
GEOL 3002

Introduction to Earth Materials

Overview

This course is designed to help you develop four broad skills: 1) an understanding of the basic concepts of mineralogy and crystal chemistry, 2) an ability to recognize minerals in hand specimen and apply that knowledge toward deducing physiochemical conditions and processes in nature, 3) a sharply-honed ability to communicate both in writing and speech, and 4) a philosophy of professionalism that will set you apart both in school and in the job market.

Goals

- To familiarize you with the basic concepts, themes and tools of Mineralogy and the way mineralogists work.
- To help you understand why mineralogy is important and how it relates to other sciences.
- To help you develop scientific communication skills
- To help you develop the ability to work with others on group projects. and, perhaps most importantly.....
- To help you become "intentional learners" by helping you understand what learning is and what you can do to improve learning outcomes.

D2L

We use D2L – a courseware system – for this class. So, to see a calendar with all assignment due-dates, you must register with D2L and go to the class web page. To do this, simply go to www.gsu.edu – and look for D2L, you will find simple instructions on how to register and access the class site.

Topics Covered and Tentative dates

The right side panel of this syllabus provides the topics covered each week as well as the tentative dates when we will cover them. You should use the calendar provided on this syllabus only as a guide. **It is your responsibility to consult the full calendar of activities in the D2L site for the most updated information.**

Fall 2014

[TR: 11:00am -12:15 am; F 9:30 am-12:15 pm] Room 321 Kell Hall

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Office Hours: by appointment

Teaching Assistant: Tyler Boyd

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Materials

- We use the text Manual of Mineral Science, 23rd Edition (by Cornelis Klein, Barbara Dutrow).
- Supplementary books available in Room 321
- Hand lens

Milestones

Aug 26

Class Begins

Aug 28

Introduction to symmetry operations.

Klein p. 1-18, 109-128

Weekly Lab: No lab this week

Sept 2-4

- The 32 Crystal Classes. Klein p.109-128

- Crystal Morphology, Crystal Symmetry and Crystallographic axes, Klein p. 129-131

Weekly Lab: Elements of Crystal Symmetry

How class is Taught

This class is taught in a studio format. Studio classrooms may have many different manifestations but all share common elements. They involve class sessions with focused, intense, student activity. Lectures are de-emphasized or eliminated altogether so students can work on projects instead, generally in groups.

Why Teach This Way?

Many studies have shown that students learn best by doing things (active learning) instead of just listening (passive learning). Additionally, it is well known that most students learn best when they learn in groups (cooperative/collaborative learning). Studio classrooms are centered around active and group learning. The interactive classroom helps students learn the standard class content. Additionally, it promotes holistic skills, including thinking, inquiry, creativity and reflection.

Spiral Learning

This class also involves spiral learning. That means we will cover topics more than once, returning to them several times and in different contexts. The basic order of topics follows the textbook but we will discuss the key principles many times.

Working in Groups

Most of the work you do this semester will be done in groups. The instructor and TA will assign the groups; they will change periodically. All members of a group are responsible for seeing that assignments get completed. For some assignments, a single group report will be adequate. For others, each person must write his or her own report.

Reading Assignments

In addition to the text for this course, the instructor will provide many handouts and supplemental information pertinent to specific class activities. You are expected to read them on your own. The instructor and TA will NOT give lectures that just repeat what is in the books. Instead, they will talk about things that you identify as being areas of confusion.

Sept 9-11

- Axial Ratios, Weiss parameters, Miller Indices Klein p.131-134
- Crystal Form, Zones, Crystal Habit, 32 Crystal Classes, Klein p. 134-142 182-208

Weekly Lab: Crystallographic Axes and Introduction to Crystal forms

Sept 16-18

- Crystallographic Calculations, Klein p. 182-208
- Stereographic Projection of Crystal Faces, Crystal angles, and zones, Klein p. 169-181

Weekly Lab: Crystallographic Angles and Axial Ratio Calculations and stereographic projections

Sept 23-25

- What is a Mineral? Klein p. 2-16
- Physical properties of Minerals, Klein p. 20-36

Weekly Lab: Physical properties of Minerals

Sept 30- Oct 02

- Twinning in crystals, Polymorphism, Polytypism, Pseudomorphism, Klein p. 227-234 and 266-285
- Crystal Chemistry, Klein p. 37-65

Weekly Lab: Twinning in crystals and Mineral Identification - native elements, sulfates, sulfides, oxides, hydroxides, and halides. Klein p. 331-398

Oct 7-9

EXAM 1 (Oct 10)

- Coordination and Pauling's Rules, Klein p. 66-89.
- Atomic packing exercise

HW: Linking between Anionic Groups

Quizzes

We will have many quizzes this semester. They are meant, primarily, to be learning experiences. Often, you will take the quiz individually and then get together with other students and take it again. Individual and group grades will be averaged.

Work Time In and Out of Class

Although class is scheduled to meet in 3 time blocks, there will be quite a bit of variation. During a typical class period, we will have several things going on. Different groups will be doing different things. Some days you may get done early. But, if you fall behind, it will be very difficult to catch up. Also, many of the projects we will be doing require you to put in time beyond normal class hours.

Assessment

There will be three in class exams. There will be many quizzes. There will be fundamental laboratory exercises. In the end, your grade depends more on completing all assignments than anything else. Individual and group activities/ projects/ exercises are just as important as exams.*****

Quantitative lab assignments: 20 %
Quizzes and Homework: 10 %
Presentation and report paper: 15%

two-hour Exams: 35%
Final Exam: 20%

Grade boundaries will be drawn as follows:

91.0 – 100 =A, 85.0-90.9=A-, 82-84.9=B+, 78.0 - 81.9=B, 75.0 - 77.9=B-, 70 -74.9 C+, 61.0 - 69.9=C, 60.0 - 60.9=C-, 50.0-59.9=D, <50=F

Attendance

Lecture attendance is strongly recommended; students who miss lectures and/or labs will be at a serious disadvantage.

Make up Exams

All exams must be taken at the scheduled time unless you have a documented conflict and made arrangements before the exam or you have a medical emergency and you bring proof of this to the instructor before final grades are computed. In any other case, missing the exam will result in a grade of "F" for that exam. Quizzes cannot be made up.

Oct 14-16

- Crystal Chemistry, Klein p. 90-108 and 321-330
- Calculation of mineral formulas, p. 90-108 and 321-330

Weekly Lab: Mineral Identification - halides, carbonates, tungstates, molybdates, borates, chromates, phosphates, and arsenates, Klein p. 399-433.

Oct 21-23

- Mineral Chemistry Klein p. 90-108 and 321-330
- Mineral Stability, phase diagrams and Thermodynamics, Klein p. 245-256 and Lecture Notes

Weekly Lab: Mineral Identification - Neso-, soro-, and ino- silicates

Oct 28-30

- Binary phase diagrams, congruent melting, Klein p. 245-256 and Lecture Notes
- Binary phase diagrams, incongruent melting, solid solution, and exsolution, Klein p. 276-282 143-148 and Lecture Notes

Weekly Lab: Mineral Identification - cyclo- and phyllo-silicates, Klein p. 518-534

Nov 4-6

- Mineral Identification, tectosilicates, Klein p. 534-553
- Binary phase diagrams, incongruent melting, solid solution, and exsolution, Klein p. 276-282 143-148 and Lecture Notes

Weekly Lab: Phase Diagrams

Make up Labs and Homework

It is expected that you will complete every lab and homework. Due to the nature and intense preparation involved in setting up these lab assignments, if you miss a one, it is not possible to make it up. The TA and I reserve the right to use weekly lab attendance as a guide to adjust final lab and homework grades. We will NOT accept late assignments or assignments from students who missed the class where the assignment was handed.

Some other rules

- Turn your cell phones to silent mode during class and keep them off the desk. Text messaging is strictly prohibited and grounds for dismissal.
- Food is prohibited in class and drinks are allowed only on appropriate closed containers.

Nov 11-13

Exam 2 (Nov 14)

- X-ray crystallography: the powder method Klein p. 307-321
- Identification of an unknown by X-ray powder refraction.

Nov 18-20

- Silicate Structures Klein p. 434-482
- Olivines, Garnets, Aluminosilicates, Pyroxenes and Amphiboles, Klein p. 484-519 and Lecture Notes

Weekly Lab: X-ray Powder diffraction demonstration Ionic Spacing. Klein p. 307-321

Nov 25-27

Thanksgiving break

Dec 2-4

- Clays, Micas, serpentine, and chlorite Klein p. 519-534 Lecture Notes
- Tectosilicates Klein p. 534-553

Weekly Lab: No lab this week

Dec 11

Final Exam 10:45 am-13:15 pm

Department of Geosciences

Georgia State University

General Information to be included in all Departmental Class Syllabi

Although specific policies and requirements will vary from class to class and from instructor to instructor, the following information applies in general to all courses in the Dept. of Geosciences.

The course syllabus provides a general plan for the course; deviations may be necessary.

1. According to the Georgia State University undergraduate catalog, class attendance is expected; failure to attend classes regularly may result in poor course performance. The university requires instructors to verify attendance early in the term. Failure to attend classes may result in you not appearing on the *Verification Roll* and being dropped from the class. Please see section 1334 of the catalog at http://www.gsu.edu/es/catalogs_courses.html, and click on the appropriate catalog link to read about attendance policy (posted as a .pdf file).
2. All students should be familiar with the university's course withdrawal procedures. These can be found in section 1332 of the undergraduate catalog.
3. All students are required to be familiar with the Academic Honesty policy of the university and to comply with the policy. This can be found in section 1380 of the undergraduate catalog.
4. Each student must have access to an on-line computer and is responsible for reading all messages sent to his/her university email address, and any other assignments that require the use of a computer. Class changes and/or updates may be conveyed via email, in which case the student is considered to have been informed. The student is required to check this university email box regularly.
5. Accommodations for students with disabilities:
Georgia State University complies with Section 504 of the Rehabilitation Act and the Americans with Disabilities Act. Students with disabilities who seek academic accommodations must first take appropriate documentation to the Office of Disability Services locate in Suite 230 of the New Student Center.