Rationale
Introduction to Mineralogy and Optical Crystallography
GEOL2013 (Distance)

Credit Hours: 04
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Pre-requisites: CHEM1040, or equivalent classes with instructor consent.

Principal Text:
  ISBN10: 0195106911 hardback, 466 pages. Sep 1999 (about $65 used on Amazon.com)

The ‘principal text’ will be used in class lectures, and pages or chapters for readings (where provided) will be referenced to this text.

Required Materials:
• A student’s petrographic microscope (available for about $460, see
  http://www.geologicalmicroscopes.com/40x-400x-power-monocular-polarizing-petrographic-microscope/ )
• A digital camera (with 1.2 megapixel or better resolution);
• A paperback copy of Dictionary of Geologic Terms (McGraw-Hill, 420 p., about $15 used on Amazon.com);
• A magnifying glass or hand lens with about 10X magnification.
• Lecture Notes – provided online in Blackboard;
• Videos of Lectures – provided online in Blackboard;
• Videos of Laboratory Sessions – provided online in Blackboard;
• Laboratory Exercises Lecture Notes – provided online in Blackboard;
• Laboratory Mineral and Thin Section Kits – mailed by Auburn University.

Course Overview:
This course covers topics related to the study of minerals in the context of Geology. It is the first distance course to be offered by the Department of Geology and Geography at Auburn University. The course is divided into five units. In the first unit, we will discuss the nature of minerals, the historical context of mineralogy, the role of crystallography, crystal chemistry, and optics in current mineral studies, and review the major mineral groups. This first unit will last about two lecture days, and provides approximately the same content as would be typical for discussions of mineralogy in a course on physical geology (GEOL1100). The second unit provides a descriptive (non-mathematical) development of crystallography, in which the
symmetry and lattice characteristics of naturally occurring crystals are defined. The third unit focuses on the nature of atoms and chemical bonding in minerals, their chemical formulas and common substitutions, and also the role of defects. Both the second and third units of the course include introductory discussions of current research techniques and instrumentation, including X-ray diffraction, Scanning Electron Microscopy, etc. The fourth unit provides an exploration and definition of mineral’s interactions with light, particularly as evident in a standard optical microscope. The fifth unit is the longest of the course, comprising about 15 lectures, through which the mineralogy of about 100 common minerals is discussed. Following these units, the class will also include critiques of journal articles and a report with an oral presentation.

This class will be useful to anyone with an interest in the study of minerals. The content provided is essentially the same as in the on-campus Mineralogy and Optical Crystallography (GEOL2010), with the same expectations for assignments and testing in each class as put forth in their respective syllabi. Most of the courses leading to a B.S. degree in Geology are only offered on campus, thus this on-line version of mineralogy is not intended as a substitute for GEOL2010 for on-campus students majoring in geology. Instead, this on-line course is intended for individuals that are not geology majors but require or wish to have an in-depth knowledge of mineralogy. Such individuals could include science teachers in primary education systems, scientists and engineers from other fields that wish to improve their knowledge of the occurrence and properties of minerals, and anyone who would elect to undertake a systematic examination of minerals.

Objectives of Course:
1. Teach you the relationships among the internal structure of a mineral, the form or shape of the mineral, its chemical composition, and its physical properties;
2. enable you to identify samples of the common rock-forming minerals in samples of the common rocks, both in hand-sample and with a microscope;
3. familiarize you with the equipment and other resources available at Auburn University and elsewhere to characterize and identify minerals;
4. help you to understand factors that affect the stability and occurrence of minerals, and how their properties affect and record earth processes;
5. to provide context for understanding the applications of mineralogy in industry, materials science, health, and environmental protection.

Activities:
The on-campus course and the distance course are for the most part identical in their content, assignments and evaluations. The on-campus students will have face-to-face lectures in a classroom setting while the distance students will watch voice over lectures in PowerPoint format and in videos. Both the on-campus and distance students read lecture notes, have the same text assignments, answer self-quizzes, view videos of laboratory exercises, complete laboratory exercises and reports. Both the on-campus and distance students will write a term paper on a topic related to the course and present a 15-minute oral presentation using PowerPoint. The students are expected additionally to summarize and critique two articles specified by the instructor on Blackboard. Both on-campus and distance students will take 4 timed exams during the semester, and one proctored comprehensive exam at the end of the course. The distance students will take their exams on-line, but the material covered will be identical.
Assignments:
While the on-campus students have hands-on experience of the laboratory sessions, the distance students will have the opportunity to view the laboratory exercises as video sessions. After viewing the laboratory exercises, the students will complete 13 laboratory reports. Some reports will require problem solving or calculations utilizing material that can be transmitted electronically, while other lab assignments will require material mailed from Auburn University. Each student will submit a term paper, followed by an oral presentation on the same subject. The students are expected additionally to summarize and critique two articles specified by the instructor on Blackboard. The students will receive feedback on their term paper before they do the oral report using Wimba Liveclassroom in Blackboard. Timed exams will cover 1) Sections I and II, 2) Sections III, 3) Section IV, and 4) Section V. A proctored final exam will be administered at the end of the course. The final exam will be comprehensive, covering all of the course material. Both the distance and on-campus students are given the same amount of time to complete the examinations and evaluated for the same number of points.

Methods students will use to interact with the professor:
The students will watch and listen to recorded lectures by the professor. They will be able to communicate with the instructor and teaching assistant via email or other Internet connection and telephone during specified hours.

Evaluation:
Assignments and evaluations are the same for both the on-campus and distance education students. Students are expected to read from the textbook and the lecture notes made available on the course website in Blackboard each session. They are also expected to complete laboratory assignments, and a term paper. Distance education students will be evaluated identically. Both the distance and on-campus students will have four timed exams, totaling 60% of the grade and a final proctored examination worth 10% of the grade. The laboratory reports, term paper and a critique of journal articles will make up the remainder of the grade.

Final Exam:
Both the on-campus and the distance students will take a proctored final exam. This comprehensive exam is designed to give the students an opportunity to review all that they have learned throughout the course. It includes true/false questions, multiple choice, matching, fill-in-the-blank and sort answer questions, as well as some simple calculations, designed to test whether the student has learned certain information and principles taught in the course. If test responses require drawing of simple figures or diagrams, then the distance education students may fax those to the instructor.

Final Exam Process:
After the first session, the distance student must select a proctor to supervise the final examination. Examples of approved proctors are academic administrators in the learner’s locale: school superintendents or principals, academic deans or department heads at colleges, or an independent learning office test supervisor at another college, or an education officer at a military installation. All proposed proctors are verified for appropriateness by Distance Learning and Outreach Technology (DLOT) student services staff at 334-844-3106 or audl@auburn.edu. At the time of the final examination, the proctor and the student fill out the Examination Information
Verification form. The proctored final examination is administered via Blackboard to the distance students while the on-campus students take a paper-pencil examination in the classroom.

**Materials:**
The textbook and reading requirements are the same for both the courses.

**Course Description, Objectives, Grading and Syllabus:**
See the syllabus and schedule.