

GEOSCIENCES 213 - MINERALOGY - FALL 2006

LECTURES: MW 11:45-12:45 NSci 235
LABS: MW 2-5 p.m. OR MW 6-9 p.m. NSci 235
INSTRUCTOR: Mary Keskinen NSci 340 X 7769
TEACHING ASSISTANTS: Allison Payne
Sudipta Sarkar Nsci 312 X7585

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. 2002. Manual of Mineral Science. 22nd edition. John Wiley & Sons.

Nesse, W.D., 1991. Introduction to Optical Mineralogy. 2nd edition. Oxford University Press.

MATERIALS:

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

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!

Geosciences 213: Mineralogy Fall 2006

SCHEDULE OF LECTURES & READING ASSIGNMENTS

	<u>Lecture Topics</u>	<u>Reading Assignment*</u>
SYMMETRY AND CRYSTALLOGRAPHY		
SEPT	6 Introduction, basic symmetry elements	MMS 1-18, 170-181
	11 Combination of symmetry elements, plane groups	MMS 181- 189
	13 Point groups & crystal systems	MMS 189-197; 251-276
	18 Forms, zones, & Miller indices	MMS 197-213
	20 Lattices & space groups	MMS 213-239; 276-288
CRYSTAL CHEMISTRY		
	25 Atoms & molecules & bonding in minerals	MMS 17-64; CC 183-219
	27 Radius ratios, closest packing, coordination	MMS 64-80; CC 221-258
OCT	2 MIDTERM EXAM #1	
	4 Crystal structure types	MMS 80-103
DESCRIPTIVE MINERAL CLASSIFICATION & DETERMINATIVE TECHNIQUES		
	9 Systematic mineral identification	MMS 134-142; 333-335
	11 Non-silicates I	MMS 335-370
	16 Non-silicates II	MMS 371-402
	18 Non-silicates III	MMS 404-440
	23 X-ray diffraction applications	MMS 321-331
	25 X-ray diffraction theory	MMS 309-321, CCC 454-458
	30 Silicate mineral structures (overview)	MMS 441-490; CCC 258-271
NOV	1 Silicate minerals I	MMS 491-514
	6 Silicate Minerals II	MMS 514-543
	8 Silicate Minerals III	MMS 543-562
	13 MIDTERM EXAM #2	

OPTICAL MINERALOGY

NOV	15	Introduction to optics, polarization	N 3-24; MMS 290-298
	20	Refractive index, isotropic materials	N 25-36
	22	Uniaxial minerals I: indicatrix theory	N 37-65
	27	Uniaxial minerals II: Birefringence	MMS 298-303
	29	Uniaxial interference phenomena	N 65-75
DEC	4	Conoscopic methods for uniaxial minerals	MMS 303-309
	6	Biaxial minerals I: indicatrix theory	N 77-104
	11	Biaxial minerals II: interference figures	N 104-117

FINAL LECTURE EXAM: Saturday, December 16, 10:15 a.m. - 12:15p.m.

MMS = Manual of Mineral Science, Klein, 22nd edition.

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

N = Introduction to Optical Mineralogy, Nesse, 2nd edition.

SCHEDULE OF GEOSCIENCES 213 LABORATORY EXERCISES

SEPT	6	A BRIEF INTRODUCTION TO MINERALS
	11	2-D SYMMETRY AND PLANE GROUPS
	13	POINT GROUPS WITH CRYSTALS AND WOODEN BLOCKS
	18	MILLER INDICES WITH WOODEN BLOCKS
	20	EXPLORING XL MORPHOLOGY WITH THE COMPUTER (“SHAPE”)
	25	MINERALOGY AND THE INTERNET (COMPUTER EXERCISE)
	27	PACKING OF SPHERES, SYMMETRY IN 3-D
OCT	2	DENSITY-COMPOSITION-HARDNESS RELATIONSHIPS
	4	LECTURE AND LAB: MINERAL CHEMISTRY/PROBE FIELD TRIP
	9	DETERMINATIVE MINERALOGY
	11	HAND SPECIMENS I: NATIVE ELEMENTS, OXIDES, HYDROXIDES, HALIDES
	16	HAND SPECIMENS II: SULFIDES AND SULFOSALTS
	18	HAND SPECIMENS III: CARBONATES, SULFATES, BORATES, TUNGSTATES, ETC.
	23	X-RAY DIFFRACTION METHODS
	25	UNKNOWN IDENTIFICATION WITH X-RAY DIFFRACTION/S.E.M. TOUR
	30	NON-SILICATE HAND SPECIMEN MINERAL QUIZ
NOV	1	HAND SPECIMENS IV: NESO-, SORO-, CYCLO-SILICATE MINERALS
	6	HAND SPECIMENS V: CHAIN AND SHEET SILICATE MINERALS
	8	HAND SPECIMENS VI: TECTO-SILICATES AND MINERALS IN ROCKS
	13	SILICATE HAND SPECIMEN MINERAL QUIZ
	15	INTRODUCTION TO THE PETROGRAPHIC MICROSCOPE
	20	REFRACTIVE INDICES IN ISOTROPIC SUBSTANCES
	22	UNIAXIAL OPTICS: DOUBLE REFRACTION IN CALCITE, REFRACTIVE INDICES
DEC	27	UNIAXIAL ORTHOSCOPIC PROPERTIES
	29	UNIAXIAL MINERALS: INTERFERENCE FIGURES AND SIGN TESTS
	4	BIAXIAL MINERALS
	6	MORE BIAXIAL MINERAL TECHNIQUES