GEOL A280: INTRODUCTION TO MINERALOGY

Item	Value
Curriculum Committee Approval Date	10/21/2015
Top Code	191400 - Geology
Units	4 Total Units
Hours	108 Total Hours (Lecture Hours 54; Lab Hours 54)
Total Outside of Class Hours	0
Course Credit Status	Credit: Degree Applicable (D)
Material Fee	No
Basic Skills	Not Basic Skills (N)
Repeatable	No
Grading Policy	Standard Letter (S), • Pass/No Pass (B)

Course Description

Introduction to basic concepts of mineralogy, crystallography, crystal and mineral chemistry, beginning optics, paragenesis of economic minerals, and plate tectonics of mineral resources. ADVISORY: CHEM A110 or CHEM A130. Transfer Credit: CSU; UC.

Course Level Student Learning Outcome(s)

1. Explain basic concepts of crystal chemistry
2. Classify and use crystallographic elements for mineral identification
3. Differentiate the genesis, occurrence, extraction, and beneficiation of economic mineral deposits
4. Create and use an optical mineralogy notebook, and identify minerals and rocks in thin sections

Course Objectives

- 1. Describe and define mineral origin and occurrence;
- 2. Determine the properties and association of various minerals;
- 3. Demonstrate skill in use of determinative equipment and tests;
- 4. Develop the basic skills of mineral identification;
- 5. Identify at least 250 common minerals based on their physical properties, to write the chemical formulas of at least 100 of them, and to list several other minerals which are commonly associated with each mineral.
- 6. Relate the chemical and physical properties of minerals to the conditions under which they form.
- 7. Use techniques of x-ray diffraction to identify mineral unknowns.
- 8. Describe the nature of the six crystal systems, the 32 types of point group symmetry and the 230 spare groups.
- 9. Name the common forms in each crystal system, be able to recognize them and to plot them on a stereographic projection.
- 10. Use crystallographic notation to describe crystal symmetry and crystal forms.
- 11. Use crystallographic projections to show the relationships between crystal facies and axis.
- 12. Solve basic problems of descriptive and x-ray crystallography using simple matrix algebra and trigonometric techniques.
- 13. Describe the economic and environmental significance of common minerals.
- 14. Use a petrographic microscope to determine relief and index of refraction and distinguish between isotropic and anisotropic minerals.
- 15. Relate optical properties of minerals to characteristics of polarized light.
- 16. Use the petrographic microscope to identify minerals in thin section.

Lecture Content

Historical development of Crystallography External symmetry - the 32 crystal classes and 6 crystal systems Miller indices Stereographic projections of crystals Crystal forms Bravais lattices and space groups Twinning and crystal growth Physical properties of minerals (density, cleavage and fracture, hardness habit, luster, and transmission of light) Crystal chemistry of minerals (bonding, Paulings rules, crystal structures X-rays and crystal structures Occurrence and paragenisis of minerals studied Refraction of polarized light Optical properties of minerals

Lab Content

Crystal symmetry Crystal forms and stereonet projections, hand specimen identification of mineral unknowns (approx. 250 total), mineral identification by x-ray diffraction, introduction to the petrographic microscope, optical properties of minerals in thin sections, identification of minerals in thin section

Method(s) of Instruction

- Lecture (02)
- DE Live Online Lecture (02S)
- Lab (04)
- DE Live Online Lab (04S)

Instructional Techniques

Activity Cooperative Learning Directed Study Discussion Experiments Field Experience Field Trips Guest Lecturers Guided Inquiry Handouts Instructor-Prepared Materials Lab Lecture Mediated Learning Multimedia Presentations Observation and Demonstration Projects Students who wish to go into greater subject depth are referred to specific outside resources and where to find them, e.g. journals, books, maps, charts, models, Internet sites, geological locales, parks, and museums.

Reading Assignments

Students will spend approximately two hours per week on readings assigned from textbook(s)

Writing Assignments

Students will spend approxiamtely two hours per week on the following: Written assignments that analyze and critically evaluate various minerals and mineral structures Completion of laboratory write-ups

Out-of-class Assignments

Students will spend approxiamtely two hours per week on homework including textbook exercises, the introduction to each laboratory exercise and handouts given in class

Demonstration of Critical Thinking

Tests, final examination, laboratory exercises, field reports and skill demonstrations by students.

Required Writing, Problem Solving, Skills Demonstration

Each week the student shall do one or more of the following: 1.Write brief answers to questions in the lab exercises 2.Write answers to questions at the end of chapters from the text 3.Use deductive reasoning along with measured properties to identify minerals

Eligible Disciplines

Earth science: Masters degree in geology, geophysics, earth sciences, meteorology, oceanography, or paleontology OR bachelors degree in geology AND masters degree in geography, physics, or geochemistry OR the equivalent. Masters degree required.

Textbooks Resources

1. Required Nesse, W.. Introduction to Mineralogy, 2nd ed. Oxford University Press, 2011 2. Required Perkins, D. and Henke, K. R.. Minerals in Thin Section, 2nd ed. Prentice Hall, 2003 Rationale: .