

**GLY 4200C**  
**MINERALOGY AND CRYSTAL CHEMISTRY**  
**4 Credits**

**PREREQUISITES:**

GLY 2010 and 2010L or equivalent. One semester college chemistry and one year college physics. All students should have these courses **before** taking GLY4200C. Students are strongly advised to take one year of college chemistry. **Students who choose to ignore prerequisites often do poorly.**

**TERM AND LOCATION:**

Fall Semester, 2012, Section 92871, Science Engineering 417, Monday, Wednesday, 9:00-10:20 a.m., (Lecture) and Science Engineering 435, Monday or Wednesday, 10:30-12:20 p.m. (Laboratory)

Class begins on Monday, August 20, 2012

**DATES:** August 22 through December 5, 2012 excluding September 3, 2012, November 12, 2012, and November 22-23, 2012

**INSTRUCTOR:**

Dr. David L. Warburton  
SE 466  
(561) 297-3312 FAX (561) 297-2745  
E-mail [Warburto@FAU.EDU](mailto:Warburto@FAU.EDU)

**Please note: Under State of Florida law, all e-mails to or from FAU are public records.**

**Do not say anything in an e-mail you would not want to see in a newspaper, etc.**

**Office Hours:** The instructor will be in or around SE466 or 465 during the following hours each week, beginning August 20, 2012 through November 28, 2012

M,W 12:30-2:00 p.m., T,R 1:00-2:30 p.m., or by appointment

**GRADUATE TEACHING ASSISTANT:**

Ms. Caroline Wright  
SE 422  
(561) 297-3250  
E-mail: <[cwright33@my.fau.edu](mailto:cwright33@my.fau.edu)>

Office Hours: M 1:30-2:30 p.m., W 2:00-5:00 p.m., Thursday 1230-2:30, or by appointment

**COURSE DESCRIPTION:**

This course provides geology majors with basic background in mineralogy and optical mineralogy. Students will become familiar with atomic scale properties, and their usefulness in understanding macroscopic properties, as well as information which can be extracted from minerals concerning the past history of the earth, as well as changes in the earth's environment over time. The laboratory serves to familiarize students with non-silicate minerals and the use of the petrographic microscope.

**COURSE OBJECTIVES:**

The course provides background in one of the six areas tested on the Professional Geology license examination, and prepares students for the Petrology of Igneous and Metamorphic Rocks course.

**COURSE EVALUATION:**

Two midterms exams, each worth 15% of the total grade.

A cumulative final exam worth 18% of the total grade. Laboratory assignments and laboratory exams, 36% of the total grade. Homework will be worth 16% of the total grade.

**GRADING:**

The grading scale used is as follows:

93-100 % - A	80-82.9 % - B-	67-69.9 % - D <sup>+</sup>
90-92.9 % - A-	77-79.9 % - C <sup>+</sup>	63-66.9 % - D
87-89.9 % - B <sup>+</sup>	73-76.9 % - C	60-62.9 % - D-
83-86.9 % - B	70-72.9 % - C-	< 60 % - F

Attainment of the lowest grade average in any category will assure that your grade is not lower than the indicated grade, with one exception. **Anyone failing the laboratory examinations will receive a grade no higher than D<sup>+</sup>**, regardless of the overall score. For geology majors, a grade of less than C must be repeated in order to graduate. Note that this includes grades of C-.

Examinations will be returned and discussed in class. If you miss a class, you may come to the instructorMs office during office hours. Grades will not be posted. Overall grade distributions and class averages are posted on the examination key, which will be available on the course web pages after the examination.

Incomplete grades will be given only when a student is unable to complete the course within the semester due to unforeseen circumstances, with a considerable impact on the studentMs life, and beyond the studentMs control. Such events are rare. Therefore, incomplete grades are rare.

**Attendance at the laboratory sessions is essential for satisfactory performance in the course.**

**LATE WORK AND MISSED EXAMINATIONS:**

Exams will be announced at least one week in advance. It is the student's responsibility to take the tests on the announced date. Failure to take any test will result in a grade of zero (F) on that test. Exceptions, for truly unusual circumstances only, may be obtained by consultation with the instructor prior to the test. Similarly, homework and lab assignments are due on the date announced when the assignment is made. **Late assignments will be heavily penalized.**

## **CLASSROOM ETIQUETTE:**

In order to enhance and maintain a productive atmosphere for education, personal communication devices such as cellular telephones, are to be disabled in class sessions. (University policy which applies to all classes - see <http://www.fau.edu/academic/registrar/catalog/academics.php>) Any use of these devices during a quiz or examination will be considered to be cheating, and will be penalized accordingly. Communication devices (cell phones, laptop computers, etc.) must be turned off and **out of reach** during all examinations.

## **DISABLED STUDENTS:**

In compliance with the Americans with Disabilities Act (ADA). students who require special accommodation due to a disability to properly execute course work must register with the Office for Students with Disabilities (OSD) - in Boca Raton, SU 133 (561-297-3880); in Davie, MOD 1 (954-236-1222); in Jupiter. SR 117 (561-799-8585); or at the Treasure Coast, CO 128 (772-873-3305) - and follow all OSD procedures.

## **HONOR CODE POLICY STATEMENT:**

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information. see University Regulation 4.001 at

[http://www.fau.edu/regulations/chapter4/4.001\\_Code\\_of\\_Academic\\_Integrity.pdf](http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf)

## **TEXT:**

Manual of Mineral Science, Cornelis Klein and Barbara Dutrow, 23rd edition, John Wiley, 2007. ISBN: 978-0-471-72157-4. The price on Amazon for a new book is \$129.25. New and used copies are available from Amazon resellers, from \$59.49 for a new copy on July 13th. The J. Wiley book site shows a list price of \$181.95, or \$109.50 for an e-book. ( <http://www.wiley.com/WileyCDA/WileyTitle/productCd-EHEP000641.html> ) Use caution - some used books are marked, and many are missing the CD-ROM that accompanies the text. Do not buy any edition before the twenty-third, because there were substantial improvements with the new book. All assignments are keyed to the 23<sup>rd</sup> edition.

### **ADDITIONAL SUPPLIES:**

One hand lens (10 X) - should have a metal case - 20 X is also useful but 10 X is better for most purposes. See [Field Equipment](#) for a list of possible sources.

### **HOLIDAYS:**

Labor Day, September 3, 2012

Veteran's Day, November 12, 2012

### **METHOD OF INSTRUCTION:**

The material for the lecture part of the course will be presented in lecture format, usually accompanied by PowerPoint presentations. The laboratory portion of the course will consist of a number of exercises done during the Monday afternoon laboratory section, with write-ups done outside of class.

### **COURSE WEB PAGES:**

Web pages for the course are located at:

[http://www.geosciences.fau.edu/Resources/CourseWebPages/Fall2012/GLY4200C\\_F12/index\\_4200\\_F12.html](http://www.geosciences.fau.edu/Resources/CourseWebPages/Fall2012/GLY4200C_F12/index_4200_F12.html)

An enhanced syllabus, an index page with a great deal of information, a laboratory schedule, and other documents are located at this site. Notices, including any changes in dates, etc. will be posted on the web site. The lecture schedule, which summarizes the material covered during lecture, as well as assignments made and their due dates, will be updated after each lecture, and will serve as an up-to-date indicator of course progress. **Students need to check this site frequently (at least once per week).**

### **EXAMINATION SCHEDULE:**

The approximate schedule of lecture examinations is as follows - actual examination dates may vary in accordance with the above outlined policy:

First Midterm Exam - Wednesday, September 19, 2012

Second Midterm Exam - Wednesday, October 24, 2012

Final Examination - Friday, November 30, 2012 7:45 - 10:15 a.m.

Lecture exams consist of a variety of questions, including true-false, multiple choice, matching, fill-ins, problems, definitions, and occasional essay or discussion questions.

The approximate laboratory examination schedule is as follows:

Lab Quiz 1 Labs 1-3 (Physical properties, Native elements, Sulfides, Sulfosalts, Oxides and Hydroxides) September 28, 2011

Laboratory Quiz 2 (Symmetry-K & H, Chapter 2, 20-100) - October 19, 2011

Laboratory Quiz 3 (Halides, Sulfates, Borates, Carbonates, Bicarbonates, Phosphates) November 2, 2011

Laboratory Final (Optical Mineralogy Techniques) - Wednesday, December 7, 2011 10:30 a.m. - 1:00 p.m.

Laboratory quizzes and examinations are hands-on exercises involving the identification of minerals, and determination of mineral properties, including optical properties using the petrographic microscope.

Make-up tests and quizzes will be given under truly unusual circumstances, which involve a problem or problem beyond the students control, and which could not be foreseen a reasonable time in advance of the examination. Students who know of a problem are urged to contact the instructor two weeks before the examination, to see if alternative arrangements can be made. Anyone missing a quiz or exam must contact the instructor as soon as possible after the exam. Don not wait until the next class! Make-up exams are often in different format than the original examination, and many students consider the make-up exams to be more difficult than the original.

### **TOPICS COVERED:**

Introduction	K & D , Chapter 1
Physical properties, crystal habit, form, mineral physics, piezoelectricity, pyroelectricity	K & D , Chapter 2 Frye, Chapter 3, 131-140, 142 - 152; Z & S, Chapter 6, 149 - 167
Crystal chemistry, composition of the earth's crust, atoms, ions, quantum numbers, bonding, Pauling's Rules, crystal structures, and crystalline solution	K & D , Chapter 3, 4, and 5 Frye, Chapter 5, 171-187 and Chapter 1, 27 - 42 Battey, Chapter 1, 3-28

### **MIDTERM I**

Crystallographic concepts, symmetry elements and operations, order, overview of point group symmetry

K & D , Chapter 6, 7, and 9

Mineral reactions, crystallization, crystal growth

K & D , Chapter 10  
Phillips & Phillips, Chapter 16,  
239-247

## MIDTERM 2

Mineral stability, phase diagrams, exsolution, metamict minerals, pseudomorphism, twinning, origin of color, magnetic properties, radioactivity

K & D , Chapter 11 and 12

Optical Properties of Minerals, Reflection, Refraction, Critical Angle, Isotropic and Anisotropic Crystals, Polarized Light

K & D , Chapter 13

X-ray crystallography, Diffraction, Bragg Equation, Powder and Single-Crystal Methods, Transmission Electron Microscopy, Chemical Analytic Techniques, Atomic Force Microscopy

K & D Chapter 14

**FINAL EXAMINATION** - includes review questions from midterms

## REFERENCE LIST

The following books are on three-hour reserve in the library. They may prove useful if you are having trouble with a particular subject area, or would like more information.

Mineralogy for Students - M. H. Battey  
QE 363.2 B33 1975

Modern Mineralogy - Keith Frye  
QE 363.2 F79 1974

Mineralogy - John Sinkankas  
QE 363.2 S47 1970

An Introduction to Mineralogy for Geologists - W.J. Phillips & N. Phillips  
QE 363.2 P44

Mineralogy - Concepts and Principles - Tibor Zoltai and James H. Stout  
QE 363.2 Z 65

The book by Frye describes chemical bonding and close packing well in Chapter 1, and has a very good discussion of color and luster in Chapter 5. The Sinkankas book contains excellent descriptions of minerals, including the origin of mineral name, methods of identification, and noteworthy occurrences of type or museum grade specimens. Also included are many illustrations of crystals showing common crystal faces and interfacial angles. The theoretical sections are relatively uncomplicated and thus easier to understand than some textbooks, although detail is sacrificed. The Phillips book contains a great deal of information on crystal structure, a subject not emphasized in this course, and the habits and stereo-representations of many rock-forming minerals. The growth and twinning of crystals is also discussed. The book by Zoltai and Stout was formerly used as the textbook for this course, and contains a wealth of detailed information on many of the theoretical aspects of mineralogy.