Course Syllabus
Earth Materials (GLY 205)
University at Buffalo

Instructor: Dr. James Boyle
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Lab Instructor: Meredith Cole
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Lectures: MWF 11:30AM-12:20PM**,** Natural Sciences Complex 218
Labs: Tu 5:30-7:59PM & W 6:00-8:30PM, Cooke 15
Meredith Cole Student Hours: 3:30-5:30PM Tuesday

Dr. Boyle Student Hours: Tu/Th 10:00AM-12:00PM, or by appointment
Student Hours Zoom Room
https://buffalo.zoom.us/j/4027616352?pwd=NHcreUErRFFCVzlTNVZBZ0FGYmp2UT09

With COVID-19 continuing to spread throughout the country setting strict expectations seems like wishful thinking at best. All I can ask at this time is that everybody follow the UB and New York State health guidelines and remember that those rules are to protect others as well as yourself.

Public Health Compliance in Classroom setting: As indicated in the Student Compliance Policy for COVID-19 Public Health Behavior Expectations (https://www.buffalo.edu/studentlife/who-we-are/departments/conduct/coronavirus-student-compliance-policy.html), in our classroom you are required to:

1. Obtain and wear masks/face coverings in campus public spaces, including campus outdoor spaces.
2. Maintain proper physical distancing in public spaces and must stay 6 feet apart from one another.
3. Stay home if you are sick.
4. Abide by New York State, federal and Center for Disease Control and Prevention (CDC) travel restrictions and precautionary quarantines.
5. Follow campus and public health directives for isolation or quarantine.
6. Should you need to miss class due to illness, isolation or quarantine, you are required to notify the course instructor and make arrangements to complete missed work.
7. You are responsible for following any additional directives in settings such as labs, clinical environments etc.

Students who are not complying with the public health behavior expectations will be asked to comply. Should the non-compliant behavior continue, course instructors are authorized to ask the student to leave the classroom. Non-compliant students may also be referred to the Office of Health Promotion to participate in an online public health class to better educate them on the importance of these public health directives for the entire community.

Discord Server: In an attempt to reduce the difficulty of communicating while maintaining social distancing, wearing masks, and the strong possibility that some people might be unable to attend some lectures in person we will be using a discord server for the course [server name = GLY205_UB_Fall2020]. I will provide a link to the server at the start of the course.

Course Description: Earth Materials will explore the chemical makeup and physical properties of the Earth and how they influence everything from engineering decisions to oil & gas exploration. Topics will include minerology, rock-forming environments, and practical applications of the material to economic resource extraction.

Course Objectives and Learning Outcomes: The purpose of this course is to provide a practical background knowledge of how to identify rocks and their constituent minerals from field samples and to infer the geological history of those samples.
In particular we will focus on….

1) Understanding the most common set of minerals and their relationships to geological settings
2) The ability to use chemical and mineralogical data to reconstruct past events in Earth's history
3) The impact of different minerals/rocks on public safety (volcanoes, debris flows) and economics (engineering, mineral extraction).

Desired Learning Outcomes:

TOPIC	LEARNING OUTCOMES	OUTCOME ASSESSMENT
Major rock forming minerals	Understand the main groups of minerals, identify and know the composition of major rock forming minerals in hand samples and thin sections	Exams, in-class exercises, quizzes, lab exercises
Classification, diversity, and processes of igneous rocks	• Understand composition and classification of igneous rocks • Understand the basic principles of magma evolution • Understand the main igneous environments	Exams, in-class exercises, quizzes, lab exercises
Classification, diversity, and origins of sediments and sedimentary rocks	• Identify and explain the types of sedimentary deposits and rocks • Understand the main depositional environments for clastic and "chemical" sediments/rocks and organic deposits • Understand the basic processes by which sediments become rocks	Exams, in-class exercises, quizzes, lab exercises
Classification, composition, and origins of metamorphic rocks	• Identify and explain the main types of metamorphic rocks • Basic understanding of metamorphic settings and processes	Exams, in-class exercises, quizzes, lab exercises
Mechanical properties of Earth materials	• Understand forces and stresses that operate in the Earth • Understand principles of elastic, ductile, & brittle failure deformation	Exams, in-class exercises, quizzes, lab exercises
Transport properties of Earth	• Have a basic understanding of	Exams, in-class exercises,

materials, including heat, flow of, and flow through the materials	heat and heat transfer processes in the Earth • Have a basic understanding of rheology of Earth materials and how they are measured • Understand the basic concepts of porosity, permeability of Earth materials, how they are measured, & how they apply to spread of contaminants	quizzes, lab exercises
Applications of Earth materials, including industrial uses, ores, petroleum, and extraction basic engineering aspects	• General overview of industrial uses of Earth materials • General overview of application of Earth material properties to practical problems including ore and hydrocarbon extraction	Exams, in-class exercises, quizzes, lab exercises

Suggested Text: There is no required textbook for the course. However, most of the material will be drawn from "Earth Materials: introduction to mineralogy and petrology" by Cornelis Klein & Anthony Philpotts 2017, ISBN: 978-1-316-608-852.

Additional required material (for lab):
Hand lens (loupe). For example: HTS 203A0 Chrome Triplet Jeweler's Loupe (anything between 10x and 30x is fine, prices <$15). This will be needed for future geology courses as well.

Means of Assessment: To succeed in this course you will need to do well in both the lecture and lab portions.

The specific details regarding grade distribution are as follows (and are subject to change):

Grade Points		Grade scale (%)			
Weekly Homework	200 points	A	94-99	C	74-77
Take-home Exams	400 points	A-	90-93	C-	70-73
Lab Assignments	400 points	B+	88-89	D+	68-69
		B	84-87	D	65-67
		B-	80-83	E	<65
		C+	78-79		

Assignments

Weekly Homework: There will be an assignment due on UBLearns by 11:59PM each Sunday. These will either be a series of short questions (mostly in the early part of the course) or short answers based on prompts after in-class activities and discussions. For those based on in-class discussions there will often be readings/lectures posted before class that you will be expected to have looked at before the class period. We will then break into smaller discussion groups in the discord server. I will be dropping the lowest two weekly homework scores at the end of the semester.

Take-home Exams: Traditional exams are not a realistic option this semester and frankly they are poor measures of whether learning has actually occurred. In their place we will have three take-home exams due throughout the semester (Sept. 28th, Oct. 30th, & Dec. 14th). Each of these take-home exams will be released two weeks before it is due and be **worth 133 points**. The exams will consist of a combination of short answer questions and data analyses on the topics currently being covered in class. You are allowed to use any resources at your disposal, including collaboration with your fellow students, but all work should be in your own words (i.e. no plagiarism).

Labs: Labs will be due at the start of the following week's lab but can usually be completed in the allotted lab time. There will also be a single projects due over the course of the semester. Your TA will cover this in more detail during the lab period.

Make-up Policy: Assignments for this course are built so that it is possible to complete the assignments outside of class. However, it will be much more difficult to complete the assignment if you are unable to participate in the class in real-time. In cases where students are unable to attend in person due to quarantine or other circumstances please let Dr. Boyle (for lectures) and/or Meredith Cole (for labs) know as soon as possible. We will make every effort to allow you to continue attending class virtually.

Academic Integrity: Academic integrity is a fundamental university value. Through the honest completion of academic work, students not only advance their educational objectives, they sustain the integrity of the university and facilitate the transmission of knowledge and culture based upon the generation of new and innovative ideas. The Undergraduate Academic Integrity Policy provides additional information about what UB considers to be academic dishonesty and the possible consequences for violating UB's policies on academic integrity. In particular, you should be sure that you are aware of what UB considers to be academic dishonesty and that you understand how to avoid academic dishonesty. If you are unsure about the meaning of any of this information please talk to me or your academic advisor about them and we will try to clarify our expectations.

Accessibility Resources: If you have any disability which requires reasonable accommodations to enable you to participate in this course, please contact the Office of Accessibility Resources, 25 Capen Hall, 645-2608, and also the instructor of this course. The Office of Accessibility Resources will provide you with information and review appropriate arrangements for reasonable accommodations.

Student Wellness: As a student you may experience a range of issues that can cause barriers to learning or reduce your ability to participate in daily activities. These might include strained relationships, anxiety, high levels of stress, alcohol/drug problems, feeling down, health concerns, or unwanted sexual experiences. Counseling, Health Services, and Health Promotion are here to help with these or other issues you may experience. You learn can more about these programs and services by contacting:

Counseling Services:	120 Richmond Quad (North Campus), phone 716-645-2720 202 Michael Hall (South Campus), phone: 716-829-5800
Health Services:	Michael Hall (South Campus), phone: 716- 829-3316
Health Promotion:	114 Student Union (North Campus), phone: 716- 645-2837

If you find yourself struggling with course-related issues, or any other issues regardless of the reason, please don't hesitate to contact me so I can help you resolve the difficulty or direct you to some other resource who can.

Lecture Schedule

Dates	Week	Monday	Wednesday	Friday
8/31-9/4	1	A	B	C
9/7-9/11	2	D	E	F
9/14-9/18	3	G	H	I
9/21-9/25	4	J	K	L
9/28-10/2	5	M	N	O
10/5-10/9	6	P	Q	R
10/12-10/16	6	S	T	U
10/19-10/23	7	V	W	X
10/26-10/30	8	Y	Z	AA
11/2-11/6	9	BB	CC	DD
11/9-11/13	10	EE	FF	GG
11/16-11/20	11	HH	II	JJ
11/23-11/27	12	KK	**No Class**	**No Class**
11/30-12/4	13	LL	MM	NN
12/7-12/11	14	OO	PP	QQ

A	Introduction and Preparedness Survey
B	Minerals - Physical Properties
C	Minerals - Bonding
D	Minerals - Packing, Coordination Number
E	Minerals - Symmetry & Point Groups
F	Minerals - Chemical Formulas
G	Silicates Types Intro
H	Silicates - Neosilicates, Sorosilicates, Cyclosilicates
I	Silicates - Phyllosilicates, Tectosilicates
J	Non Silicates - Carbonates & Native Elements
K	Non Silicates - Oxides & Sulfides
L	Igneous Rocks - Classification & Composition
M	Phase Diagrams I
N	Phase Diagrams II
O	Igneous Rocks - Melting & Diversification

P	Igneous Rocks - Physical Properties, extrusive & intrusive
Q	Igenous Rocks - Settings
R	Sedimentary Rocks - Classification & Characteristics
S	Weathering, Erosions, & Soils
T	Clastic (detrital) sediments & processes I
U	Diagenesis & Lithification I
V	Diagenesis & Lithification II
W	Metamorphic Rocks - Classification & Composition
X	Metamorphic Rocks - textures
Y	Metamorphic Facies & Settings
Z	Forces & Stresses in the Earth
AA	Elastic behavior, parameters, & how they are measured
BB	Inelastic deformation & Brittle Failure
CC	Heat & Heat Capacity
DD	Thermal Properties of Earth Materials

EE	Viscosity & Rheology
FF	Porosity & Permeability in Earth Materials
GG	Types of porous flow - water, vadose zone, & hydrocarbons
HH	Contaminant motion in porous media
II	Industrial geomaterials
JJ	Engineering aspects
KK	Ore Deposits Introduction
LL	Ore Deposit Formation I
MM	Ore Deposit Formation II
NN	Petroleum resources
OO	Petroleum extraction techniques
PP	Earth Materials & Society I
QQ	Earth Materials & Society II

Lab Schedule

	Lab Topic
1	Mineral Properties
2	Earth Materials
3	Sedimentary Minerals
4	Sedimentary Rocks - Clastic
5	Sedimentary Rocks - Chemical & Biogenic
6	Igneous Minerals
7	Igneous Rocks - Mafic
8	Igneous Rocks - Felsic
9	Metamorphic Minerals
10	Metamorphic Rocks - Low Grade Metamorphism
11	Metamorphic Rocks - Medium to High Grade Metamorphism
12	**Lab Exam**
13	Copper Porphyry
14	Petroleum Resources