

GEOLOGY 4403 IGNEOUS AND METAMORPHIC PETROLOGY

SPRING 2015

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OFFICE (9-10 M-W; 9:30 – 11 TR)
Sul Ross State University

Purpose and Organization of Course: Igneous and metamorphic rocks comprise > 90% of the rocks of the Earth's crust. Knowledge of their nature and origin is, therefore, essential to understanding the geologic processes operating on our planet. The two main objectives of this course are: 1) to teach you how to

identify the most common igneous and metamorphic rocks, both in the field and in the lab; and 2) to introduce you to the physical and chemical processes involved in their formation.

Learning Objectives: After completing this course, students will be expected to be able to identify common igneous rocks and minerals, have an understanding of the origins and evolutionary processes that create the diversity seen in igneous and metamorphic rocks on a global scale, and be able to independently analyze petrographic and geochemical data for a suite of rocks and interpret the history of these rocks.

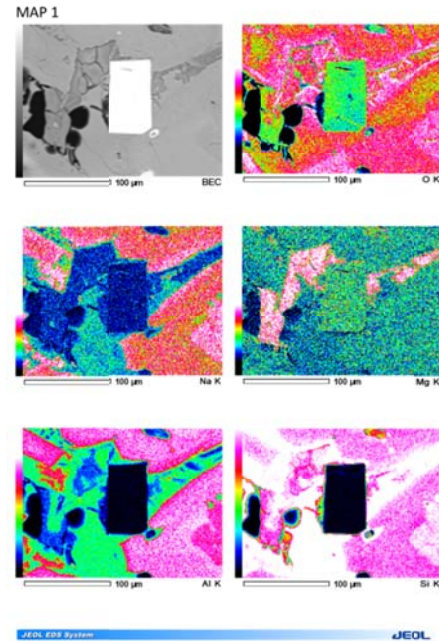
Class meets in WSB101 MWF 12-1 and is taught via remote connection to Midland at the same time.

Labs: Lab meets on Tuesdays, 2-5 in WSB 303 (or in the Midland college lab at time to be determined). Lab will start with a review of optical mineralogy. The rest of the labs will involve examination of a suite of rocks in hand sample and thin section, and/or the analysis of geochemical data.

Problem sets: Homework assignments will be issued. Unless otherwise noted, these will be due exactly one week from the date assigned.

Field Trip(s): We will commit one lab session to a field trip to the Davis Mountains on April 14, and a weekend trip from Feb 20 to Feb 22 to Big Bend National Park or Big Bend Ranch State Park.

Semester projects: One term paper (and oral presentation) is required. This will cover a topic of your choice, approved by your instructor. The presentation will be made during the final week of class. Attendance is mandatory for these. The term paper must have a minimum of 10 references from approved peer reviewed journals. The paper must be a minimum of 7 pages in



1 X-Ray map of a granodiorite xenolith

length, double spaced, excluding graphics. A draft version of the paper will be due March 27. This will be graded and the edits will be incorporated into the final version that will be due April 29. Grading will be 33% for draft, 67% for final.

Lecture Text: Gill, Igneous Rocks and Processes, **Lab Text:** Philpotts, Petrography of Igneous and Metamorphic Rocks, **Optional text:** Nesse and Shulze Introduction to Optical Mineralogy.

Conduct: Students are expected to observe the University's Code of Student Conduct (see Student Handbook, http://www.sulross.edu/sites/default/files//sites/default/files/users/docs/student_svc/handbook.pdf - page 38).

Please turn OFF all cellular phones, IPODs, MP3s, etc.

Sul Ross State University is committed to equal access in compliance with the Americans With Disabilities Act of 1973. It is the student's responsibility to initiate a request for accessibility services. Students seeking accessibility services must contact Mary Schwartze, M. Ed., L.P.C., in Counseling and Accessibility Services, Ferguson Hall, Room 112. The mailing address is P.O. Box C-122, Sul Ross State University, Alpine, Texas 79832. Telephone: 432-837-8203. E-mail: mschwartze@sulross.edu .

Distance Education Statement: Students enrolled in distance education courses have equal access to the university's academic support services, library resources, and instructional technology support. For more information about accessing these resources, visit the SRSU website. Students should submit online assignments through Blackboard or SRSU email, which require secure login information to verify students' identities and to protect students' information. The procedures for filing a student complaint are included in the student handbook. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website.

GRADING SCHEME	%
Exam 1	10
Exam 2	10
Final Exam	15
Homework and weekend Field Trip	15
Term paper	15
Lab	35
Total	100

Lecture/Lab Schedule

wk	date	Topic	Lecture Reading	Lab	Comment
1	1/21	Introduction	1		
	1/23	Introduction			
2	1/26	Introduction		L1. Optical Mineralogy review	Review the physics of light and how polarized light can be used to help identify minerals
	1/28	Basalts and related rocks	2		
	1/30	Basalts and related rocks			
3	2/2	Basalts and related rocks		L2. Igneous minerals and textures	Review the common igneous minerals
	2/4	Basalts and related rocks			KMU in Boquillas Canyon
	2/6	Magma Differentiation	3		KMU in Boquillas Canyon
4	2/9	Magma Differentiation			
	2/11	Magma Differentiation		L3. SEM/EDXRF and processing of geochemical data	
	2/13	Magma Differentiation / Exam 1			KMU at Rincon Geology tour
5	2/16	Gabbroic rocks		M&M lab / magmatic differentiation	Lab exercise - track magmatic differentiation
	2/18	Gabbroic rocks			
	2/20	Gabbroic rocks			Weekend Field trip to Big Bend National Park or Big Bend Ranch State Park
6	2/23	Gabbroic rocks		L5. Kitchen exercises and phase diagrams	Lab exercise - eat popsicles, learn how granites melt and use salt and water to learn how to make a phase diagram
	2/25	Ultramafic and Ultrabasic rocks	5		
	2/27	Ultramafic and Ultrabasic rocks			

7	3/2	Ultramafic and Ultrabasic rocks		L6. Mafic igneous rocks	Basalts and more ...
	3/4	Ultramafic and Ultrabasic rocks			KMU in LC
	3/6	Andesite, dacite and rhyolite	6		KMU in LC
8	3/9	Andesite, dacite and rhyolite		L7. Midterm	Lab midterm, KMU in LC
	3/11	Andesite, dacite and rhyolite / Exam 2			KMU in LC
	3/13				
	3/16	3/16/2015		Spring Break	
9	3/23	Andesite, dacite and rhyolite		L8. Intermediate and felsic rocks	Andesites, rhyolites and more...
	3/25	Pyroclastic rocks	7		
	3/27	Pyroclastic rocks			
10	3/30	Pyroclastic rocks		L9. Plutonic rocks	The coarse grained rocks
	4/1	Pyroclastic rocks			
	4/3	Granitic rocks	8		
11	4/6	Granitic rocks		L10. Pyroclastic rocks	Very cool rocks ...
	4/8	Granitic rocks			
	4/10	Granitic rocks			
12	4/13	Alkali rocks	9	L11. DMSP field trip	Rhyolites versus rheomorphic tuffs, Barrel Springs outcrops - Davis Mountains State Park
	4/15	Alkali rocks			
	4/17	Alkali rocks			
13	4/20	Alkali rocks		L12. Metamorphic rocks part 1	
	4/22	Metamorphic rocks			
	4/24	Metamorphic rocks			
14	4/27	Metamorphic rocks		L13. Metamorphic rocks part 2	
	4/29	Presentations			
	5/1	Presentations			
15	5/4	Presentations		L14. Lab Final	
	5/6	Presentations			
	5/13	Final Exam		12:30 PM	