

GEOSCIENCES 213 - MINERALOGY - FALL 2012

LECTURES: MW 11:45-12:45

Reichardt

235

LABS: MW 2:15 – 5:15 p.m. OR MW 6-9 p.m.

Reichardt 235

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COURSE DESCRIPTION: The purpose of this course is to introduce beginning geology students to the characteristics of the common rock-forming minerals: crystallography, crystal structures, physical and chemical properties, systematic identification in the field and the laboratory, optical and x-ray properties, occurrence, stability, and associations. Two overall concepts will be stressed: how all these properties reflect the intrinsic order within the crystal structure of these minerals, and how a basic knowledge of minerals provides a key to the interpretation of geological environments and processes.

TEXTBOOKS:

Klein, C. & B. Dutrow, 2007. Manual of Mineral Science. 23rd edition. John Wiley & Sons.

Nesse, W.D., 2004. Introduction to Optical Mineralogy. 3rd edition. Oxford University Press.

GRADING (TENTATIVE):

Lab exercises	20%
Problem sets	10%
Laboratory quizzes (2 or 3)	10%
Midterm exams (2)	40%
Final lecture exam	20%

- ☐ **PLEASE NOTE:** Reading assignments should be completed before the class for which they are scheduled!

Disability Services: The Office of Disability Services implements the Americans with Disabilities Act (ADA) and insures that UAF students have equal access to the campus and course materials. This class will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities. Make sure to let the instructor know if there are concerns of this type.

Geosciences 213: Mineralogy Fall 2012

SCHEDULE OF LECTURES & READING ASSIGNMENTS

	<u>Lecture Topics</u>	<u>Reading Assignment*</u>
SYMMETRY AND CRYSTALLOGRAPHY		
SEPT 5	Introduction, basic symmetry elements	MMS 1-18, 109-118
10	Combination of symmetry elements, plane groups	MMS 118-125; 143-156
12	Point groups & crystal systems	MMS 125-131; 182-208
17	Forms, zones, & Miller indices	MMS 131-142
19	Lattices & space groups	
	MMS 156-168	
CRYSTAL CHEMISTRY		
24	Atoms & molecules & bonding in minerals	MMS 37-65; CCC 183-219
26	Radius ratios, closest packing, coordination	MMS 66-80; CCC 221-258
OCT 1	MIDTERM EXAM #1	
3	Crystal structure types	MMS 80-108
DESCRIPTIVE MINERAL CLASSIFICATION & DETERMINATIVE TECHNIQUES		
8	Systematic mineral identification	MMS 19-36; 266-274;
331-333		10
	Non-silicates I	MMS 333-367

	15	Non-silicates II	MMS 368-398
	17	Non-silicates III	MMS 399-433
	22	X-ray diffraction theory	MMS 307-321; CCC 454-458
	24	X-ray diffraction applications	MMS 321-330
	29	Silicate mineral structures (overview)	MMS 434-482; CCC 258-271
	31	Silicate minerals I	MMS 483-505
NOV	5	Silicate Minerals II	MMS 505-534
	7	Silicate Minerals III	MMS 534-553
	12	MIDTERM EXAM #2	

OPTICAL MINERALOGY

NOV	14	Introduction to optics, polarization	N 1-24; MMS 287-294
	19	Refractive index, isotropic materials	N 25-36
	21	Uniaxial minerals I: indicatrix theory	N 37-65
	26	Uniaxial minerals II: Birefringence	MMS 294-299
	28	Uniaxial interference phenomena	N 65-75
DEC	3	Conoscopic methods for uniaxial minerals	MMS 300-305
	5	Biaxial minerals I: indicatrix theory	N 76-103
	10	Biaxial minerals II:	
		interference figures	N 103-109

FINAL LECTURE EXAM: Wednesday, December 12, 10:15 a.m. - 12:15p.m.

MMS = Manual of Mineral Science, Klein & Dutrow, 23rd edition.

CCC = Crystallography and Crystal Chemistry, Bloss - copies available in the classroom

N = Introduction to Optical Mineralogy, Nesse, 3rd edition.

SCHEDULE OF GEOSCIENCES 213 LABORATORY EXERCISES - 2012

	10	2-D SYMMETRY AND PLANE GROUPS
	12	POINT GROUPS WITH CRYSTALS AND WOODEN BLOCKS
	17	MILLER INDICES WITH WOODEN BLOCKS
	19	EXPLORING XL MORPHOLOGY WITH THE COMPUTER ("SHAPE")
	24	MINERALOGY AND THE INTERNET (COMPUTER EXERCISE)
	26	PACKING OF SPHERES, SYMMETRY IN 3-D
OCT	1	DENSITY-COMPOSITION-HARDNESS RELATIONSHIPS
	3	LECTURE AND LAB: MINERAL CHEMISTRY/PROBE FIELD TRIP
	8	DETERMINATIVE MINERALOGY
	10	HAND SPECIMENS I: NATIVE ELEMENTS, OXIDES, HYDROXIDES, HALIDES
	15	HAND SPECIMENS II: SULFIDES AND SULFOSALTS
	17	HAND SPECIMENS III: CARBONATES, SULFATES, BORATES, TUNGSTATES, ETC.
	22	X-RAY DIFFRACTION METHODS
	24	UNKNOWN IDENTIFICATION WITH X-RAY DIFFRACTION/S.E.M. TOUR
	29	NON-SILICATE HAND SPECIMEN MINERAL QUIZ
	31	HAND SPECIMENS IV: NESO-, SORO-, CYCLO-SILICATE MINERALS
NOV	5	HAND SPECIMENS V: CHAIN AND SHEET SILICATE MINERALS
	7	HAND SPECIMENS VI: TECTO-SILICATES AND MINERALS IN ROCKS
	12	SILICATE HAND SPECIMEN MINERAL QUIZ
	14	INTRODUCTION TO THE PETROGRAPHIC MICROSCOPE
	19	REFRACTIVE INDICES IN ISOTROPIC SUBSTANCES
	21	UNIAXIAL OPTICS: DOUBLE REFRACTION IN CALCITE, REFRACTIVE INDICES
	26	UNIAXIAL ORTHOSCOPIC PROPERTIES
	28	UNIAXIAL MINERALS: INTERFERENCE FIGURES AND SIGN TESTS
DEC	3	MORE UNIAXIAL MINERAL METHODS
	5	BIAXIAL MINERALS
	10	MORE BIAXIAL MINERAL TECHNIQUES