

I. CATALOG DESCRIPTION

- A. Department Information:
Division: Science & Math
Department: Geology/Oceanography
Course ID: GEOL 201
Course Title: Mineralogy
Units: 4
Lecture: 3 hours
Laboratory: 3 hours
Prerequisite: CHEM 101

B. Catalog Description

Identification of minerals through chemical tests, physical properties, spectroscopic, optical and x-ray diffraction analysis. Study of crystal structures with models, natural crystals, and stereographic projection.

C. Schedule Description

Identification of Minerals through chemical tests, physical properties, spectroscopic, optical and x-ray diffraction analysis. Study of crystal structures with models, natural crystals, and stereographic projection.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS

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

- A. know and apply the visually distinct characteristics of 50 significant minerals
B. use analytical techniques such as field chemical analysis, density measurements, and field flame testing, to characterize and identify approximately 75 of the more significant minerals,
C. identify the 6 major crystal systems and their elements of symmetry, and apply them in characterizing minerals into their appropriate crystal group,
D. identify the chemical classes of minerals, list a number of important examples of each, and apply the chemical characteristics of each class to the identification of a mineral sample,
E. recognize common mineral associations and their most common occurrences in nature, and explain the chemical and physical basis for the pairing of certain minerals, and
F. identify the major economic minerals, their major sources, and their economic uses

IV. CONTENT:

- A. 1. Introduction
2. Crystallography - external form
3. Crystals - internal order and symmetry
4. Crystal chemistry
5. Mineral chemistry
B. 1. Physical properties of minerals
2. X-ray crystallography
3. Optical properties of minerals
4. Mineral stability diagrams
C. 1. Systematic mineralogy: native elements, sulfides, & sulfosalts
2. Oxides, hydroxides, and halides
3. Carbonates, nitrates, borates, sulfates, and others
4. Silicates
D. 1. Mineral assemblages
2. Gem minerals

V. METHODS OF INSTRUCTION:

- A. Lecture, including directed discussion, instructor-guided investigations, instructor-moderated problem solving sessions, and audio-visual aids-including computer-generated lecture outlines, supervised illustration of major features.
- B. Field trips in which students will be shown geologic features first hand, collect representative samples, perform field identifications, and assess the results of a variety of geologic processes.
- C. Laboratory work, including instructor-guided demonstrations of mineral identification and classification processes, student-initiated identification and classification of minerals, analysis of crystal and crystallographic models, and chemical identification of minerals.

VI. TYPICAL ASSIGNMENTS:

- A. Reading Assignments
 - 1. Selected assignments from the textbook and laboratory manual.
 - 2. Articles covering current events in geology (for example, natural resource depletion, environmental effects of mining and processing ores).
- B. Writing Assignments
 - 1. Selected chapter exercises from the textbook.
 - 2. Instructor-prepared exercises, especially those involving illustrations (charts, diagrams, cross-sections) and their analysis.
 - 3. A journal to be kept when in the field.
 - 4. Laboratory reports including observations, drawings, conclusions, and answers to related questions.
 - 5. A written term project, either a research paper or a group project, showing synthesis of the concepts and processes covered in the course.
- C. Example

Choose one of the magazine or newspaper articles on the reading list and analyze the following

 - 1. Scientific accuracy
 - 2. Topic of study in this course
 - 3. What was reinforced as learned in this course
 - 4. What was new information for you
 - 5. Prepare a written summary and 3-5 minute class presentation.

VII. EVALUATION:

- A. Methods of evaluation:
 - 1. Written quizzes and/or tests of a variety of types of questions from among true-false, multiple choice, fill-in, sentence completion, and short essay.
 - 2. Written exercises.
 - 3. Written summaries of magazine or newspaper articles.
 - 4. Laboratory assignments.
 - 5. Performance in the field, including the journal.
 - 6. Performance on the term project.
- B. Frequency of evaluation:
 - 1. Quizzes are given in lecture and/or lab, at weekly or monthly intervals.
 - 2. Exams are given on a monthly basis, including a comprehensive final exam.
 - 3. Exercises are assigned on a frequency to support comprehension of material, as deemed appropriate by the instructor.
 - 4. Laboratory assignments are given weekly.
 - 5. Typically, the class will take two field trips each semester.
- C. Typical exam questions
 - 1. List the 6 crystal systems; describe the rules distinguishing of the systems
 - 2. In the list below, identify the minerals that have a hardness greater than glass.

a. Plagioclase	f. Corundum
b. Kaolinite	g. Chlorite
c. Chalcedony	h. Garnet
d. Calcite	i. Gypsum
e. Hornblende	j. Fluorite
 - 3. Identify the minerals in the display set. Provide the mineral name, Crystal System, Chemical class, and economic significance, if any.

VIII. TYPICAL TEXTS:

Klein and Hurlbut, *Manual of Mineralogy*, 22nd ed., John Wiley and Sons., 1997
Perkins, Dexter, *Mineralogy*, 1st ed., Prentice Hall, 1998
Battey, M. H., Late and A. Pring, *Mineralogy for Students*, 1st ed., Prentice Hall, 1997

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: NONE