GEOSCIENCES 213 - MINERALOGY - FALL 2007

LECTURES: MW 11:45-12:45	Reic 235		
LABS: MW 2:15 – 5:15 p.m. OR MW 6-9 p.m.	Reic 235		
INSTRUCTOR: Mary Keskinen	Reic 340	X 7769	ffmjk@uaf.edu
TEACHING ASSISTANTS: Steve Polkowski	Reic 312	X7585	ftsjp@uaf.edu
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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.

MATERIALS:

Students should have a hand lens (10X triplet suggested), a hand magnet, and a pocket knife. These and other materials will be provided as needed in the lab.

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!

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SCHEDULE OF LECTURES & READING ASSIGNMENTS

		Lecture Topics	Reading Assignment*
SYMMETRY AND CRYSTALLOGRAPHY			
SEPT	10	Introduction, basic symmetry elements	MMS 1-18, 109-118
	12	Combination of symmetry elements, plane groups	MMS 118-125; 143-156.
	17	Point groups & crystal systems	MMS 125-131; 182--208
	19	Forms, zones, & Miller indices	MMS 131--142
	24	Lattices & space groups	MMS 156-168
CRYSTAL CHEMISTRY			
	26	Atoms & molecules & bonding in minerals	MMS 37-65; CCC 183-219
OCT	1	Radius ratios, closest packing, coordination	MMS 66-80; CCC 221-258
	3	MIDTERM EXAM #1	
	8	Crystal structure types	MMS 80-108
DESCRIPTIVE MINERAL CLASSIFICATION & DETERMINATIVE TECHNIQUES			
	10	Systematic mineral identification	MMS 19-36; 266-274; 331-333
	15	Non-silicates I	MMS 333-367
	17	Non-silicates II	MMS 368-398
	22	Non-silicates III	MMS 399-433
	24	X-ray diffraction theory	MMS 307-321, CCC 454-458
	29	X-ray diffraction applications	MMS 321-330
	31	Silicate mineral structures (overview)	MMS 434-482; CCC 258-271
NOV	5	Silicate minerals l	MMS 483-505
	7	Silicate Minerals ll	MMS 505--534
	12	Silicate Minerals III	MMS 534-553
	14	MIDTERM EXAM #2	

OPTICAL MINERALOGY

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

FINAL LECTURE EXAM: Monday, December 17, 10:15 a.m. - 12:15p.m.

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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.

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SCHEDULE OF GEOSCIENCES 213 LABORATORY EXERCISES

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