University of Arkansas – Fort Smith
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General Syllabus

GEOL 3504 Petrology

Credit Hours: 4 **Lecture Hours:** 3 **Laboratory Hours:** 2

Prerequisite: GEOL 2313/2311 Minerals and Rocks/Lab

Effective Catalog: 2020-21

I. Course Information

A. Catalog Description

The origin, classification, and occurrences of igneous and metamorphic rocks: their texture, mineralogy, chemistry, and plate tectonic associations. The lab emphasizes the identification and description of igneous and metamorphic microtextures in thin section under polarized light.

B. Additional Information

This course is required for the B.S. degree in Geoscience.

II. Student Learning Outcomes

A. Subject Matter

Upon successful completion of this course, the student will be able to:

1. Classify igneous rocks using IUGS systems, both in hand samples and thinsection, and by using geochemical discrimination diagrams.
2. Classify metamorphic rocks based on both grade and protolith, both in hand samples and thin section.
3. Determine geological environments (tectonic setting, P, T, fluid flow) of igneous and metamorphic rocks.
4. Determine histories of igneous and metamorphic rocks based on textures.
5. Use phase diagrams to infer stable igneous and metamorphic mineral assemblages under various PTX conditions.
6. Describe the role of equilibrium and disequilibrium crystallization in the origin, evolution and diversification of magmas.
7. Describe the methods of determining PT conditions for metamorphic rocks, and the limitations of these methods.
8. Describe the nature of metamorphic reactions.

B. University Learning Outcomes

This course will enhance student abilities in the following areas:

Analytical Skills

Critical Thinking Skills

Students will identify a problem or issue and will research, evaluate, and compare information from varying sources in order to evaluate authority, accuracy, recency, and bias relevant to the problems/issues. The student will generate solutions/analysis of problems/issues evaluated and will assess and justify the solutions and/or analysis.

Communication Skills (written and oral)

Students will communicate proficiently. The student will compose coherent documents appropriate to the intended audience and effectively communicate orally in a public setting.

Global & Cultural Perspectives

Students will reflect upon cultural differences and their implications for interacting with people from cultures other than their own. The students will demonstrate understanding or application of their discipline in a global environment and will demonstrate how their discipline impacts or is impacted by different cultures.

III. Major Course Topics

A. Classification and nomenclature of igneous and metamorphic rocks
B. Textures, structures, and field relations of igneous and metamorphic rocks
C. Thermodynamics and phase diagrams in igneous and metamorphic systems
D. Origin and diversification of magma
E. Magmatism at various tectonic environments, including mid-ocean ridges, island and continental volcanic arcs, continental flood basalts and oceanic plateaus, and continental rifts
F. Metamorphic mineral reactions and metamorphic facies
G. Metamorphism of pelitic sedimentary rocks, calcareous rocks, and mafic rocks

Metamorphic fluids, mass transport, and metasomatism