

GEOSCIENCES 213 - MINERALOGY - FALL 2005

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: Dolores van der Kolk
Mariah Tilman 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 2005

SCHEDULE OF LECTURES & READING ASSIGNMENTS

Lecture Topics

Reading Assignment*

SYMMETRY AND CRYSTALLOGRAPHY

SEPT	7	Introduction, basic symmetry elements	MMS 1-18, 170-181
	12	Combination of symmetry elements, plane groups MMS 181- 189	14
		Point groups & crystal systems	MMS 189-197; 251-276
	19	Forms, zones, & Miller indices	MMS 197-213
	21	Lattices & space groups	MMS 213-239; 276-288

CRYSTAL CHEMISTRY

	26	Atoms & molecules & bonding in minerals	MMS 17-64; CC 183-219
	28	Radius ratios, closest packing, coordination	MMS 64-80; CC 221-258
OCT	3	MIDTERM EXAM #1	
	5	Crystal structure types	MMS 80-103

DESCRIPTIVE MINERAL CLASSIFICATION & DETERMINATIVE TECHNIQUES

	10	Systematic mineral identification	MMS 134-142; 333-335
	12	Non-silicates I	MMS 335-370
	17	Non-silicates II	MMS 371-402
	19	Non-silicates III	MMS 404-440
	24	X-ray diffraction applications	MMS 321-331
	26	X-ray diffraction theory	MMS 309-321, CCC 454-458
	31	Silicate mineral structures (overview)	MMS 441-490; CCC 258-271
NOV	2	Silicate minerals I	MMS 491-514
	7	Silicate Minerals II	MMS 514-543
	9	Silicate Minerals III	MMS 543-562
	14	MIDTERM EXAM #2	

OPTICAL MINERALOGY

NOV	16	Introduction to optics, polarization	N 3-24; MMS 290-298
	21	Refractive index, isotropic materials	N 25-36
	23	Uniaxial minerals I: indicatrix theory	N 37-65
	28	Uniaxial minerals II: Birefringence	MMS 298-303
	30	Uniaxial interference phenomena	N 65-75
DEC	5	Conoscopic methods for uniaxial minerals	MMS 303-309
	7	Biaxial minerals I: indicatrix theory	N 77-104
	12	Biaxial minerals II: interference figures	N 104-117

FINAL LECTURE EXAM: Friday, 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 7 A BRIEF INTRODUCTION TO MINERALS

- 12 2-D SYMMETRY AND PLANE GROUPS
- 14 POINT GROUPS WITH CRYSTALS AND WOODEN BLOCKS
- 19 MILLER INDICES WITH WOODEN BLOCKS
- 21 EXPLORING XL MORPHOLOGY WITH THE COMPUTER (“SHAPE”)
- 26 MINERALOGY AND THE INTERNET (COMPUTER EXERCISE)
- 28 PACKING OF SPHERES, SYMMETRY IN 3-D

OCT 3 DENSITY-COMPOSITION-HARDNESS RELATIONSHIPS 5 LECTURE AND LAB: MINERAL CHEMISTRY/PROBE FIELD TRIP 10 DETERMINATIVE MINERALOGY

12 HAND SPECIMENS I: NATIVE ELEMENTS, OXIDES, HYDROXIDES,
HALIDES

17 HAND SPECIMENS II: SULFIDES AND SULFOSALTS 19

HAND SPECIMENS III: CARBONATES, SULFATES, BORATES,
TUNGSTATES, ETC.

24 X-RAY DIFFRACTION METHODS

26 UNKNOWN IDENTIFICATION WITH X-RAY DIFFRACTION/S.E.M. TOUR

31 NON-SILICATE HAND SPECIMEN MINERAL QUIZ

NOV 2 HAND SPECIMENS IV: NESO-, SORO-, CYCLO-SILICATE MINERALS

7 HAND SPECIMENS V: CHAIN AND SHEET SILICATE MINERALS

9 HAND SPECIMENS VI: TECTO-SILICATES AND MINERALS IN ROCKS

14 SILICATE HAND SPECIMEN MINERAL QUIZ

16 INTRODUCTION TO THE PETROGRAPHIC MICROSCOPE 21

REFRACTIVE INDICES IN ISOTROPIC SUBSTANCES 23

UNIAXIAL OPTICS: DOUBLE REFRACTION IN CALCITE, REFRACTIVE
INDICES

DEC 28 UNIAXIAL ORTHOSCOPIC PROPERTIES

30 UNIAXIAL MINERALS: INTERFERENCE FIGURES AND SIGN TESTS

5 BIAXIAL MINERALS