GEOL 3400: Mineralogy and Petrology
Fall 2019 - 4 credits
Lecture: MWF 11:00-11:50 am VIN 146
Lab: R 2:00-4:50 pm VIN 146

Instructor: Dr. Elizabeth C. Koeman-Shields
Office: VIN 124
Phone: 325-486-6767 (office)
Email: ekoemanshields@angelo.edu

Office Hours: MWF 9a-10a, M 1p-3p, and TR 11a-12p, or by appointment

Required Materials:
- ASU email account that you check regularly
- Blackboard course site

Course Description:
Classification, description, and interpretation of igneous and metamorphic rocks, including identifying common minerals. Interpretations include tectonic setting, processes of formation, and pressure-temperature conditions. Laboratory work consists of hand sample description, examination of thin sections under a petrographic microscope, and field trips. Prereq: GEOL 1403 or 1404.

Course Objectives:
Learning objectives will be evaluated by exams, lab projects, lab quizzes, and homework assignments.

1. To study in more detail topics introduced in Physical and Historical Geology, such as rock types erupted from volcanoes (for example Davis Mountains trachytes, Big Bend pyroclastic flow deposits) and the pressure-temperature conditions at which different facies of metamorphic rocks form.
2. To get hands-on experience in describing and interpreting rocks so that you will have a solid background you could use when taking summer field camp, a 5-week field course (GEOL 3600), when working on your own research project (GEOL 4391), and when taking geology courses in graduate school. The ultimate goal is that you have a good working knowledge of how to describe and interpret whatever igneous and metamorphic rocks you encounter anywhere in the world. We will emphasize what you can do with outcrops and hand samples and thin sections in the field/lab.
3. To practice using the basic terms of igneous and metamorphic rocks so that you can compete well and work with Geology Majors at other schools at field camp or in graduate school.
4. To learn how to use geology tools in the field and the lab (hand lenses, hardness kits, maps, aerial photos, and polarizing microscopes).

Attendance Policy:
You are expected to attend all scheduled class meetings. Attendance will be checked at each class meeting. Please inform me well ahead of time if you will need to be absent for any reason including religious holidays. 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! NOTE: You are NOT automatically dropped if you stop attending class. October 31st is the last day to drop a course.
GRADING:
- 10 graded lab projects, including one required field trip project (4% each; 40%)
- 1 hand sample quiz: rock and mineral identification and description (10%)
- 1 Mineralogy Project (5%)
- 4 HW Assignments (2.5% each; 10%)
- 1 summary and discussion of a scientific paper (5%)
- 2 Lecture Exams (10% each; 20%)
- 1 Comprehensive Final Exam (10%)

There will be no make-ups for homework, in-class activities, or labs. Make-up exams will be given for tests ONLY under extenuating circumstances. Prior email notification is needed for a make-up exam.

LECTURE:
A typical class meeting will combine mini-lectures, discussions, group activities, multimedia presentations, and other demonstrations and activities to give you an opportunity to learn concepts in as active a manner as possible.

CELL PHONES AND OTHER ELECTRONIC DEVICES:
You may use a laptop or tablet to take notes during class. Please do not disturb others with their use. Please keep all electronics on vibrate or silent. The use of any electronic device not authorized by the instructor during a test may result in the forfeiture of your grade for that test. All electronic devices should be turned off and stored out of sight during tests.

Field Trips!
You will get a chance to apply concepts discussed in class to describe and interpret outcrops of igneous and metamorphic rocks. You must attend each of the two required weekend field trips (listed as 1 and 2 below). The field trip #1 will be part of your Mineralogy Project grade and the field trip #2 project will be your Lab 10 grade. The last field trip listed is optional. Our schedule:

1. (Required) Saturday, November 9: Describe Grenville orogen schist and gneiss and the famous 1.1 Ga Town Mountain Granite, interpret the origin of rare blue phenocrysts in Llanite, visit the Enchanted Rocks rock ship in Llano. This is a combined trip with Sedimentology.

2. (Required) Saturday, October 5: Collect and identify common rock forming minerals, as well as hydrothermal altered minerals at Badu Hill and Emerald Ridge near Llano.

3. (Optional) Thursday, September 26 – Sunday, September 29: Describing volcanic igneous rocks in New Mexico. This is a combined field trip with Volcanology and immediately follows the GSA Annual Conference in Phoenix, AZ.

CLASS PREPARATION ASU EMAIL:
Since class announcements will be routinely distributed via email and Blackboard, you will need to regularly check your ASU email account and our course Blackboard site (daily). All course correspondence will be through your ASU email account and Blackboard. Please see the email policy in Bb for more details. ASU provides Internet and email services to you at any of the computer labs on campus. Call 325-942-2911 to set this up if necessary.

STUDENTS WITH DISABILITIES:
1. “Angelo State University is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the
services, programs, or activities of the university, or be subjected to discrimination by the university, as
provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act
Amendments Act of 2008 (ADAAA), and subsequent legislation.”

2. The Office of Student Affairs is the designated campus department charged with the responsibility of
reviewing and authorizing requests for reasonable accommodations based on a disability, and it is the
student’s responsibility to initiate such a request by contacting the Office of Student Affairs, University
Center, Room 112 at (325) 942-2047 or (325) 942-2211(TDD/FAX) or by e-mail at
studentservices@angelo.edu to begin the process. The Office of Student Affairs will establish the
particular documentation requirements necessary for the various types of disabilities.

Reasonable accommodations will be made for students determined to be disabled or who have
documented disabilities.

**TITLE IX:**
Angelo State University is committed to providing and strengthening an educational, working, and living
environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In
accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence
Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based
on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad
term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of
a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual
sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence
(domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX
Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Boone, J.D. You may
submit reports in the following manner:
Online: Incident Form
Face to Face: Mayer Administration Building, Room 210
Phone: 325-942-2022
E-Mail: michelle.boone@angelo.edu

**RELIGIOUS HOLY DAY:**
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.

**INCOMPLETE GRADE POLICY**
It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact
faculty if you have serious illness or a personal misfortune that would keep you from completing course
work. Documentation may be required. See ASU Operating Policy 10.11 Grading Procedures for more
information.

**ACADEMIC INTEGRITY:**
Students are expected to maintain complete honesty and integrity in all work. Any student found guilty
of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from
ASU. The College of Science and Engineering adheres to the Statement of Academic Integrity.
PLAGIARISM:
Plagiarism is a serious topic covered in ASU’s Academic Integrity policy in the Student Handbook. Plagiarism is the action or practice of taking someone else’s work, idea, etc., and passing it off as one’s own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin. Resources to help you understand this policy better are available at the ASU Writing Center.

COPYRIGHT POLICY:
Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

GENERAL POLICIES RELATED TO THIS COURSE:
All students are required to follow the policies and procedures presented in these documents:
1) Angelo State University Student Handbook
2) Angelo State University Catalog

SYLLABUS CHANGES
The faculty member reserves the option to make changes as necessary to this syllabus and the course content. If changes become necessary during this course, the faculty will notify students of such changes by email, course announcements and/or via a discussion board announcement. It is the student’s responsibility to look for such communications about the course on a daily basis.

COURSE EVALUATION:
Students are provided the opportunity and are strongly encouraged to participate in a course evaluation at the end of the semester.

GEOLOGIC EXHIBITION ORGANIZATION (GEO):
GEO, the student organization of all interested in geology (not just majors/minors), meets almost every Wednesday @ 6:00PM. GEO is a student chapter of the American Association of petroleum Geologists (AAPG). Sigma Gamma Epsilon, the national honor society of the earth sciences is related to GEO.

i http://blackboard.angelo.edu
ii www.angelo.edu/incident-form
iii https://www.angelo.edu/content/files/14197-op-1011-grading-procedures
iv http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
v http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
vi http://www.angelo.edu/dept/writing_center/academic_honesty.php
vii http://www.angelo.edu/student-handbook/
viii http://www.angelo.edu/catalogs/
ix http://www.aapg.org
<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topics</th>
<th>Assigned Reading</th>
<th>Lab Projects</th>
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| #1: 8/26 - 8/30 | - Syllabus  
- Igneous Minerals  
- Basic Petrographic Techniques | Lab Manual | 1: Igneous Minerals in Hand Sample (due 9/5) |
| #2: 9/2 - 9/6 | - Microscope Theory  
- Petrographic Techniques cont. | Lab Manual | Intro to Petrographic Microscope  
2: Identifying Felsic Igneous Minerals in TS (due 9/12) |
| #3: 9/9 - 9/13 | - Fundamental Concepts of Igneous Rock Classification and Nomenclature | Chapter 1  
Chapter 2 | 3: M&M Magma Chamber Modeling (due 10/3) |
| #4: 9/16 - 9/20 | - Textures of Igneous Rocks  
- Igneous Structures & Field Relations  
- 9/20: HW #1 due in class | Chapter 3  
Chapter 4 | Complete Lab 3 – Bring laptop |
| #5: 9/23 - 9/27 | Classes Cancelled this week | GSA Annual Meeting | No Lab |
| #6: 9/30 - 10/4 | - Pluton Types & Emplacement Mechs  
- Volcanic Rocks  
- Seminar and Min. Trip Discussion | Chapter 4 | 4: Mafic Minerals in Thin Section (due 10/10)  
Oct 5: Req. Mineralogy Field Trip |
| #7: 10/7 - 10/11 | - Pyroclastic Rocks and Calderas  
- 10/11: Exam #1 – Igneous Rocks | Chapter 4 | 5: Intrusive Igneous Rocks in Hand Sample and Thin Section (due 10/24) |
| #8: 10/14 - 10/18 | - The Phase Rule  
- 1-2-component systems  
- Phase Diagrams | Chapter 5  
Chapter 6 | Complete Lab 5 and Ternary Plots |
| #9: 10/21 - 10/25 | - 10/21: HW #2 due in class  
- Phase Diagrams  
- Introduction to Metamorphism | Chapter 21  
Chapter 22 | 6: More Petrographic Microscope Techniques (due 10/31) |
| #10: 10/28 - 11/1 | - Classification of Metamorphic Rocks  
- Structures and Textures of Metamorphic Rocks | Chapter 23 | 7: Extrusive Igneous Rocks in Hand Sample and Thin Section (due 11/7) |
| #11: 11/4 - 11/8 | - Interpreting Histories of Metamorphism and Deformation | Chapter 23 | 8: Metamorphic Minerals in Thin Section (due 11/14) |
| #12: 11/11 - 11/15 | - Hand Samples of Meta Rocks  
- Metamorphic Facies | Lab Manual  
Chapter 25 | 9: Metamorphic Rocks in Hand Sample and Thin Section (due 11/25) |
| #13: 11/18 - 11/22 | 11/18: HW #3 due in class  
Hand Samples of Meta Minerals  
11/22: Exam #2 – Meta Rocks and Phase Diagrams | Lab Manual | Complete Lab 9 and Discuss Hand Sample Quiz |
Thanksgiving Holiday |
| #15: 12/2 - 12/6 | 12/2: Review all Hand Samples  
12/4 and 12/6: Final Exam Review  
12/6: HW #4 due in class | Lab Manual | Hand Sample Quiz: Igneous and Metamorphic Rocks and Minerals |
| #16: 12/9-12/13 | Cumulative Final Exam | W 10:30a-12:30p | Lab 10 is field trip grade |

*Information and schedule subject to change*