GEOLOGY 420 / 620 (3 cr) and 421/621 Lab (1 cr) -- MINERALOGY FALL 2023

DEPARTMENT OF EARTH, ENVIRONMENTAL, AND GEOSPATIAL SCIENCES, NORTH DAKOTA STATE UNIVERSITY

COURSE INFORMATION AND SCHEDULE VERSION 2023-08-21

Time:	Tuesday and Thursday, 12:30 pm - 1:45 pm
Instructor:	B. Saini-Eidukat, office 208 Sugihara Hall
	701-231-8785, bernhardt.sainieiduk@ndsu.edu
Office hours:	Tuesday, 2:00 - 4:00 pm or by appointment
Text:	C. Klein and B. Dutrow, Manual of Mineral Science, 23rd Edition, Wiley
Web Site:	www.ndsu.edu/pubweb/~sainieid/min/
Bulletin Description:	Crystal forms, crystal chemistry, and formation of non-silicate and silicate minerals
-	Recommended prerequisites: CHEM 122 or 151.

This course provides an introduction to mineralogy. We will examine minerals from crystallographic, chemical, physical and thermodynamic points of view. We will learn how to identify and classify minerals, and how to measure their properties using a variety of hands-on methods including X-ray diffraction. We will apply our knowledge by analyzing scientific literature on mineralogy and identifying unknown materials. We will learn from a combination of lectures, in-class exercises and discussion, homework assignments, and a term project.

COURS	SE SCHEI	DULE:	
Т	Aug 22	Introduction; Physical Properties of Minerals	Ch. 1 & 2; p. 113; p. 217 - 234
W	Aug 23	Lab 1 – Physical properties of minerals	Ch. 2
Crysta	llography	and X-Ray Diffraction Methods in Mineralogy	
Th	Aug 24	Symmetry Operations, Crystal Systems, Bravais Lattices	Ch. 6; p. 184; Fig. 7.17; Fig. 9.31
Т	Aug 29	Crystal Morphology, Principal Directions, Translational Symmetry; Plane Groups (Lab)	Ch. 6 Ch. 7
W	Aug 30	Lab 2 – Symmetry and crystal systems	Ch. 6, 7, portion of 9
Th	Aug 31	Miller Indices, Principle Directions	Ch. 6 and 7
т	Sep 5	Point Groups	Ch. 6
W	Sep 6	Lab 3 – Crystal classes and forms	Ch. 6 - 9
Th	Sep 7	Stereographic Projection, Cubic Point Groups	Ch. 6
т	Sep 12	Black Hills Geology Field Course – no class	
W	Sep 13	Black Hills Geology Field Course – no class	
Th	Sep 14	Black Hills Geology Field Course – no class	
т	Sep 19	Space Groups	Ch. 9, p. 208-216
W	Sep 20	Lab 5 – X-Ray diffraction	Ch. 14, p. 307-321
Th	Sep 21	X-Ray Diffraction	Ch. 14, p. 307-321
т	Sep 26	Lecture Exam 1	Ch 1, 2, 6-9
W	Sep 27	Lab 5 – X-Ray diffraction	
Crysta	l and Mine	eral Chemistry	
Th	Sep 28	Bonding; Coordination	Ch. 3, p. 46-65;
			Cii. 4, p. 00-79
Т	Oct 3	Chemical Compositions of Minerals	Ch. 5
W	Oct 4	Lab 6 – Elements and sulfides	Ch. 15
Th	Oct 5	Calculation of Mineral Formulas	Ch. 5, p. 96-104
т	Oct 10	Graphical Representation	Ch. 5, p. 104-108
W	Oct 11	Lab 7 – Oxides, Hydroxides, and Halides	Ch. 16
Th	Oct 12	Substitution; Compatibility Diagrams	Ch. 11, p. 257-262
т	Oct 17	Chemical Analytical Techniques	Ch. 14, p. 321-330

Systematic Mineralogy

W Th	Oct 18 Oct 19	Lab 8: Carbonates, Sulfates, other -ates Lecture Exam 2	
T Oct 24 W Oct 25 Th Oct 26	Oct 24	Intro to Silicate Mineralogy	Ch. 18, p. 434-438
	Nesosilicates	p. 438-441; 484-498	
T W	Oct 31 Nov 1	Sorosilicates, Cyclosilicates	p. 441-446; 498-505
Th Nov 2	Inosilicates – Single Chain	p. 446-452; 505-513	
T W	Nov 7 Nov 8	Inosilicates – Double Chain Lab 10: Inosilicates, Phyliosilicates	p. 452-456; 514-519
Th Nov 9	Asbestos	p. 516; 462-463	
T W	Nov 14 Nov 15	Phyllosilicates; Clay Mineralogy Lab 11: Clay Mineralogy	p. 456-467; 519-534
Th	Nov 16	Tectosilicates	p. 467-482; 534-553
T W Th	Nov 21 Nov 22 Nov 23	Tectosilicates; Lab 12, Tectosilicates No Class - Thanksgiving Day Holiday No Class - Thanksgiving Day Holiday	p. 467-482; 534-553
T W	Nov 28 Nov 29	Silica Minerals Lab 12: Tectosilicates	p. 467-470; 534-539
Th Nov 30	Feldspathoids; Feldspars -Wikipedia entry due	p. 470-477; 539-549	
T W	Dec 5 Dec 6	Feldspars No Lab	p. 470-477; 539-549
Th (Sched	Dec 7 Jule and E	Zeolites xam dates subject to change)	p. 477-482; 549-553

Tue, Dec 12, 10:30 am. Lab Exam 2 (covers labs 8 – 12) Fri, Dec 15, 8:00 am. Lecture Exam 3

INTENDED STUDENT OUTCOMES:

- · To be able to identify common rock forming minerals
- To understand the Earth processes that form minerals
- To understand chemical, physical, and crystallographic properties of minerals
- To understand mineral classification schemes
- To be familiar with analytical tools such as X-ray diffraction and electron microprobe analysis
- To analyze and discuss scientific literature on the topic of mineralogy

EXAMINATIONS AND GRADING:

Lecture (420 / 620) grading is based on four exams (short answer, problem solving), several quizzes, a few homework assignments, and the Wikipedia project.

In addition, graduate students are required to submit a term paper based on an independent literature research project, the topic of which will be agreed upon with the instructor.

Exams 1-3	70%
Quizzes, homework	20%
Wikipedia / term project	10%

Lab (421 / 621) grading is based on laboratory assignments and three exams (short answer, problem solving, identification). In addition, graduate students are required to carry out an independent project.

Exams 1, 2	50%
Lab assignments	50%

The final letter grade will be assigned based on the following table, unless the class average deviates significantly from 75%. In the latter case, a "curve" will be applied.

A = 90-100; B = 80-89; C = 70 - 79; D = 60-69; F = <60

"Borderline" cases will be judged individually, based on grade improvement, demonstrated effort, class participation, etc.

SPECIAL NEEDS: Any students with disabilities or other special needs, who require accommodations in this course are invited to share concerns or requests with the instructor and contact the Disability Services Office as soon as possible.

ACADEMIC RESPONSIBILITY: The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

This document subject to change.