes will be brief (1-3 questions), and based on the previous lecture and current reading. You may expect ~8-15 quizzes over the course of the semester. I strongly recommend that you review your notes after each lecture, as quizzes will either cover the assigned reading or the material covered in the previous lecture. Be on time for class!

**Laboratory Assignments:** Labs are assigned weekly (see course schedule). Complete the background reading for the lab assignment that I will give to you prior to the lab period. We will get to work, and if you haven’t done the background reading you will fall behind. Bring your notebook, lab manual, hand lens, calculator (with trig functions), and drafting materials to every lab period. You are expected to attend lab periods in their entirety – arrive promptly for the introduction and plan to work through the end. You should expect to complete most lab work outside of the lab period. Labs are due at the beginning of the lab period one week after they are assigned (see course schedule). You are expected to follow instructions and complete your work individually and with academic integrity. Failure to turn in more than 2 labs will result in an incomplete grade.

**Rock of the Week:** At the beginning of each lab (most weeks), I’ll set out the Rock of the Week (ROTW). You will have one week to sketch the rock, write a description, and explain the rock’s structural and geologic history. At the beginning of each lab period, when you’ve turned in your ROTW description, one of you will be randomly selected to present the ROTW. You will receive more detail about this work in lab.
**Attitudes of the Week:** Similar in concept to ROTW, I will set up the strike and dip board around the classroom. You will have a week to make all of the structural measurements (but it really shouldn’t take you long). My goal is for you to become extremely proficient at using a Brunton Compass to make structural measurement such that it is almost second nature. You’ll find that this assignment will become easier and easier as the semester goes by. But, that is the point, for this to be fast and easy. I want you to be extremely prepared for Field Camp.

**Required Field Trip:** This course has a required field trip on **April 16-19**. We will travel by SFA vans to the spectacularly deformed Arbuckle and Ouachita Mountains of Oklahoma, where you will apply your knowledge and skills from this course and from Field Methods. If you miss the field trip, you will receive an incomplete for the course, and you will have to make it up next spring. This is a camping field trip – you will receive more detailed information regarding requirements, the itinerary, and a packing list well before the trip. This is a good test run for your field camp gear!

**Exams:** Exams (Exam 1, Exam 2, Final Exam) will test concepts introduced in lecture and lab. These exams will include a variety of question formats (e.g., multiple choice, fill in the blank, sketching and labeling diagrams, short answer, problems, etc.). The Final Exam is not cumulative. You will need a pencil, eraser, calculator (if indicated), and drafting materials for exams; you will be notified if you need additional tools. The use of books, notes, or other electronic devices is not permitted.

**Course Schedule:** A course calendar provided at the end of the syllabus outlines the schedule of lecture topics, lab activities, readings, exams, the field trip and other course activities, as well as the due dates for all assignments. Note that all assignments are due at the beginning of class on the date for which they are listed. I reserve the right to modify the schedule as needed, and I will notify you accordingly.

**Attendance:** You are expected to attend all course meetings. I will take attendance for university accounting purposes. Excused absences include illness, serious emergency, and events during which you are representing the University. Poor planning and vacations do not constitute excused absences. **If you have been absent,** it is your responsibility to get notes, lecture slides, and course assignments. Contact a classmate for lecture notes. You are welcome to attend office hours or make an appointment for clarification of missed concepts or assignments. You do not need to provide documentation regarding an absence unless you require new deadlines. Exams will not be rescheduled for unexcused absences.

**Late Work:** If you have an upcoming excused absence or are having trouble completing an assignment on time, please contact me **before** the due date about alternative arrangements. No assignment will be accepted for credit after the assignment has been graded and returned – stay on top of your work! Otherwise, a 10% per school day penalty will apply to all late assignments.
**Final Grades**: Your final grade will be determined by summing the weighted averages of your grades in each of the categories below. Letter grades will be assigned as follows: A (90.0–100), B (80.0–89.9), C (70.0–79.9), D (60.0–69.9), F (< 60.0). There will be no extra credit assignments – focus your attention on the tasks at hand.

5-Minute Quizzes

**Your final grade will be calculated as follows:**

<table>
<thead>
<tr>
<th>Category</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Exam 1</td>
<td>15%</td>
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<td>Exam 2</td>
<td>15%</td>
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<tr>
<td>Final exam</td>
<td>20%</td>
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<tr>
<td>Laboratory and field trip exercises (15 total)</td>
<td>25%</td>
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<tr>
<td>Rock of the week</td>
<td>10%</td>
</tr>
<tr>
<td>Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Attitudes of the week</td>
<td>5%</td>
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</tbody>
</table>

**Total possible:** 100%

**Success**: I am invested in your education and academic success. Your proficiency in Structural Geology and Field Methods is a reflection on my ability to teach and mentor you as a student. Also, I want ensure you are adequately prepared for the challenges of Field Camp. And, I want SFA to have a reputation for producing good geologists. However, your academic achievement naturally depends on your level of involvement in this course. You improve your chances of success if you: complete readings and assignments, attend all lectures and labs, take advantage of office hours, participate in activities and discussions, study regularly, make use of available resources, and ask questions. Do not hesitate to ask for help. I am available during office hours, but also feel free to drop by or make an appointment. I’ll be glad to talk (unless I am meeting with a student already or a pressing deadline is upon me).

**Office Hours**: Office hours are the times when I guarantee my availability. My office hours for this semester are listed at the top of this syllabus. Office hours are open to all students. Office hours are a good time to discuss course topics, ask questions, discuss your course progress, talk about ways to improve your understanding, or just chat. Also, Adrian is available during his office hours as well. Feel free to stop by his office to get help or ask questions about the labs.

**Communication**: Seek me out when you have questions or concerns. You are welcome to stop by any time – basically, if my door is open, I’m available. Email (ryan.anderson@sfasu.edu) is preferable to telephone communication – I won’t check voicemail when I’m off campus (I actually don’t even know how to check my office voicemail now that I think about it...). I will contact you through SFA email about any important announcements – it is your responsibility to make sure you check your SFA email messages regularly.

**Students with Disabilities**: To obtain disability related accommodations, alternate formats, and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Room 325, Human Services Building, 936-468-3004/1004 (TDD) as early as possible in the semester. Once verified, ODS will notify me and outline the accommodations and/or auxiliary aids to be provided. Failure to
request services in a timely manner may delay your accommodations. For additional information, go to http://www.sfasu.edu/disabilityservices. Please be in touch with me at the beginning of the semester to discuss arrangements for accommodations.

**Color Vision Deficiency:** Color vision deficiency (CVD, a.k.a. color blindness) poses additional challenges to geoscientists working with samples and maps. If you experience CVD, please notify me so that I can best assist you.

**Academic Integrity:** Academic integrity is the responsibility of all university faculty and students. Faculty members promote academic integrity in multiple ways including instruction on the components of academic honesty, as well as abiding by university policy on penalties for cheating and plagiarism. Academic dishonesty includes both cheating and plagiarism. Cheating includes but is not limited to (1) using or attempting to use unauthorized materials to aid in achieving a better grade on a component of a class; (2) the falsification or invention of any information, including citations, on an assigned exercise; and/or (3) helping or attempting to help another in an act of cheating or plagiarism. Plagiarism is presenting the words or ideas of another person as if they were your own. Examples of plagiarism are (1) submitting an assignment as if it were one's own work when, in fact, it is at least partly the work of another; (2) submitting a work that has been purchased or otherwise obtained from an Internet source or another source; and (3) incorporating the words or ideas of an author into one's paper without giving the author due credit. Read the complete policy at http://www.sfasu.edu/policies/academic_integrity.asp (Policy A-9.1). You are encouraged to ask questions about completing your coursework with academic integrity.

**Withheld Grades:** At the discretion of the instructor of record and with the approval of the academic unit head, a grade of WH will be assigned only if the student cannot complete the course work because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F, except as allowed through policy [i.e., Active Military Service (6.14)]. If students register for the same course in future semesters, the WH will automatically become an F and will be counted as a repeated course for the purpose of computing the grade point average.

**Classroom Courtesy:** Please be considerate of your classmates and of me. Put yourself in my shoes and the shoes of your fellow classmates, if it would seem distracting or disrespectful if you were up front trying to teach or trying to listen you probably shouldn’t do it. Refrain from distracting behaviors, and keep electronic devices silent. Use of electronic devices for purposes other than participating in class (e.g., note-taking), such as listening to music or studying for other courses, is distracting, and therefore not acceptable in the classroom. You may not photograph or record lectures without my permission.
<table>
<thead>
<tr>
<th>Week</th>
<th>Date</th>
<th>Topic</th>
<th>Readings &amp; Assignments</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Course Schedule – GOL 338 – Structural Geology – Spring 2020</strong></td>
</tr>
<tr>
<td>1</td>
<td>W Jan. 15</td>
<td>Introduction</td>
<td>Read: Syllabus, Davis (P. 1-7, 21-29)</td>
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<tr>
<td></td>
<td>W Jan. 15</td>
<td><strong>Lab 1:</strong> Introductory Techniques, Topographic Maps &amp; Profiles</td>
<td>Read: Lab Handout</td>
</tr>
<tr>
<td>2</td>
<td>M Jan. 20</td>
<td><strong>Martin Luther King Jr. Holiday – No Class</strong></td>
<td></td>
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<tr>
<td></td>
<td>W Jan. 22</td>
<td>Transformations/kinematics</td>
<td>Read: Davis (P. 7-9, 34-39, 44-59)</td>
</tr>
</tbody>
</table>
|      | W Jan. 22 | **Lab 2:** Geologic Contacts and Topography | Read: Marshak and Mitra (P. 24-26)  
**Due:** Lab 1, Rock of the Week (ROTW) 1 |
| 3    | M Jan. 27 | Strain 1 | Read: Davis (P. 59-68) |
|      | W Jan. 29 | Strain 2 | Read: Davis (P. 68-75, 84-86) |
|      | W Jan. 29 | **Lab 3:** Determining finite strain | Read: Lab Handout  
**Due:** Lab 2, ROTW 2, Attitudes of the Week 1 (AOTW) |
| 4    | M Feb. 3 | Strain 3 | Read: Davis (P. 78-84)  
**Due:** Lab 3, ROTW 3, AOTW 2 |
|      | W Feb. 5 | Stress 1 | Read: Davis (P. 11-15, 95-99, 101-104) |
|      | W Feb. 5 | **Lab 4:** Structure contour and isopach maps | Read: Marshak and Mitra (P. 27-33) |
| 5    | M Feb. 10 | Stress 2 | Read: Davis (P. 104-108, 112-113) |
|      | W Feb. 12 | Stress 3 | Read: Davis (P. 113-120) |
|      | W Feb. 12 | **Lab 5:** Calculating attitude and apparent dip | Read: Marshak and Mitra (P. 47-56)  
**Due:** Lab 4, ROTW 4, AOTW 3 |
| 6    | M Feb. 17 | Relating Stress and Strain 1 | Read: Davis (P. 120-136)  
**Due:** Lab 5, ROTW 5, AOTW 4 |
|      | W Feb. 19 | Relating Stress and Strain 2 | Read: Davis (P. 136-147)  
**Note:** No Class – Spring Break |
|      | W Feb. 19 | **Lab 6:** Calculating thickness and dimensions, Mohr circles | Read: Marshak and Mitra (P. 67-78)  
**Due:** Lab 6, ROTW 6, AOTW 5 |
| 7    | M Feb. 24 | **EXAM 1** | |
|      | W Feb. 26 | Microstructural deformation 1 | Read: Davis (P. 148-164) |
|      | W Feb. 26 | **Lab 7:** Stereonets 1: basics of plotting data | Read: Marshak and Mitra (P. 87-103)  
**Due:** Lab 7, ROTW 7, AOTW 6 |
| 8    | M Mar. 2 | Microstructural deformation 2 | Read: Davis (P. 164-181) |
|      | W Mar. 4 | Crustal Strength/Faults 1 | Read: Davis (P. 188-191, 249-260) |
|      | W Mar. 4 | **Lab 8:** Stereonets 2: poles, folds, rotations | Read: Marshak and Mitra (P. 105-116)  
**Due:** Lab 8, ROTW 8, AOTW 7 |
| 9    | Mar. 9-13 | **No Classes – Spring Break** | |
| 10   | M Mar. 16 | Faults 2 | Read: Davis (P. 260-268, 272-280) |
|      | W Mar. 18 | Faults 3 | Read: Davis (P. 281-291)  
**Due:** Lab 9, ROTW 9, AOTW 8 |
| 11   | M Mar. 18 | **Lab 9:** Geologic map interpretation | Read: none  
**Due:** Lab 8, ROTW 8, AOTW 7 |
|      | W Mar. 23 | Faults 4 | Read: Davis (P. 291-293, 296-300, 305-320) |
|      | W Mar. 25 | Faults 5 | Read: Davis (P. 322-343)  
**Due:** Lab 10, Cross section 1: Lewiston fold |
|      | W Mar. 25 | **Lab 10:** Cross section 1: Lewiston fold | |
| 12   | M Mar. 30 | Joints 1 | Read: Davis (P. 193-206, 221-222, 226-229)  
**Due:** Lab 11, Cross section 2: Willow Creek fold |
|      | W Apr. 1 | Joints 2/Folds 1 | Read: Davis (P. 230-239, 351-365, 375-383)  
**Due:** Lab 10, ROTW 10, AOTW 9 |
|       | W Apr. 1 | **Lab 11:** Cross section 2: Willow Creek fold | Read: None  
**Due:** Lab 10, ROTW 10, AOTW 9 |
| 13   | M Apr. 6 | Folds 2 | Read: Davis (P. 366-368, 383-403)  
**Due:** Lab 12, Cross section 3: Yerington district  
**Due:** ROTW 11, AOTW 10 |
|      | W Apr. 8 | Folds 3 | Read: Davis (P. 403-417, 420-423)  
**Due:** Lab 11, ROTW 11, AOTW 10 |
| 14   | M Apr. 13 | Folds 4 | Read: Davis (P. 428-429, 433-447, 449-452) |
|      | W Apr. 15 | **EXAM 2** | |
|      | W Apr. 15 | **Lab 13:** Lecture on Structural Fabrics | Read: Davis (P. 463-484, 487-517)  
**Due:** Lab 12, ROTW 12, AOTW 11  
**Note:** Lab 14 & Lab 15, AOTW 13  
**Note:** GOL 472 Field Trip  
**Note:** Lab 10, ROTW 10, AOTW 9  
**Note:** Lab 9, ROTW 9, AOTW 8  
**Note:** Lab 11, ROTW 11, AOTW 10  
**Note:** Lab 12, ROTW 12, AOTW 11 | |
| 15   | M Apr. 20 | Shear Zones 1 | Read: Davis (P. 530-545, 556-577) |
|      | W Apr. 22 | Shear Zones 2 | Read: Davis (P. 526-529, 546-555)  
**Due:** ROTW 13, AOTW 12, Field Notes  
**Due:** Lab 14 & Lab 15, AOTW 13 |
| 16   | M Apr. 27 | Structure and Plate Tectonics 1 | Read: None |
|      | W Apr. 29 | Structures and Plate Tectonics 2 | Read: None  
**Due:** Lab 14 & Lab 15, AOTW 13 |
|      | W Apr. 29 | **Lab 15:** Field Trip Data / Field Camp Preview | |
| 17   | M May 4 | **FINAL EXAM:** 10:45 a.m. – 1:15 p.m. | |

*Note:* For readings, please refer to the modules specified in the course schedule.