TR-11 PHYSICAL GEOLOGY FOR MAJORS, FALL 2017

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Office hours: Monday: 8:00 – 10:00 am, 2:00 – 3:00 pm
Tuesday: 9:00 – 11:00 am
Wednesday: 8:00 – 9:00 am
Thursday: 8:00 – 11:00 am
Friday: 8:00 – 9:00 am
(or contact me to set up a convenient time to meet)

Textbooks 2. *GEOL 1403, Physical Geology Laboratory Manual*, by Heather L. Lehto

Grading:
- 2 exams (15% each)
- 1 comprehensive final exam (20%)
- 2 homework assignments (3% each).
- 2 lab quizzes (10% each),
- 8 graded lab exercises (3% each)
- Extra Credit Project (+ 0 – 5%). Tentative: Read and discuss a mystery novel written by geologist Sarah Andrews or Susan Cummins Miller. Details to be provided after Exam 1.
- Optional Field Trip. Make up a single lab or homework grade by participating on an optional field trip and turning in a brief project report. More details on next page.

Student learning outcomes

You will learn about rocks and minerals that make up Earth and the sometimes subtle and often destructive processes that shape it. You will learn and test fundamental concepts about meteorite impacts, volcanoes, earthquakes, river flooding, oil and gas resources, groundwater, and plate tectonics. Many examples will be from West Texas and western North America. Problem-solving techniques that you will learn and practice:
1. Use multiple working hypotheses
2. Be skeptical: look for ways to test hypotheses
3. Make sketches: they help in visualizing the world in three dimensions
4. Quantify events and processes when possible
5. Apply the Principle of Uniformitarianism
6. Study and work together
7. Get as much practice or experience as you can
8. Carefully defend your thinking when answering questions.

Learning outcomes will be evaluated by exams, lab quizzes, homework assignments, and lab assignments.
Field Trips!

On field trips you will get a chance to apply concepts discussed in class to describe and interpret outcrops of rocks and sediments. **Geoscience and Physics majors will have special preference to attend field trips!** We may schedule additional trips just for majors! On the optional weekend trips we will travel in a university van. No special equipment is required but space is limited! You may go on more than one optional trip, but you can only use one field trip project to replace a single homework or lab assignment grade. Tentative schedule:

1. **Required field trip to San Angelo State Park during lab time:** Monday-Thursday afternoon October 16-19 (Dr. Joe’s M-3 and R-3 labs: October 9 or 12). We will meet at San Angelo State Park to review and practice rock and mineral identification skills on Permian and younger rocks. Leader: your lab instructor (James Ward, Heather Lehto, Fawn Last, Bob Purkiss, or Joe Satterfield)

2. **Archaeology Fair at Fort Concho:** Saturday, September 23. Help Geoscience majors and faculty lead a hands-on geology activity for all ages. Leader: Fawn Last

3. **Big Bend National Park:** Friday-Sunday, November 10-12. Physical Geology field trip to western Big Bend National Park: hike and sketch Cretaceous stratigraphy in Santa Elena Canyon, collect shark teeth and dinosaur bone fragments in Terlingua area, describe Tertiary volcanic rocks in Tuff Canyon and Chisos Mountains. Leaders: James Ward and Joe Satterfield

4. **Favorite San Angelo area outcrops:** Saturday, December 9. We will meet early in the morning and return in the mid-afternoon. We will visit little-known outcrops just north of San Angelo, including Rattlesnake Hill, Edith Spring, Spence Reservoir, and the Divide Roadcut. Leaders: Joe Satterfield and James Ward

5. **Caverns of Sonora:** Date to be announced, Tour a living cave lined with spectacular glistening cave formations such as gravity-defying helectites, long soda straws, cave draperies, and moon milk. Leader: Fawn Last

GEO, the student organization for all interested in geology, meets Wednesdays at 6:00 pm. The first meeting will be September 6. GEO is a Student Chapter of the American Association of Petroleum Geologists ([www.aapg.org](http://www.aapg.org)). Sigma Gamma Epsilon, the national honor society of the earth sciences, is related to GEO.

**Attendance Policy**

You are expected to attend every class meeting. Your attendance will be recorded. We will discuss many topics that are not in the textbook. If you must miss a class, contact me if you need help in obtaining assignments or notes. Although showing up for class is not directly part of your grade (see Grading section above), you will find it extremely difficult to pass this class if you do not attend regularly and participate!

**Course Webpages**

[http://blackboard.angelo.edu](http://blackboard.angelo.edu) contains Powerpoint slides, web links to scenic areas mentioned in class, practice problems, answers to lab assignments, and your official grades.
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture/Discussion Topics</th>
<th>Lab Exercises</th>
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</thead>
</table>
| I: 8/29, 8/31 | Minerals (Ch 5, p. 116)                                                                                                                                                                                              | 1: Topographic maps and aerial photos (read p. 1 – 7 before lab)  
Dr. Joe’s labs: Lab 2 |
| II: 9/5, 9/7 | Journey to the Center of the Earth (Ch 1 and 2, p. 34)  
Magma and Igneous Rocks (Ch. 6, p. 152)  
*Project: Calculating pluton surface area*                                                                                                                                 | No labs this week!  
(Labor Day Holiday Monday) |
| III: 9/12, 9/14 | Sedimentary Rocks (Ch 7, p. 202)  
Drifting Continents (Ch 3, p. 61)  
*Project: Discovering Plate Boundaries, Part 1*                                                                                                                                 | 2: Rock-forming minerals (p. 18 – 29)  
Dr. Joe’s labs: Lab 3 |
| IV: 9/19, 9/21 | 9/19: HOMEWORK 1 DUE  
*Project: Discovering Plate Boundaries, Parts 2, 3*  
Plate Tectonics (Ch 4, p. 86)                                                                                                                                 | 3: Igneous Rocks (p. 34 – 37)  
Dr. Joe’s labs: Lab 4 |
| V: 9/26, 9/28 | Metamorphic Rocks (Ch 8, p. 233)  
9/28: EXAM 1 (not including Ch 8)                                                                                                                                                                                               | 4: Sedimentary Rocks (p. 42 – 48)  
Dr. Joe’s labs: Lab 5 |
| VI: 10/3, 10/5 | Geologic maps (Ch 12, p. 445-449)  
*Project: Introduction to San Angelo, Edwards Plateau geology*                                                                                                                                                     | 5: Metamorphic Rocks (p. 54 – 57) and Quiz Review  
Dr. Joe’s labs: LAB QUIZ 1 |
| VII: 10/10, 10/12 | The Wrath of Vulcan: Volcanic Eruptions (Ch 9, p. 272)  
*Project: Constructing 3-D volcano models*                                                                                                                                                                              | LAB QUIZ 1: MINERALS AND ROCKS (Labs 2-5)  
Dr. Joe’s labs: Lab 6 |
| VIII: 10/17, 10/19 | A Violent Pulse: Earthquakes (Ch 10, p. 312)                                                                                                                                                                          | 6: San Angelo State Park Field Trip (Required): Meet at State Park. Directions: p. 62 – 63  
Dr. Joe’s labs: Lab 1 |
| IX: 10/26 | 10/23 – 10/25, Geological Society of America Meeting, Seattle  
*Project: Locating Earthquake epicenters*  
10/26: HOMEWORK 2 DUE                                                                                                                                                  | No labs this week! |
| X: 10/31, 11/2 | Mountain Building (Ch 11, p. 379)  
*Project: Constructing block diagrams of structures*  
*Project: Fault games with wood blocks*                                                                                                                                                           | 7: Block diagrams of folded and faulted rocks (p. 68 – 74) |
| XI: 11/7, 11/9 | Wind and deserts: Chihuahuan Desert, West Texas, Great Basin, Nevada (Ch 21, p. 768)  
*Project: Viewing mountains in 3-D*  
11/9: EXAM 2                                                                                                                                                          | 8: Constructing a geologic cross section (p. 90 – 92), Part I |
| XII: 11/14, 11/16 | Oil, natural gas resources in Texas (Ch 14, p. 504)  
*Bronte Oil Field Project*                                                                                                                                                                                               | 8: Constructing a geologic cross section (p. 90 – 92), Part II |
| XIII: 11/21 | Streams and Floods (Ch 17, p. 614)                                                                                                                                                                                    | No Labs this week!  
(Thanksgiving Holidays Weds-Fri) |
| XIV: 11/28, 11/30 | *Project: Constructing Rum Brook profile*  
Groundwater (Ch.19, p. 694)                                                                                                                                                                                              | Practice for Lab Quiz 2 |
| XV: 12/5, 12/7 | Review Projects  
12/7: MAKE-UP EXAMS                                                                                                                                                                                        | LAB QUIZ 2: TOPOGRAPHIC AND GEOLOGIC MAPS (Labs 1, 6-8) |
| XVI: 12/12 | FINAL EXAM: 10:30 – 12:30 am |
GEOSCIENCE DEGREE REQUIREMENTS AND CAREER OPPORTUNITIES!

See Geoscience BS requirements at https://www.angelo.edu/dept/physics/geoscience_degree.php. A Geoscience Minor requires 18 hours of geology courses. Physical Geology is a requirement for a major or a minor. Rewarding careers exist for geologists, geophysicists, hydrogeologists, and secondary science teachers. Talk to your professors!


Read http://www.sarahandrews.net/white-papers/

### Core Curriculum Objectives and related ASU Student Learning Outcomes

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<thead>
<tr>
<th>Student Learning Outcome</th>
<th>Assessment Method</th>
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<tbody>
<tr>
<td>1. Gather, analyze, evaluate, and synthesize information relevant to a question or issue (CT1).</td>
<td>Lab Quiz 1 grade</td>
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<tr>
<td>2. Develop, interpret, and express ideas through effective visual communication (CS3).</td>
<td>Lab 8 grade</td>
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<tr>
<td>3. Manipulate and analyze numerical data and arrive at an informed conclusion</td>
<td>Homework Assignment</td>
</tr>
<tr>
<td>4. Manipulate and analyze observable facts and arrive at an informed conclusion</td>
<td>Lab Quiz 2 grade</td>
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<tr>
<td>5. Work effectively with others to support and accomplish a shared goal.</td>
<td>Lab 7 grade</td>
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Persons with disabilities which may warrant academic accommodations must contact the Student Life Office, Room 112 University Center, in order to request such accommodations prior to any accommodations being implemented. You are encouraged to make this request early in the semester so that appropriate arrangements can be made.

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence.

Know the ASU Honor Code

Angelo State University expects its students to maintain complete honesty and integrity in their academic pursuits. Students are responsible for understanding the Academic Honor Code, which is contained in both print and web versions of the Student Handbook.