

Earth and Environmental Sciences 131

“Introduction to Rocks and Minerals”

Spring, 2008

Instructor:	Prof. Gray E. Bebout (office: room 410, Williams Hall 31; Network ID: geb0)
Teaching Assistant:	Annie Palya (office: room 312, Williams Hall 31; Network ID: app207)
Class Meetings:	Lectures: Tuesdays and Thursdays, 10:45 to noon, Room 100 Laboratories: Tuesdays, 1:10 to 4:00 PM, Room 413
Textbooks:	Blatt, H., Tracy, R. J., and Owens, B. E. (2006) <i>Petrology: Igneous, Sedimentary, and Metamorphic</i> , W. H. Freeman and Co. (3rd Ed.), 530 pp. Prinz, M., Harlow, G., and Peters, J., editors (1978) <i>Simon & Schuster's Guide to Rocks and Minerals</i> , Simon and Schuster, New York.

Introduction

This course develops skills in the hand-sample identification of minerals and rocks (the materials of which most of Earth is made), introduces aspects of the petrologic evolution of igneous, sedimentary, and metamorphic rocks, and provides a brief survey of the field of environmental mineralogy. The course considers the major mineral groups, and their physical properties and chemical compositions, and briefly introduces some methods other than hand-specimen analysis for the identification and study of minerals (e.g., x-ray diffractometer; petrographic microscope; electron microprobe; mass spectrometers). Discussions of each of the three major rock types focus not only on their description and classification, but also on their distributions and the plate tectonic processes responsible for their formation. The laboratory exercises are closely coordinated with the lecture part of the course. At least one, single-day field trip will be scheduled [weekend date(s) to be announced by mid-February].

Some Rules

General: Attendance in labs, lectures, and field trips is expected/required.

Laboratory Rules (read carefully!):

Students are expected to participate in the laboratory session for the full 3-hour period, unless they have completed and turned in the exercise for that day and no other activities or demonstrations have been planned.

Laboratory exercises must be turned in by the Thursday morning following the laboratory period (at the beginning of the Thursday lecture period) to be considered for full credit. The graded labs will be returned at the beginning of the next Tuesday laboratory period.

Late laboratory exercises: Laboratory exercises turned in after the Thursday morning lecture after the lab will be accepted until the beginning of the next Tuesday lab, but will be penalized by 25%. Labs not turned in by the beginning of the next Tuesday lab period (i.e., when the others are returned) will not be accepted.

Grading Scheme

Lecture Exams (2 one-hour exams; worth 15% each)	30%
Final Lecture Exam (cumulative, contains larger number of questions on metamorphic rocks, tectonics)	20%
Laboratory Exercises (10 labs worth 3% each)	30%
Laboratory Exams (2 exams; first worth 8%; second worth 12%)	20%

Accommodations for Students with Disabilities: If you have a disability for which you are or may be requesting accommodations, please contact both your instructor and the Office of Academic Support Services, University Center 212 (610-758-4152) as early as possible in the semester. You must have documentation from the Academic Support Services office before accommodations can be granted.

Lecture Schedule

Class Period (abbreviations are month and date)	Relevant Reading (P=Prinz et al., BTO=Blatt, Tracy, Owens)
J15 Course Introduction and Strategy Minerals—Definition & Classification Crystal Symmetry—Physical and Chemical Properties	Handout (HO) BTO-Introduction P-p.413-438
J17 Bond Types/Properties Conferred by Bond Types Coordination of Ions	
J22 Crystallography; Crystal Systems and Classes, begin Non-Silicates	P-Part One (+HO)
J24 Non-Silicates, cont'd	" "
J29 Non-Silicates, con'd; Silicates—Introduction Nesosilicates and Sorosilicates	" "
J31 Sorosilicates and Cyclosilicates	" "
F5 Inosilicates and Phyllosilicates	" "
F7 Tectosilicates	
F12 Color, Electrical and Magnetic Properties Quantitative Analysis of Minerals (EPMA, XRD, IRMS)	" "
F14 Environmental Mineralogy	" "
F19 First Lecture Exam (Mineralogy)	
F21 Igneous Rocks—Introduction + Classification	BTO-Ch.1-3, P-p.413-438
F26 Igneous Rocks: Evolution of Magmas Phase Rule and Phase Equilibria in Binary Systems	BTO-Ch. 4 BTO-Ch. 5, p. 92-103
F28 Igneous Rocks: The Evolution of Magmas Fractional Crystallization and Contamination	BTO-Ch. 6
Spring Break, March 1-9	
M11 Igneous Rocks: Plate Tectonics and Melting Magmatism in Rift Zones and Continental Margins	BTO-Ch. 7-10
M13 Igneous Rocks: Magmatism in Continental Settings+Summary	BTO-Ch. 7-10
M18 Sedimentary Rocks: Introduction, Settings, and Clastic Rocks	BTO-Ch. 11, 12
M20 Sedimentary Rocks: Clastic Rocks	BTO-Ch. 12-14
M25 Sedimentary Rocks: Clastic Rocks	" "
M27 Sedimentary Rocks: Limestones and Dolomites	BTO-Ch. 15
A1 Sedimentary Rocks: Other Sedimentary Rocks + Summary	BTO-Ch. 16
A3 Second Lecture Exam (Igneous and Sedimentary Rocks)	

A8 Metamorphic Rocks: Introduction+Classification	BTO-Ch. 17, 18
A10 Metamorphic Rocks: Reactions/Methods of Representation	BTO-Ch. 19, 20 (HO)
A15 Metamorphic Rocks: Textures+Controls and Processes	" "
A17 Metamorphic Rocks: Metamorphism and Plate Tectonics	BTO-Ch. 17, 21-23
A22 Petrogenesis and Plate Tectonics	HO
A24 Wrap-Up— "The Rock Cycle" (Lithosphere-Hydrosphere-Atmosphere-Biosphere Connections; HO)	

Laboratory Topics and Schedule

January 22: Ia. Introduction—Symmetry, wood-block models and household objects [demonstration of Mineralogy Tutorials CD-ROM Interactive Software]

January 29: Ib. Symmetry, cont'd. (and Miller Indices)

February 5: II. Non-silicates—Sulfides, Oxides, Halides, Carbonates, Phosphates, Sulfates

February 12: III. Nesosilicates (having isolated SiO₄ tetrahedra), Sorosilicates (having isolated, double tetrahedra), and Cyclosilicates (having rings of tetrahedra)

February 19: IV. Inosilicates (single and double chain silicates), Phyllosilicates (layer silicates), and Tectosilicates (framework silicates); X-ray diffraction

February 26: ***First Lab Exam—Symmetry/Mineral Identification***

March 11: V. Igneous Rocks—Intermediate and Felsic Compositions

March 18: VI. Igneous Rocks—Ultramafic and Mafic Compositions
(+ selected suites showing wide compositional ranges)

March 25: VII. Sedimentary Rocks—Clastic Rocks (sandstones, shales, conglomerates);
demonstration of petrographic microscope (optical mineralogy mini-course)

April 1: VIII. Sedimentary Rocks—Limestones and Dolomites+Other Non-Clastic Rocks

April 8: IX. Metamorphic Rocks—Metamorphosed Pelitic and Quartzofeldspathic
Rocks (Metaclastic Rocks)

April 15: X. Metamorphic Rocks—Metamorphosed Mafic, Ultramafic, and Carbonate Rocks

April 22: ***Final Lab Exam—Igneous, Sedimentary, and Metamorphic Rocks (and including Mineral Identification)***
