21:460:323
Rocks And Minerals

COURSE DESCRIPTION: A detailed introduction to rocks and minerals – the essential materials of the solid earth. Classification and systematic study of the chemical and physical properties of the common rock-forming mineral groups; textural and mineral compositional studies of common igneous, sedimentary and metamorphic rock groups.

STUDY MATERIAL:

- Mineralogy and optical mineralogy by Dyar, Counter and Tasa (Mineralogical Society of America) Principles of Igneous and metamorphic petrology, 2nd edition; J.D. Winter (Prentice Hall).
- Handouts from other sources provided throughout the semester.
- Samples collection (Lab)

COURSE OBJECTIVES: By the end of the course, students should be able to do the following:

- Describe the general chemical features of the solid earth, including the major chemical differences between the earth's core, mantle, and crust.
- Describe the most common rock types in the crust and upper mantle.
- Know the 8 most common elements and 7 most common minerals of the crust, and describe the connections.
- Explain the chemical basis of our classification scheme for minerals.
- Given the chemical formula of a mineral, classify the mineral into the appropriate mineral class. Identify minerals using physical property tests and determinative tables.
- Know the common mineralogic classification schemes for all igneous rock compositions.
- Know the common mineralogic classification schemes for all metamorphic rock compositions.
- Be able to interpret common binary and ternary phase diagrams for a variety of crystallization and melting paths.
- Compare and contrast chemical compositions of igneous rocks from the various plate tectonic settings.
- Know the phase rule and how it applies to igneous and metamorphic rocks. Plot metamorphic assemblages on AFM and ACF diagrams.
- Track a reaction series in pelitic metamorphic rocks on an AFM diagram showing reactions.
- Be able to identify and interpret hand samples and especially thin sections of igneous and metamorphic rocks and describe their genesis using theory from the lecture part of the class.

COURSE SCHEDULE (subject to change based on class needs and performance)

Week	Lecture/Lab	Ch.
Week 1	Review of Mineralogy	1
	PART I: MINERALOGY	
Week 2	Lecture: Mineral chemistry and hand sample	2, 3
	Lab: Hand sample and Periodic table	
Week 3	Lecture: Crystallography and Optical Mineralogy	4, 5
	Lab: Crystallography and Optical Mineralogy	
Week 4	Lecture: Optical mineralogy and mineral systematics	5, 6
	Lab: Optical mineralogy and phase diagrams	7
Week 5	Lecture: **Midterm Exam**	
	Lab: **Midterm Exam**	
	PART II: MINERALS	
Week 6	Lecture: X-Ray Diffraction	10, 15
	Lab: X-Ray Diffraction	
Week 7	Lecture: Silicate minerals	22
	Lab: Sample analyses	
Week 8	Lecture: Non-silicate minerals	23
	Lab: Sample analyses	
	Spring Break	
Week 9	Lecture: **Midterm Exam**	
	Lab: **Midterm Exam**	
	PART III: IGNEOUS PETROLOGY	
Week 10	Lecture: Introduction to Igneous Petrology.	2, 5
	Lab: Crystallization of Magma	
Week 11	Lecture: Igneous rocks. Phase Diagrams.	2, 5
	Lab: Sample analyses	
Week 12	Lecture: Chemical Classification and tectonic setting of igneous rocks.	
	Lab: Sample analyses (SEM)	
	PART IV: METAMORPHIC PETROLOGY	
Week 13	Lecture: Introduction to Metamorphic Petrology. Metamorphic minerals, textures.	2, 7
	Lab: Sample Analyses	
Week 14	Lecture: Metamorphic facies and zones. Metamorphic reactions and Phase Diagrams	7
	Lab: Sample analyses	
	Petrology Exam	