

GY 302: Crystallography and Mineralogy
Fall 2009

Your Host: Dr. Doug Haywick
<http://www.southalabama.edu/geology/haywick>

Objectives and Goals: This course will introduce geology majors to elementary crystallography, crystal chemistry, and atomic structure of minerals. It will also instruct students how to identify and characterize common rock-forming minerals and important ore minerals. Specific student learning goals and objectives include: (1) recognition of crystal systems and symmetry elements (e.g., mirror planes, axes of rotation etc.); (2) understanding crystallography controls on optical mineralogy; (3) appreciation of the economic importance of ore minerals; (4) geochemical controls on mineral formation. Prerequisites: GY 111\111L, GY 112\112L and CH 100 or 131.

TENTATIVE LECTURE/LAB GAME PLAN

Week 1 CRYSTALLOGRAPHY (Chapters 1, 2 and 3)

Lect 1: Course structure, Introduction to crystal chemistry, Symmetry operations
(Assignment 1: cubic & hexagonal crystals)
Lect 2: Plane and Bravais Lattices
[Lab 1]: *Symmetry operations and cubic and Hexagonal Mineral Systems*

Week 2 CRYSTALLOGRAPHY (Chapters 2, 3, 4 and 5)

Lect 1: Miller Indices and Point Groups
(Assignment 2: Ortho. & Tetragonal crystals)
Lect 2: Stereonet projections of crystal faces
[Lab 2]: *Orthorhombic and Tetragonal Mineral Systems (Quiz: Hex & Cubic)*

Week 3 CRYSTALLOGRAPHY (Chapter 7)

Lect 1: Space Groups, Twinning and Crystal Growth
(Assignment 3: Mono & Triclinic crystals)
Lect 2: Polymorphs, pseudomorphs and crystal habit
[Lab 3]: *Triclinic and Monoclinic Mineral Systems (Quiz: Ortho & Tetra)*
Lecture Test 1 issued (Take Home)

Week 4 NATIVE ELEMENTS AND SULFIDES (Chapters 6, 19 and 20)

Lect 1: Properties and economics of native elements: Gold and diamonds
(Assignment 4: Stereonet projections)
Lect 2: Properties of sulfides/sulfosalts **Test 1 due by 5:00 pm**
[Lab 4]: *Native mineral identification (Quiz: Tri & Mono)*

Week 5 SULFIDES AND SULFOSALTS (Chapter 19)

Lect 1: Economics of sulfides/sulfosalts
(Assignment 5: Choose a mineral for your poster)
Lect 2: Economics of sulfides/sulfosalts
[Lab 5]: *Sulfide mineral identification (Quiz: Natives)*

Week 6 OXIDES, HYDROXIDES AND HALIDES (Chapter 18)

Lect 1: Properties & economic uses of oxide/hydroxide minerals 1
(Assignment 6: Poster Literature Review)
Lect 2: Properties & economic uses of oxide/hydroxide minerals 2
[Lab 6]: *Oxide, Hydroxide and halide mineral identification (Quiz: sulfides)*

Week 7 CARBONATES AND SULFATES (Chapter 17)

Lect 1: Properties & economic uses of halides
(Assignment 7: Ore assessment)
Lect 2: Properties & economic uses of carbonate minerals; Mississippi Valley type deposits
[Lab 7]: *Carbonate and Halide mineral identification (Quiz: oxides/hydroxides)*

Mineral Note Book Examination 1

Week 8 PHOSPHATES, TUNGSTATES, MOLYBDATES & BORATES (Chapter 17)

Lect 1: **Mineralogy 1 Lecture (test 2)** (in class)

Lect 2: Properties & economic uses of sulphate minerals

[Lab 8]: *Sulfate and Phosphate mineral identification (Quiz: carbonates/halides)*

Week 9 Optical Mineralogy

Lect 1: Basic transmission and incident light microscopy

(Assignment 8: Microscopy)

Lect 2: TBA (Catch up day)

[Lab 9]: *Optical mineralogy exercises (Quiz: sulfates/phosphates)*

Week 10 THE SILICATES (Chapters 14, 15 and 16)

Lect 1: Orthosilicate (olivine group)

(Assignment 9: phase diagrams)

Lect 2: Orthosilicates (garnet group)

[Lab 10]: *Silicate mineral identification*

Week 11 THE SILICATES (Chapters 14)

Lect 1: Soro and Cyclosilicates

Lect 2: Poster Preparation Guidelines

[Lab 11]: *Silicate mineral identification (Quiz: Orthosilicates)*

Week 12 THE SILICATES (Chapter 13)

Lect 1: Inosilicates (pyroxenes & pyroxenoids)

Lect 2: Inosilicates (amphiboles) **Mineral Poster draft due**

[Lab 12]: *Silicate mineral identification (Quiz: Soro/cyclosilicates)*

Week 13 THE SILICATES (Chapters 14, 15 and 16)

Lect 1: Phyllosilicates (Mica group)

Lect 2: Phyllosilicates (Clay group; X-ray diffraction)

[Lab 13]: *Silicate mineral identification (Quiz: Inosilicates)*

Week 14 THE SILICATES (Chapters 14, 15 and 16)

Lect 1: Tektosilicates (Silica Group)

Lect 2: Tektosilicates (Feldspar Group)

[Lab 14]: *Silicate mineral identification (Quiz: Phyllosilicates)*

Week 15 PRESENTATION WEEK (Various Chapters)

Lect 1: Tektosilicates (Feldspathoid group)

Lect 2: Thanksgiving Day Holiday (Nov 25-27)

[Lab 15]: *Poster Presentation (GSA Conference Style)*

Week 16 RECAP WEEK (Various Chapters)

Lect 1: **Final Lab test**

Dec 3 (Thurs) 2 hour in-class Final exam 10:30am to 12:30 p.m.

Text book (required): Nesse, William D., 2000. *Introduction to Mineralogy*. Oxford University Press, New York, NY., 442p.

Additional Requirements:

- 3 ring binder (large enough to hold mineral info pages)
- Quality Hand lens
- Art ink pens
- Mineral identification handbook (optional)
- Mineral hardness testing kit (optional)

Assessment:	Attendance*	05%
	Discussion Participation*	05%
	Lab manual**	10% (examined twice)
	Lab quizzes***	20%
	Assignments	05%
	Mineralogy poster***	10%
	Poster Presentation***	05%
	Crystallography take home test (test 1)	10%
	Mineralogy 1 Lecture test (test 2)	10%
	Lab Final exam**	10%
	Final Exam	<u>10%</u>
		100%

Grading: A - 90+ B - 80 to 89 C - 70 to 79 D - 60 to 69 F - 59 and below

Attendance and Discussion Participation:* It seems that a good number of people who take courses feel they do not have to attend classes. Even more feel that they can ignore what's actually being discussed in class (at least up until the time that they feel it is time to study for exams). Nothing could be further from the truth. Much of the material we will discuss will not be covered in text books or on web pages and if you miss class or zone out during class, you will miss this material. Besides, its rude to the instructor. Attendance is mandatory and assessable in GY 302 (5%). So is your participation in discussion sessions (5%). As far as attendance is concerned, I will dock you if you have 4 or more unexcused absences (approximately 10% of class meetings). If you have 8 or more unexcused absences (approximately 20% of class and lab meetings) you will receive 0% for attendance. Excessive absences (more than 30% of class meetings) will result in an additional punitive 10% reduction of your grade (e.g., **I will dock you an additional letter grade). Excessive tardiness will be considered equivalent to missing classes. Note: I will base your attendance on the class role I record sometime during the class meeting (not at the beginning like GY 111/112). I have a similar draconian philosophy about failing to participate during in-class discussions. **There will be no** exceptions to this attendance/discussion policy.

***Laboratories and Mineral Notebooks:* It is up to you to examine the specimens that are assigned in this course and to do all additional laboratory assignments. You may do this during the lab periods and/or outside of normal university hours. A good chunk of your mark in GY 302 will be based upon lab material (lab tests, quizzes etc). Spend suitable time in the lab going over the crystallographic models and minerals. Refer to the web page for lab assignment due dates. **I do not give extensions; labs assignments not turned in on time will not be accepted (you get an F for that assignment).** You are all required to produce a mineral lab book of all of the minerals that you will see in this class. I recommend that you use a three ring binder with a standard page per mineral. An example page will be available on line, but you are free to make your own if you wish. The mineral note book will be examined twice (see due date webpage). Each examination will be worth 5% of your total grade (total 10%).

****Lab Quizzes and Final Exam:* There are a whole bunch of minerals and crystal systems that you need to know in this class. To make it manageable for you, I've found it best to give you essentially weekly quizzes. The will start in Week 2 and will be at the start of each Tuesday lab period (approximately 2:00 to 2:20 PM). Weeks 2-4 will involve crystal systems. Each of you will pull 2 wooden models out of a hat and answer specific questions about those models during the quiz periods. From Week 5 onwards, the quizzes will be on minerals. You will need to answer specific questions about 5 unknown minerals based upon the previous weeks mineral offerings (10-30 minerals; usually around 20). You may use your mineral notebooks for these quizzes and you will have a few opportunities to redo some crystal models and minerals that comprise the quizzes during the course. See the webpage for details.

The final lab exam will consist of 20-30 minerals drawn from the entire GY 302 mineral collection, but at least 5 minerals will be tectosilicates (they will be asterisked for you). For the final, you will only have to identify the mineral and you will be able to use your mineral note book.

Assignments: Expect some assignments in this class. All assignments (and where applicable, revised versions) are due by 5:00 pm on the assigned due dates. **I will not accept late assignments (you will get an F).** See the class website for a comprehensive assignment schedule.

****Poster Session:* The capstone project in this class will be a poster presentation on one mineral of your choice. The poster will follow a standard PowerPoint template associated with a geological meeting hosted by the GSSA (The Geological Survey of South Alabama). Although this is a fictitious organization, the poster will be presented in a conference setting modelled after real GSA meetings. You will be provided with the poster template for this assignment. **Do not modify it.** Posters will be put on display around the building at the end of the semester and will be criticized by Earth Sciences faculty.

Missed exams: The reason for producing a syllabus is to give students advanced notice of exams and assignment due dates. Translation: there is no excuse for missing an exam. However, sometimes it happens. If you have a **legitimate** excuse for missing an exam (i.e. medical problem), you will be permitted to write a make-up during the last week of classes provided that you show me a signed certificate from a medical doctor stating that it was impossible for you to make the exam. **The make up exam will consist of 2 essay questions** (i.e. no easy stuff like multiple choice questions).

The fine print: Plagiarism and cheating are not permitted in this class and either of them will result in severe embarrassment to you (and quite possibly an F for the assignment or exam in question) if you are caught doing them. Be sure to use proper reference citations in your take home exam otherwise it's plagiarism. All written reports (essay questions, term papers, assignments) are subject to examination through the *Turnitin* website. This is not meant as a punishment, but is instead, a process intended to improve your writing skills. See me if you have questions about plagiarism and/or *Turnitin* during my office hours.

Disability disclaimer: In accordance with the American's with Disabilities Act (ADA) students with bona fide disabilities will be afforded any reasonable accommodation. The Office of Special Student Services will certify a disability and advise faculty members of reasonable accommodations. If you have a specific disability that qualifies you for academic accommodations, please provide us with certification from the Office of Special Student Services, directed by Ms. Andrea Agnew, and located in the Student Center, room 270. The phone number is 460-7212.

Changes in Course Requirements: Since all classes do not progress at the same rate, instructors may wish to change the number and frequency of exams, or the number and sequence of assignments. Inclement weather (e.g., hurricanes) may also force rescheduling of lectures, assignments or exams. When ever possible, this material will be made up. Students will be given adequate written notice of any changes in lecture sequence, assignment due dates and/or exam date changes.

D. Haywick Contact Information and Schedule

How & where to find Doug: I reside in LSCB room 049. I believe in open office hours, so feel free to pay me a visit anytime that I am not in class between 9:00 am & 5:00 pm (except on my research days!). However, I will generally be in my office during the times posted on my schedule. Should you be unsuccessful in your attempts to find me, fear not! You have two options: 1) check the Where's Doug note on my door for my location during normal office hours, or 2) leave a message for me:

Telephone: 460-7569 (Haywick's office – you can leave a message).

E-mail: dhaywick@jaguar1.usouthal.edu

internet: <http://www.southalabama.edu/geology/haywick>

D. Haywick Hours (Fall 2009 Semester)

Time	Monday	Wednesday	Friday
8:00-8:50 AM			
9:05-9:55 AM			
10:10-11:00 AM	Office	Office	Office
11:15 AM-12:05 PM		Office	Office
12:20-1:10 PM	GY 402/544 (LSCB 337) 12:20 to 3:20 PM	Reserved for GY Students involved in Research	GY 301 Lab (LSCB 337) 12:20 to 2:10 PM
1:25-2:15 PM			
2:30-3:20 PM			Office
3:35-4:25 PM	Office		

Time	Tuesday	Thursday
8:00-9:15 AM		
9:30-10:45 AM	GY 301 (LSCB 337)	GY 301 (LSCB 337)
11:00 AM-12:15 PM	GY 302 (LSCB 337)	GY 302 (LSCB 337)
12:20 – 1:45 PM	GY 302 Lab (LSCB 337)	GY 402/544 (LSCB 337)
2:00-3:50 PM	1:00 PM to 3:50 PM	12:20 PM to 3:20 PM
4:00 – 5:00 PM	Office	Office

Note: shaded areas are research\committee\personal times: STAY AWAY!

Note: Tuesdays and Thursdays will be very intense for Haywick this semester. You are strongly advised to visit during office hours for Monday, Wednesday or Friday.



Please turn off all beepers and cellular phones before you enter the classroom. I hate those noisy things and they can really be an embarrassment to you when they go off. (The embarrassment comes primarily from the tennis balls I throw in your direction)