GEOL 3400: MINERALOGY AND PETROLOGY, FALL 2018

**Lecture: MWF 11:00; Lab: M 2:00 or R 2:00**

Description, classification, 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.

Andalusite porphyroblasts in slates from Bavaria, Germany and Sierra Nevada, CA viewed under a petrographic microscope (Williams and others, 1954). In this class you will view thin-sections from a ductile shear zone in the Sand Springs Range, NV that contain andalusite

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**Office hours**
- Monday: 8:00 – 10:00 am
- Tuesday: 3:00 – 4:00 pm
- Wednesday: 8:00 – 10:00 am, 3:00 – 4:00 pm
- Thursday: 8:00 – 9:00 am, 11:00 – 12:00
- Friday: 8:00 – 10:00 am
- Or contact me to set up a convenient time to meet

**Required Textbooks**

**Grading**
- 2 exams over lecture, test, and project topics (13% each)
- 1 comprehensive final exam (16%)
- 1 hand sample quiz: rock and mineral identification and description (10%).
- 10 graded lab projects, including one required field trip project (40%; 4% each)
- 1 summary and discussion of a scientific paper (8%)

**Lab and Field Equipment Needed**
1. Hand lens, 10x Hastings Triplet recommended
2. Geology field book (We will place an order for all interested and get a bulk rate)
3. Set of colored pencils (Buy good ones at Hobby Lobby or Michaels)
**Field Trips**
You will get a chance to apply concepts discussed in class to describe and interpret outcrops of igneous and metamorphic rocks. You will attend at least one of two required weekend field trips. You can go on both! The field trip project will be your Lab 10. Our schedule:

1. **Saturday, September 22**: 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, and end the day by swimming and cliff-jumping at the Devils Waterhole in Inks Lake State Park. Barbeque for lunch!

2. **Friday – Sunday, October 12 - 14**: Davis Mountains Volcanic Field. We will explore areas containing Tertiary lava flows, pyroclastic flows, and intrusive igneous rocks. We will camp at Davis Mountains State Park. Look forward to an informal star party Saturday night!

**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**
Blackboard\(^1\) contains lecture slides, practice problems, web links to scenic areas mentioned in class and lab, answers to lab assignments and class projects, and your official grades.

Here are a couple of sites that have useful thin-section photos of rocks and minerals:

- Microscopy and Minerals Images\(^2\)
- University of North Carolina Petrology Atlas\(^3\)

**Course objectives**
- 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.
- 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 can be done with outcrops and hand samples in the field and thin sections in the lab.
- 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.
- To learn how to use geology tools in the field and the lab. In the field we will use hand lenses, maps, and aerial photos. In the lab we’ll use polarizing microscopes to identify minerals and textures (see last page for a detailed look)
- Learning objectives will be evaluated by grades on exams, lab projects, lab quizzes, and homework assignments.
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<thead>
<tr>
<th>Week</th>
<th>Lecture/Discussion topics</th>
<th>Lab Projects</th>
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<tbody>
<tr>
<td>I:</td>
<td>Igneous Minerals (Lab Manual) Basic petrographic microscope techniques (Lab Manual)</td>
<td>1- Igneous Minerals in Hand Sample (mostly review)</td>
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<td>II:</td>
<td>Microscope theory and techniques, continued</td>
<td>No lab meetings! M: Labor Day Holiday</td>
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<td>III:</td>
<td>A Few Fundamental Concepts (Ch 1) Igneous Rock Classification and nomenclature (Ch 2)</td>
<td>Intro to the Petrographic Microscope 2- Identifying felsic igneous minerals in thin-section Ethics discussion on group work</td>
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<td>IV:</td>
<td>Classification Project Textures of Igneous Rocks (Ch 3) Igneous structures and field relations (Ch 4)</td>
<td>3- M&amp;M magma chamber modeling</td>
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<td>V:</td>
<td>Papers on Davis Mountains volcanic field distributed 9/26: WTGS Fall Symposium, Midland (no class meeting) Pluton types, pluton emplacement mechanisms (Ch 4)</td>
<td>Complete Lab 3 Bring laptops to lab</td>
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<td>VI:</td>
<td>Plutons, continued Solitario cross-section project</td>
<td>4- Mafic Minerals in thin section</td>
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<td>VII:</td>
<td>Volcanic Rocks (Ch 4) 10/10: EXAM 1 - IGNEOUS ROCKS</td>
<td>5- More Petrographic Microscope Techniques: determining plagioclase composition, uniaxial and biaxial interference figures, optic signs, 2V</td>
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<td>VIII:</td>
<td>Pyroclastic Rocks and Calderas (Ch 4) The Phase Rule and 1-2-component systems (Ch 6) 10/19: Out of Class Assignment: Davis Mtns Papers</td>
<td>6- Intrusive Igneous rocks in hand sample and thin section</td>
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<td>IX:</td>
<td>Phase Diagrams, continued Phase Diagram Practice Problems</td>
<td>6- Lab 6 concluded, Finish thin-sections, Work on ternary plots</td>
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<td>X:</td>
<td>An Introduction to Metamorphism (Ch 21) Play-do Deformation project A Classification of Metamorphic Rocks (Ch 22) 11/2: PAPER SUMMARY DUE, Seminar discussion</td>
<td>7- W Nevada Extrusive Igneous rocks in hand sample and thin section</td>
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<td>XI:</td>
<td>Interpreting shear sense from mylonites (Ch 23) Textures of contact and regional orogenic metamorphism (Ch 23) Metamorphic rocks in hand sample project</td>
<td>8- Metamorphic Minerals in thin-section</td>
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<tr>
<td>XII:</td>
<td>Interpreting histories of metamorphism and deformation (Ch 23)</td>
<td>9- Metamorphic Rocks in thin section and hand sample</td>
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<td>XIII:</td>
<td>Events timing project Hand samples of metamorphic minerals (lab topic)</td>
<td>No formal lab meetings Lab open for work on Lab 9</td>
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<td>XIV:</td>
<td>11/28: EXAM 2 – METAMORPHIC ROCKS Metamorphic facies (Ch 25)</td>
<td>9- Metamorphic Rocks in thin section and hand sample, concluded Discuss Hand Sample Quiz</td>
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<td>XV:</td>
<td>12/3: Review all hand samples Final Review: phase diagrams, mylonite shear sense</td>
<td>HAND SAMPLE QUIZ: IGNEOUS AND METAMORPHIC ROCKS AND MINERALS</td>
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<td>XVI:</td>
<td>Wednesday, 12/12, 10:30 – 12:30: FINAL EXAM</td>
<td>Note: Lab 10 is the Field Trip Project</td>
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Turn in your lab on time!
1) Lab projects submitted after the due date will receive a 10-point deduction!
2) Work turned in after graded work is returned to others will not be graded. This is a professional ethics issue.
3) If you score below a 50 on a lab project you may request an opportunity to correct or redo a portion of your work. You must make this request within one week of receiving your graded lab.

Geoscience Careers
See Geoscience BS requirements in the Angelo State Catalog. 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!

The US Department of Labor Occupational Handbook contains information on geology careers, salaries, education needed, and future job outlook in geology.

GEO, the student organization for all interested in geology, meets Wednesdays at 6:00 pm. The first meeting will be September 5. GEO is a Student Chapter of the American Association of Petroleum Geologists.

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.

Student Disability Services
ASU 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 of 2008 (ADAAA), and subsequent legislation.

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: Ms. Dallas A. Swafford, Director of Student Disability Services, 325-942-2047
Title IX
Angelo State University is committed to the safety and security of all students. If you or someone you know experience sexual harassment, sexual assault, domestic or dating violence, stalking, or discrimination, you may contact ASU’s Title IX Coordinator: Michelle Nicole Boone, J.D., Director of Title IX Compliance, 325-486-6357, michelle.boone@angelo.edu, Mayer Administration Building 204A

Student Absence for Observance of Religious Holy Days
A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for Observance of Religious Holy Day9 for more information

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 Procedures10 for more information.

General Policies Related to This Course
All students are required to follow the policies and procedures presented in these documents:

- Angelo State University Student Handbook11
- Angelo State University Catalog12

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1 http://blackboard.angelo.edu
2 http://jm-derochette.be/
3 http://leggeo.unc.edu/Petunia/IgMetAtlas/mainmenu.html
4 https://www.angelo.edu/dept/physics/geoscience_degree.php
6 https://www.aapg.org/about/membership/types/student
7 https://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
8 https://www.angelo.edu/dept/writing_center/academic_honesty.php
9 https://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of
10 https://www.angelo.edu/content/files/14197-op-1011-grading-procedures
11 https://www.angelo.edu/student-handbook/
12 https://www.angelo.edu/catalogs/