

Lecture: Monday, Wednesday, Friday, 9:00 - 9:50 114 Bretske Hall
 Lab (sec. 500): Monday, 1:00 - 2:50 114 Bretske Hall
 GEOL 442: Tuesday, 12:15 - 1:15 114 (and 110) Bretske Hall

Instructor: J. W. Mies, Ph.D. 105 Bretske Hall
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Text: Klein, Cornelis & Dutrow, Barbara, 2008, *The Manual of Mineral Science*,
 23rd Edition, John Wiley & Sons, New York, 675 p. ISBN 0-471-25177-1

Credit hours: 4 credit hours, plus 1 hour for GEOL 442

Prerequisites: GEOL 111 & 181, CHEM 121 Corequisite: GEOL 341 LAB (sec 500)

Description: GEOL 341, *Mineralogy*, is a course in descriptive and determinative mineralogy with emphasis on crystallography, mineral chemistry, and the systematic examination and identification of minerals. Conceptual, theoretical, and historical aspects of the science are covered in the lecture, whereas descriptive aspects, leading to mineral identification, are treated in the laboratory. This course is intended to be the undergraduate student's first course in mineralogy. It expands greatly upon the treatment of the subject given in Geology 111 and serves as a preparation for many upper-level geology courses.

GEOL 442, *X-ray Diffraction Methods*, is a supplement to GEOL 341 that emphasizes X-ray crystallography, particularly methods of powder diffraction, and provides the mineralogy student with experience using an X-ray diffractometer.

It is recommended that students of Mineralogy also take GEOL 442.

TENTATIVE LECTURE SCHEDULE

	M	W	F	Topic	Chapter (pages)
Aug	20			Introduction	1
		22		Symmetry elements and operations (cont'd from lab)	6 (109-118)
			24	Sym. elem. and op. (cont'd), crystal sym., cryst. axes	6 (118-128)
	27			Crystal symmetry, crystallographic axes (cont'd)	6 (129-131)
		29		ACAT Geology (geology majors only)	
Sep			31	Miller indices	6 (131-134)
	3			Labor Day Holiday, no class	
		5		Miller indices (cont'd), forms	6 (134-142)
			7	Crystal angles and spherical projections	8 (169-181)
	10			Triclinic and monoclinic crystal systems	9 (182-187)
		12		Orthorhombic and tetragonal crystal systems	9 (187-194)
			14	Hexagonal and isometric crystal systems	9 (194-200)
	17			Iso. crystal sys. (cont'd), review of crystal morphology	9 (200-208)
		19		EXAM 1	1, 6, 8, 9
			21	Internal order and symmetry, lattices	7 (143-152)
	24			Plane groups and related symmetry	7 (152-156)
		26		Three-dimensional lattices and space groups	7 (156-168)
			28	Space groups (cont'd)	7(165-168),9(208-)
Oct	1			Crystal chemistry, review of inorganic chemistry	3 (37-53)
		3		Chemical bonds	3 (53-62)
			5	Chemical bonds (cont'd), coordination of ions	3(62-65),4(66-68)

TENTATIVE LECTURE SCHEDULE (CONT'D)

	M	W	F	Topic	Chapter (pages)
Oct	8			Coordination of ions (cont'd), crystal structure	4 (68-78)
		10		Crystal structure (cont'd)	4 (79-89)
			12	Chem. comp. of Earth, chem. variation in minerals	5 (90-99)
	15			Recalculation of chemical analyses	5 (99-108)
		17		Recalc. of chem. analyses (cont'd), chem. variation	5 (99-108)
		19		Recalc. of chem. analyses (cont'd), chem. variation	5 (99-108)
	22			Fall Break, no class	
		24		Review of lattices, crystal structure, and cryst. chem.	
		26		EXAM 2	3, 4, 5, 7 [1, 6, 8, 9]
	29			Optical microscopy, the nature of light	13 (287-291)
		31		Isotropic and anisotropic crystals, pol. microscope	13 (291-294)
Nov			2	Uniaxial crystals	13 (294-299)
	5			Uniaxial crystals (cont'd), biaxial crystals	13 (299-304)
		7		Biaxial crystals (cont'd)	13 (299-304)
		9		Rock-form silicate minerals, neso- and soro-silicates	18(434-),19(483-)
	12			Cyclosilicates	18(442-),19(502-)
		14		Inosilicates	18(446-),19(505-)
		16		Inosilicates (cont'd)	18(446-),19(505-)
	19			Phyllosilicates	18(456-),19(519-)
	21			Thanksgiving Holiday, no class	
		23		Thanksgiving Holiday, no class	
	26			Phyllosilicates (cont'd)	18(456-),19(519-)
		28		Tectosilicates	18(467-),19(534-)
		30		Tectosilicates (cont'd)	18(467-),19(534-)
Dec	3			Tectosilicates (cont'd), review	18(467-),19(534-)
		7		FINAL EXAM , Friday, December 7, 8:00 - 10:00 am	13, 18, 19 [1, 3-9]
	10			LAB PRACTICAL EXAM , Mon., Dec. 10, 11:00 - 1:00	

TENTATIVE LABORATORY SCHEDULE

GEOL 341 (500), Mineralogy Lab Monday, 1:00 - 2:50			GEOL 442, X-Ray Diffraction Methods Tuesday, 1:00 - 1:50		
Aug	20	Basics of symmetry	21	Demonstration of powder XRD	
	27	Crystal classes (32 point groups)	28	Production, prop., and detect. of X-rays	
Sep	3	Labor Day Holiday, no class	4	Radiation safety, safety considerations	
	10	Morphological description of crystals	11	Principles of powder diffract., Bragg eq.	
	17	Nat. elem., sulf., arsenides, etc., Ch.2,15,22	18	Routine acquisition of diffraction data	
	24	Oxides, hydroxides, halides, Ch. 2, 16, 22	25	Manual data reduction and mineral ID	
Oct	1	Carbonates, nitrates, Ch. 2, 17, 22	2	Computer-auto. search-match of PDF	
	8	Borates, sulf., chromates, etc., Ch. 2, 17, 22	9	MID-TERM EXAM	
	15	Phosphates, arsen., vanadates, Ch.2,17,22	16	Project 1 – TBA	
	22	Fall break, no class	23	Project 1 (cont'd)	
	29	Opt. min. and the pol. microscope	30	Project 2 – TBA	
Nov	5	Optical study of selected minerals	6	Project 2 (cont'd)	
	12	Nesosilicates and sorosilicates, Ch.2,19,22	13	Project 3 – TBA	
	19	Cyclosilicates and inosilicates, Ch. 2,19,22	20	Thanksgiving Holiday, no class	
	26	Phyllosilicates, Ch. 2, 19, 22	27	Project 3 (cont'd)	
Dec	3	Tectosilicates, Ch. 2, 19, 22			
Dec	10	LAB PRACTICAL EXAM (Mineral ID) Monday, Dec. 10, 11:00 am - 1:00 pm			

GRADES AND RELATED MATTERS

The *final numerical grade* for the class will be computed as follows.

Numbers of problem sets, quizzes, and laboratory exercises are approximate.

18 %	Exam 1 (Sept 21)	_____	x 0.18 =	_____.
20 %	Exam 2 (Oct 26)	_____	x 0.20 =	_____.
22 %	Final Exam (Dec 7, 8:00 - 10:00 am)	_____	x 0.22 =	_____.
15 %	Lab practical exam (Dec 10, 11:00 am - 1:00 pm)	_____	x 0.15 =	_____.
10 %	Avg. of 3 to 5 problem sets	_____	x 0.10 =	_____.
10 %	Avg. of 6 to 8 mineral-identification (lab) quizzes	_____	x 0.10 =	_____.
5 %	Attendance and participation	_____	x 0.05 =	_____.
			TOTAL	_____.

The *final letter-grade* for this class will conform to the following scale, based upon the computed *final numerical grade*.

F≤59.9, D=60-69.9, C=70-79.9, B=80-89.9, A=90-100

EXAMS

Exams will be comprehensive, meaning that each exam will cover all material that precedes it. The second and third (final) exams will emphasize the material covered since the previous exam. For example, the second exam will emphasize chapters 3, 4, 5 and 7, but will also include questions related to chapters 1, 6, 8 and 9.

Exams may include questions of fill-in-the-blank, matching, and multiple-choice formats, and may require computations like those made in class and on problem sets. Each exam will also include a question or two (or three) that requires short written answers (several well-composed sentences, plus diagrams).

Make-up exams will be provided in only the most adverse circumstances (e.g. serious illness). Documentation of the circumstance (e.g. doctor's note) may be required.

Arrangements for a make-up exam must be made with the instructor prior to the scheduled time of the regular exam. In the event that a student is provided with a make-up exam, he or she should anticipate that it is likely to be different from the regular exam.

WEB RESOURCES

Mineralogy and crystallography database
<http://webmineral.com/>

mindat—the mineral and location database
<http://www.mindat.org/>

Athena Mineralogy
<http://un2sg4.unige.ch/athena/mineral/mineral.html>

Geologynet: mineral database
<http://www.geologynet.com/dbasesmin.php3>

WWW-MINCRYST
http://database.iem.ac.ru/mincryst/s_full.php

American Mineralogist crystal structure database
<http://rruff.geo.arizona.edu/AMS/amcsd.php>

BLACKBOARD

Some aspects of this course are available through UTC's online course delivery system (Blackboard), which can be accessed at:

<http://utconline.utc.edu>

Your user name for logging on to the system is your UTCID (mix of letters and numbers). Your password for Blackboard is the same as your password for your UTC e-mail (Onenet) and for your access to the Lupton Library databases. If you change your password in Blackboard, you also change your password on both of these other systems. If you forget your password, follow the "Forgot Password" links from either the Onenet (<http://onenet.utc.edu/>) or Blackboard (<http://bb2.utc.edu/webapps/login>) login pages.

Documentation on student use of Blackboard is available at:

<http://utconline.utc.edu/BB6Students.html>

EMAIL (firstname-lastname@utc.edu)

To enhance student services, the University will use your UTC email address (firstname-lastname@utc.edu) for communications. (See <http://onenet.utc.edu> for your exact address.) Please check your UTC email on a regular basis. If you have problems with accessing your email account, contact the Help Desk at 423-425-2676.

OTHER POLICIES

Students are expected to attend class regularly. Attendance and participation will be considered in the final grade. (See *Grades* .)

Students are expected to be punctual, attentive and prepared for class.

Students that arrive late for an exam may not be permitted to take the exam.

Assignments are expected to be turned in on time. Late assignments will be accepted in only the most adverse circumstances (e.g. serious illness or accident). Documentation of the circumstance (e.g. doctor's note) may be required.

All students are expected to follow the UTC honor code.

ATTENTION: If you are a student with a disability and think that you might need special assistance or special accommodation(s) in this class or any other class, call the Office for Students with Disabilities/College Access Program at 425-4006 or come by the office, 110 Frist Hall.

This syllabus is subject to minor changes.