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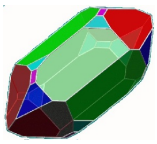

Course Syllabus
GEL 3050 Mineralogy & Optical Min.
Fall 2024

Sec.001 - 51343: T R 11:00 - 01:15pm

Course URL: http://college.earthscienceeducation.net/MIN/index.html

Professor
Uwe Richard Kackstaetter, Ph.D. (Dr. "K")
Office: SI2017

Office Hours
Face-to-Face: M W 10:00 - 11:00 AM & 12:30 - 2:00 PM;
By Appointment: T R 10:00 - 11:00 AM

Contact
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URL: http://college.earthscienceeducation.net

This syllabus may be modified at any time without prior notice.

Table of Contents

Course Description

This course examines minerals and rocks that make up the Earth's crust, including their origin, occurrence, and identification. In addition to the recognition of hand specimens, this course utilizes microchemical testing & simple assays, the petrographic microscope and X-ray crystallography to identify minerals and rocks. Furthermore, students will engage in assignments showing their application of acquired mineralogical & petrological skills. One or more self guided fieldtrips are essential for these course.

Credits: 4

Prerequisits: GEL 1010 **Highly Recommended:** Basic algebra concepts, some trig, basic chemistry

Course Outcomes

1. Distinguish between mineral specimens using a variety of physical & chemical techniques;
2. Collect date by using the XRD as a identification tool;
3. Interpret crystal classes and systems, as well as basic mineral chemistry;
4. Construct thin sections for rock & mineral identification;
5. Apply Bowen's reaction series to field work;
6. Evaluate thin sections using optical microscopy techniques in order to identify minerals
7. Formulate diagenetic processes of mineral formation from thin section observations and in hand sample

Outline of Course Content

Major Topics & Subtopics

I. Basic Crystallography
II. Geochemistry & Minerals
III. Physical & Chemical Methods for Mineral Identification
IV. XRD, portable XRF & mineral identification
V. Petrographic Microscopy & Thin Sections
VI. Igneous and Metamorphic mineral associations

Required Course Materials

1. Kackstaetter, U.R., 2019, 1st ed., Manual of Rapid Mineral Identification - Vol I, ISBN 978-0-9820580-2-2
2. Kackstaetter, U.R., 2021, Draft Edition, Manual of Rapid Mineral Identification - Vol II. Download as PDF
3. GEL1010 Rock / Mineral Lab kit. Use your old one from class or purchase through bookstore.
4. Mineralogy Analytical Lab Kit 1! Distributed by EAS after payment at https://commerce.cashnet.com/MSUDenverEM_EAS
5. Raith, M.M., Raase, P. & Reinhardt, J., 2011, Guide to Thin Section Microscopy. http://www.minsocam.org/msa/OpenAccess_publications/Guide_Thin_Sctn_Mcrscpy_index.html
6. Perkins, D., 2020, Mineralogy https://opengeology.org/Mineralogy/
7. Cell Phone w/ Apps: ☐Camera; ☐Magnetometer: http://www.rotoview.com/magnetometer.htm; ☐Radioactivity Counter: http://www.hotray-info.de/html/radioactivity.html
8. **iClicker** Cell Phone **App**. YOUR PARTICIPATION GRADE DEPENDS ON IT!
9. COMPUTER REQUIRED! Windows system preferred because of Mineralogy software not available for Mac
   a. Computer Software: Optical Mineral Microscope Simulator - PC only, most likely abandonware. Simulator of the Polarized Light Petrographic microscope that lets you investigate optical properties by orienting crystals of the 6 crystal systems. Also allows for simulating interference figures and plagioclase compositions from extinction angles.
   b. Computer Software: Brucker S1PXRF Software - PC only, ZIPed file. XRF analysis software for data files collected with our Handheld XRF Bruker unit
   c. Computer Software: Bragg's Equation Excel Calculator - PC/Mac. XLS file to calculate 2 Theta angles to d-spacings and visa versa from XRD data.
   d. Computer Software: PROFEX powder X-ray diffraction (XRD) software (FREE, open source)

Required iClicker Electronic Student Interaction Device App

The course requires you to download and install the iClicker Student Web App in order to participate in iClicker classroom activities on your laptop, tablet, or smartphone and receive your participation grade points for the course. While creating an iClicker student account and installing the app is free, being able to use it to earn participation credits for the course is NOT. Upon creating an account, students have a 14-day free trial period to use the iClicker student app to participate in class. Before that 14-day free trial period ends, students must purchase a subscription or access code in order to continue using the iClicker student app to join class sessions to participate in class. Cost for a 6-month access subscription is a nominal ~$16 as of this writing.

The subscription can be purchased through our MSU Denver bookstore or directly online from iClicker. Details can be found here. Please note that this is REQUIRED and **your grade depends on it**.

When you come to class, immediately login to your iClicker account for the course. Please use the MSU Denver secure password protected network. Do NOT use MSU Denver's Guest login, as this has a tendency to cause problems as you participate in the course.

Grading in GEL3050 Mineralogy

	Points
PREREQUISITES: PreReq Online Quiz (20 pts), PreReq MinID In-Class Quiz (20 pts), PreReq Online Lab Safety Quiz (20 pts)	60
In-class iClicker Question Participation Points	100
Timed Online Exams (50pts ea.): Crystallography EXAM; Mineral EXAM; Optical & XRD EXAM	150
Client Report LABS (50pts aa.): S.G. Lab, HM-Color-Luster-Streak Lab, Mag-Rad-Organo-UV Lab , Simple Chem & Chromatography Lab, Wet Geochemical Lab; XRF / XRD Lab; Optical Lab	350
MINERAL ID CLIENT PROJECT (Group Project)	150
Thin Section Assignment	50
Mineral ID Practical In-Class Lab Test	40
FINAL EXAM (electronic or paper, proctored, in-class)	100
TOTAL	**1000**

Final Grade Distribution Scale by Points

A+ > 970	A = 930-970	A- = 900-929
B+ = 870-899	B= 830-869	B- = 800-829
C+ = 770-799	C = 730-769	C- = 700-729
D+ = 670-699	D = 630-669	D- = 500-629
	F = ≤ 500 points	

Checking Your Course Grade

All exercises and grades processed through CANVAS. Please log in to see you grade updates as they become available.

Grading and Assessment Overview

THE FOLLOWING GRADE PENALTY APPLIES FOR LATE WORK -10% Day (autocalculated through CANVAS)

Assignment / Assessment	Delivery Method	Restrictions / Notices	Total Points
PreReq Online Quizzes [20 pts ea]	Canvas Online Quizzes pertaining to lecture block.	Timed. Can be ONLY ONCE. NO retakes.	40
1 In-Class Quiz	PreReq Quiz for Mineral ID from GEL1010	Timed. Can be ONLY ONCE. NO retakes.	20
PARTICIPATION In-class Pop-Quiz Questions + Module 1 Online Quiz	Pop lecture questions to be answered with cell phone app. Grade cumulative through semester.	Open Book, Notes, Resources Must be taken alone Can be taken ONLY ONCE Time limited, usually 60s / MC question	100
Lab & Lecture Exams	Canvas Online Exams covering the topics from hands on labs and lectures		150
EXAM Crystallography	ONLINE	Timed. Can be retaken ONCE with grades averaged	50
EXAM Minerals	ONLINE	Timed. Can be retaken ONCE with grades averaged	50
EXAM Optical & XRD	ONLINE	Timed. Can be retaken ONCE with grades averaged	50
PROFESSIONAL CLIENT MINERAL ID REPORT **GROUP PROJECT**	Mineral identification project for actual clients. Students will analyze a sample and compile a professional client report.	For exact details see the project rubric	150
Very Important Note: The **Final Version** of the Client Report must be completed and turned in by **Deadline**			
LABS for Client Report	**Individual Work**		350
Specific Gravity			50
HM, Color, Luster, Streak			50
Mag, Rad, Organo, UV	Mineral ID Labs w/ Report		50
Simple Chem & Flame Testing	**NOT group projects** NO retake possible.		50
Optical Mineral ID	However, feedback from labs		50
Wet Geochem Analysis	invaluable for the client report		50
Dry XRF & XRD Analysis			50
Mineral ID Practical In-Class Lab Test	ID of samples in the Mineralogy, Handsample, Optical, Mineral Kit	Closed Notes/ Book; Open Mineral ID kit, NO retake. *In-class!*	40
Thin Section Assignment	Practical Lab crafting a petrographic thin section to specifications	NO retake.	50
FINAL EXAM	In-class, timed, proctored	Closed Notes / Book - NO retakes	100
		TOTAL POINTS	**1000**

NOTE: Once submitted and graded with errors identified, you can NOT resubmit an assignment (e.g. lab) with your errors/omissions fixed for a better grade. Use the critique points to make your next assignment better. It is therefore imperative that you check ALL requirements, your layout, grammar, spelling, and graphics BEFORE you submit any assignment (e.g. lab)!

COURSE COMMUNICATION:

The official course communication is CANVAS and your **msudenver.edu** email. Make sure you know how to access both. Do NOT ignore any course messages coming through these two official channels. Your grade may depend on it!

Time Commitment

GEL3050 Mineralogy & Optical Mineralogy is a key core component course for geology majors and minors. At MSU Denver, this course is incredibly practical and skills based, teaching you hands-on methods and concepts, some being proprietary to this university, exclusively taught here. As such, this class requires a large time commitment from you outside of the scheduled hours. You will be granted access to the labs and facilities so you can work, study and research "after hours" so to speak. Easily plan 8 - 12 extra hours outside of our lecture blocks to spend in labs or at home working on your tasks and assignments for this class. This is usually in addition to test preparation and other study time requirements.

Note that these skills obtained should become part of your professional portfolio and resume. Thus you can list these skills under "experience" when you apply for a job in your chosen field.

Also, take ample opportunity of group study sessions which have proven to be helpful. These cross fertilizations and mini networking sessions have enhanced the knowledge bases of many students.

ELECTRONIC DEVICES:

This course requires access to a computer, the internet and a printer. If you do not own your personal electronics, our computer labs at MSU Denver can accommodate but you may then need to plan additional time for the course utilizing these resources. You will need a cell phone or tablet or laptop that you MUST bring to every class session. In the rare event that you do not own a cell phone, you must then purchase a physical remote iClicker to earn your participation points.

READY YOUR TECHNOLOGY:

As stated above, technology is REQUIRED for this class. Successful students make technology work for them. Please ready your technology for success at MSU Denver during your FIRST week in the course. These tasks involve getting your phone student-ready as well as your main school device, which is your tablet or computer you'd use to work on your courses. Students without a main device or in need of a printer can work in computer labs like Tivoli 225, Science 1058, Plaza 307, West 244, or Admin 260. Here is a checklist for your convenience.

- ☐ Know your single-sign-on username and password and password is a secure one
- ☐ Multifactor Authentification is set up (Authenticator app is on phone)
- ☐ Successfully log into campus WiFi, AurariaNet when on campus
- ☐ Canvas Student App on phone and main school device, logged in successfully, notifications turned on
- ☐ Optional: Canvas Calendar synced to phone and device calendars
- ☐ Outlook App on phone and main school device, logged in, Email appearing properly
- ☐ Teams App on phone and main school device, log in successful
- ☐ Word App on main school device
- ☐ PowerPoint App on main school device
- ☐ Student Hub added to phone homescreen
- ☐ Auraria police and text a tip added to phone contacts, Rave alert phone and email verified
- ☐ Note-taking method determined and supplies purchased
- ☐ Student ID card acquired for building access
- ☐ Optional: RTD app or ParkMobile app downloaded
- ☐ Create a folder on your phone for School Apps
- ☐ iClicker App purchased and installed w/ course login verified
- ☐ Lab Apps & Software as listed under Required Materials downloaded and installed
- ☐ Zotero Citation Manger Downloaded and Installed https://www.zotero.org/

USING AI (ARTIFICIAL INTELLIGENCE):

AI (Artificial Intelligence, such as ChatGPT, etc.) opens a world of opportunities in the geosciences and can alleviate time constraints and stress. Therefore **you are allowed to use AI** for labs, projects or other assignments, with the following addendum:

1. **Remember GIGO** (garbage in - garbage out) from the early days of computing. AI is not infallible! I have tried it and it DOES make mistakes or is missing the point. Therefore, don't trust AI blindly to do a good job. You must still carefully proof-read and edit your work. You are ultimately responsible for correct content, so be careful!!!!
2. **Cite any AI work**: If you use AI, the segments produced by it in your work must be cited, same as you would when including another author´s work. You will NOT lose points if AI is used extensively in your work as long as it is properly cited. Beware, that you can lose significant points if you try to hide that fact.
3. Be aware, that when using examples of your course work in portfolios **for future employment or graduate school, AI work may NOT be accepted**. Do NOT try to hide it. The same AI that generates your work is used in academia and employment offices to spot AI generated work with a high degree of accuracy. Note that AI generated resumes, for example, especially the electronic ones, may now be auto-rejected by the AI HR software of your anticipated employer / graduate school admissions. For these reasons it might be best NOT to use AI for every work project. Be selective where to employ AI in your schoolwork.
4. AI and Exams: **I do NOT allow AI as a source for taking open book online exams, obviously!** As for now, I use the honor system, but reserve the right for occasional spot checks. If abuse is detected, you are in danger of being charged with academic misconduct, which is a "can of worms" you do NOT want to open.

PARTICIPATION:

You are EXPECTED to attend lectures & labs and PAY ATTENTION in both. That means that your are on time in class / logged-in on our scheduled dates and are attentive by taking vigorous notes, NOT engaging in unrelated activities (e.g. using your electronic devices to play games, watch videos, check social media or email, etc.). Participation is tracked through the iClicker interactive student response system. Students earn daily points toward their participation grade by responding CORRECTLY to i-clicker questions randomly presented during lectures / labs.

Note: To earn FULL credits for a day you must a) answer ALL presented questions and b) answer ALL questions correctly. Incorrect answers will lower your score. Missing a question by not answering will lower your daily score significantly. You may use your notes. Be aware that the usual time limit for each iClicker question is ~60 seconds.
The iClicker device you have selected for the course must be brought with you throughout the semester to participate, either mobile (preferred), web, or iClicker remote. Download /purchase options: https://www.iclicker.com/students/
If you do not have / forget your chosen iClicker device for the day, you MUST contact the instructor **immediately** at the beginning of class to be instructed on how to receive at least partial credit (usually lowest iClicker score of the day minus 10%). Important Note: If you "forget" to contact me that very same day your participation score will be ZERO for the day because points can NOT be assigned retroactively !!!

ABSENCES:

Frankly, registering enrolling in this course is a serious commitment on your part akin to you taking employment. I expect from you the same professional courtesies that you would extend toward any employer. Absences that affect any course assessments (e.g. quizzes, exams, labs, Participation scores, etc.) and permit you to make-up missed work without penalty REQUIRES an external written 3rd party documentation (e.g. Doctor's Notes, hospital forms, therapist affidavit, accident report, etc.) that would verify the legitimacy of your extraneous circumstances, uniquely qualifying you for a personal due-date extension. It is vital that these documents show the EXACT dates. Without such documentation, late penalties or ZEROs will apply to your missed work.

Question: What about family celebrations, weddings, reunions, work conflicts or similar events? Since these events are usually known long in advance, you will need to let me know AT THE BEGINNING OF THE SEMESTER. I will still need an acceptable 3rd party verification, such as booking tickets, wedding announcements, employer's note, etc. showing your name and the date(s) of your anticipated absences.
Important Note: Since ALL assignments are available at the beginning of the semester and can be submitted ANY time

BEFORE the listed due dates, a last minute or after-the-fact "oh, I missed the due date" excuse is definitely NOT going to be accepted.

Note: Nothing in this policy shall require the instructor to reschedule classes, repeat lectures or other ungraded activities or provide ungraded individualized instruction solely for the benefit of students who are unable to attend regularly scheduled classes or activities.

Practical In-Class Mineral Identification Test:
This class will have an in-class, practical, Mineral ID lab exam. Here you will be required to identify minerals and certain characteristics from hand-samples, thin-sections, and from those minerals given to you in the GEL3050 kits. The test includes chemical, physical, optical, as well as other attributes of mineral identification and associated equipment.

LATE WORK:
Late Work grace period is 10 days beyond the assignment due date with a Late Penalty of -10% / day (which is automatically processed through the CANVAS grading system). After 10 days beyond the due date, late work will no longer be accepted and your assignment grade will drop to a PERMANENT "missing" or ZERO. Be intimately familiar with the CANVAS course calendar which lists due dates for your convenience thus being able to avoid late submittals. YOU DO NOT HAVE TO WAIT FOR THE DEADLINE TO TURN IN YOUR ASSIGNMENTS!!!. *Hint: Turn your work in early and there will be NO problems!*

Exceptions to Late Work Penalties - Occasionally students will asked if I can make an exception to the late work policy for a variety of reasons. Common ones are sudden work conflicts, uncooperative electronics or the internet, traveling, etc. In order to be true to "fairness for all" in the course, the only way I could grant such a request would be an external written 3rd party documentation that would verify the legitimacy of extraneous circumstances, uniquely qualifying you for a personal due-date extension. In short, if I grant you a due date exemption, I must necessarily grant the same privilege to every other student in the class. Without an external written documentation (e.g. Doctor's Notes, hospital forms, therapist affidavit, accident report, etc.) there is not much I can do without violating fairness and impartiality for all students.

For the occasional late work there is a generous 10-day grace period beyond the submittal deadline. While there is a late penalty, it usually does not affect the grade that much if the work is turned in ASAP after the deadline and the late submittals do NOT become a pattern. Think about it this way: Rushing an assessment, throwing it haphazardly together to turn in mediocre work by the deadline may give you a "D". Taking an extra day, doing a much better job and getting a 90% with a 10% late penalty for being a day late, will give you a final score of 81%, or a B-. Yes, and even if you are two days late your grade might still be higher than in the rushed and mediocre scenario by ONE WHOLE GRADE!!!! Note: Since everything is posted and available since day 1 of the semester, I usually recommend not to wait until the deadline for submittals but to turn work in early. This will most likely alleviate tons of stress and mitigate uncooperative electronics, sudden work / family conflicts, or similar consternation.

EXTRA CREDIT:
If you do an excellent, top-notch job, some extra credit (up to 10%) is build into assignments, labs, quizzes, and exams at the discretion of the instructor.

MINERAL ID PROFESSIONAL GROUP PROJECT
You may work in groups of up to 3 for this extensive project, but you can also do it by yourself if you do not want to work in a group. Everyone in the group will receive the same grade. Since this project requires professional interaction with individuals and businesses in the community, high standards are expected. In order to assure a professional criterion of the outcome, you should work with a partner.

GROUP PROJECT "FREELOADER" STATEMENT
Every student working in a group should pull his or her own weight. "Freeloaders" who just put their name in a group hoping to get a good grade while others do the work will be dropped from the group and receive a ZERO by consensus

of the remaining group members.
How are "Freeloaders" identified? Here are some common examples that will qualify you as a "Freeloader" and put you in danger of a ZERO:

- Hard to contact; Not replying to emails or phone calls from the group. Group members should document when they initiate contacts with other group members.
- Not initiating contacts themselves, but leaving it up to the group to contact them and then playing the "nobody contacted me" game when the assignment is due. Similarly, engaging in so called "last minute contacting frenzies", such as NO contact initiation all semester long, but then frantically sending out multiple contacts just before the deadline, claiming that this somehow qualifies as really having "tried" to contact the group.
- Not following through with assigned or selected tasks. This is especially cumbersome when done last minute close to the deadline. To help mitigate this behavior, groups should set internal deadlines and keep all group members accountable for completion of tasks.
- Turning in very shoddy or plagiarized work, the so called "last minute internet copiers". Cutting it close to deadlines, turning in something blatantly copied from the internet as "their" contribution. Not only does this behavior constitute academic fraud, group members should report such behavior immediately to the instructor.

YOU HAVE BEEN WARNED!
Note: Do not wait too long for a group member to "come through. Document any sign of "Freeloading" by a group member and contact the instructor early. Waiting too long neither serves you nor the "Freeloader" and jeopardizes everyone's grade.

"I have been kicked out of my group. Now what?"
You have two options: (1) Find another group that will let you work with them. (2) Do the work yourself! Working in a group is NOT required and you are allowed to do the work alone, by yourself. In either case, you will still be responsible for meeting ALL the associated group project deadlines!

THIN-SECTION
A hands on exercise producing a high quality geologic material thin section is required. If our thin section lab is closed, students will produce an alternate detrital grain mount section at home polished by hand to the appropriate thickness of 30µm (0.03 mm). Since this is a special skills set, your assignment will be graded by an industry professional.

GRADES & GRADING - Be aware of the following:
EXAMS: Online Exams can be retaken once and the scores will be averaged. You will get EXACTLY the same exam. On the retake you can copy the correct answers and focus on questions you did get wrong. (Note: Quizzes can be taken ONLY ONCE.) Unfortunately, some students guess widely on the first take and receive a low grade, hoping now to pull an incredible grade like an A the second time around. This philosophy is fundamentally flawed which can be shown by the following example:

> *You get a 28% [F] on the first take of the exam. Now you retake the test and pull an 82% [B]. Take the average (28% + 82%) ÷ 2 = 55%, you still have an F average on the exam.*

Therefore, invest time and study. A higher score the first time around means less wrong questions to make up and a greater probability of a much higher score during the retake. Which means a better chance of a passing grade in the course at the end.

Not Enough Time Problem for the Timed Assessments: A common student complaint is the time constriction when taking the online assessments. Since my exams / quizzes are open book / notes / internet, students will have a false sense of security, studying little and hoping to be able to conveniently look up the answers during the examination. Reality: There is truly not enough time **to leisurely look up each and every answer** and you will **FAIL THE EXAM** if you are planning on that. Instead, treat these examinations as if all of these were CLOSED book / notes / internet. Your accessible material for the test will now be a "security blanket" if you have to quickly reference an occasional answer choice here or there. Planning to look up the majority of answers during an exam is doomed to fail.

A Lower Grade on Exam Retakes: A few students have managed to get a lower score on a retake. How is this possible since you know which questions you got wrong? The answer is relatively simple and here are the possibilities:

1. You inadvertently copied the correct answers to the wrong question (e.g. question 2 to question 3, question 3 to question 4, and so forth) on the retake. Double check to make certain that you copy your correct answers to the right question.
2. Exams with "Multiple Response" questions can be tricky. In "Multiple Response" questions one or multiple responses could be correct. The computer gives you partial credit for correct responses mixed with missed or wrong responses. If you get more "Multiple Response" selections wrong on a retake than you did on the first take, your grade will be lower. Here is in example:

   On a "Multiple Response" question worth 2 points the correct answer choices would be A, C, D and F. During your first take you answered A, D and F, which would be 3 correct but one wrong, because you omitted it. The computer will give you credit for the correct responses (0.5 pts ea) but will subtract -0.5pts for the omitted correct response. Total credit for this answer would be (3x0.5pts) - 0.5pts = 1 out of 2pts. During the retake you answer the same question with choices B, D, E and F. Now you got 2 correct (2 x +0.5pts), 2 incorrect (2 x -0.5pts) and 2 missing (2 x -0.5pts) responses for a total of -1pt, which defaults to NO points received on your retake for this particular question.

THE FINAL EXAM:

A Final Exam will be administered in this class at our assigned Finals time and is only available during this time slot. This exam covers EVERYTHING from this course, including readings, labs and lectures. There is NO study guide provided by the instructor. However, the absolute best study guide you will have are your diligent notes taken during the course including the lecture(s), the lab(s), the book(s), and the lab manual / exercises. The exam is CLOSED resources (NO books, notes, labs. internet, etc. allowed) and has 2-hour time limit. All questions are multiple choice. It can be taken only ONCE and NO retakes are possible. This Final will be administered in a classroom, either as a paper copy with Scantron answer sheets, or electronically through CANVAS in the classroom on a computer, tablet or laptop!

Important Note: Since this is a FINAL exam, it can NOT be taken Late or Early! For any exception a discussion with the instructor is necessary and official verifiable documents must be presented support the desired exception.

ADVANCED LABORATORY KITS:

In this course you are required to purchase the Advanced Laboratory Kit. This unique kit is NOT solely for educational purposes but largely contains professional, portable field laboratory equipment to be used beyond this course in your career. Unfortunately, thus it comes with a price, the approximate cost of a "new" college textbook. But remember, this kit is a professional, complete, portable field laboratory which goes way beyond this course and is meant to last post graduation far into your profession. The lab kit contains chemicals that need your adherence to safety rules and regulation. The lab kit will not be distributed until you have passed a lab safety lecture and exam presented asynchronously by our departmental lab coordinator, Dr. Josh McGrath. (See CANVAS for details to access the video lectures) **Note: By enrolling in GEL3050 you are automatically accepting the following liability waiver:**

Lab Liability Waiver

1. All students participating in lab activities taught by the Department of Earth and Atmospheric Sciences should be aware that there is always an element of risk involved when working with equipment, machinery and/or chemicals. These risks involve serious injury or death, especially if safety protocols are not followed and/or equipment, machinery, and chemicals are misused. Instructors and/or Lab Personnel will use all reasonable precautions and students need to exercise prudent behavior during such activities, but even then there exists the possibility of an accident or injury. Since many of these activities are to be undertaken in the field and outside of the classroom without the direct supervision of an instructor, students must be alert and aware of possible risks and dangers when using chemicals, equipment, and/ or machinery with or without supervision.

2. Neither the University, nor the instructor, nor any assigned Lab Personnel shall be liable for any damages, including but not limited to injuries, death, loss of property or profits, or incidental, consequential, exemplary, special or other damages that may result from use of chemical, equipment, and/or machinery used in conjunction with or outside the framework of this college course. This condition also expands to the use of procedures and

formulations given in LAB texts.

3. The associated LAB instructions and described analytical procedures are intended for use by mature persons following the safety instructions precisely. Neither the author, nor the instructor, nor the University does accept liability or responsibility for any injury or damage to persons or property incurred by performing the experiments described in the LAB texts, nor for the content of any outside material referred to in class or manual, including linked websites.
4. EXPLICIT SAFETY RULES & REGULATIONS:
   a. You MUST wear Safety Goggles when working with chemicals or using equipment or machinery.
   b. You MUST read and follow instructions precisely.
   c. Do NOT misappropriate chemicals, equipment or machinery other than its intended and prescribed use.
   d. You must take care not to ingest, inhale, taste or otherwise orally contact chemicals or reactive products. NO FOOD / DRINK IN LAB AREA! You MUST wash hands after each experiment.
   e. Some tests may include open flames. You MUST take precautions in hair and clothing to avoid accidental or intentional contact of persons and property with flames and fire.
   f. You MUST take care when transporting equipment to avoid spillage and unintended contact with property and persons.
   g. Students who violate any of the above rules, policies and stipulations which are written in this document or implied through instruction and professional laboratory behavior or who fail to conform to directives from the instructor or lab personnel may be immediately dismissed from the course. They may also be subject to a failing grade, be required to withdraw from the course, and be subject to disciplinary action by the University.
   h. All participants MUST SIGN the following LIABILITY WAIVER.

In consideration of my being permitted to participate in this activity, I, by enrolling in GEL3050 hereby release and hold harmless: the Trustees of the Metropolitan State Universities of Denver, the Earth and Atmospheric Sciences Department, and respective employees, from all claims, losses, damages, or expenses because of property damage or personal or bodily injury incurred or caused by me during or in conjunction with the above mentioned activity or activities. By enrolling in GEL3050, I acknowledge that I fully understand the risk that is inherent with on and off campus laboratory procedures and/or equipment and/or machinery use. I also indicate by enrolling in the course that I will follow appropriate safety rules and regulations. Furthermore, I have fully read and understand the department policies and my liability and do accept the restrictions.

Incomplete (I) for the course:

Because of an extremely poor track record of students keeping their "I" or incomplete commitments, I will no longer give an "I" or incomplete. Facilitating an "I" contract is a substantial time commitment for faculty that spills over into the following semesters. And when students take an "I" lightly and do not complete the work, then facilitating the "I" contract with its tracking requirements is a total waste of my time. To put my decision against "I"s into perspective, only about 1% of my students that have requested and were granted an "I" have ever made an effort and completed the required work. I literally wasted countless hours for them in my misguided decision to help.

Therefore, please do NOT request an "I" unless there are indeed extraordinary, verifiable circumstances completely in line with the university ruling governing the "I" grade. Failing a class or poor performance because of missing assignments are definitely NOT university approved qualifiers for requesting an "I".

PASSING THE COURSE or FAILING THE COURSE?:

Without preaching a long sermon, here are my observations which can predict with a high degree of accuracy which students PASS and which ones FAIL the course. They are listed in order of importance:

1. **PASS** - watch my video From an F to an A ... no way! Being successful in College Classes 47:35
   a. Assignment completed on time BEFORE deadlines - NO late work or missing (most common reason for failure)
   b. Preparing for the Open Note Exams as if they were Closed Note Exams
   c. Good Attendance with Participation = **Note Taking!**

i. Rigorous Note Taking, not only on lectures

d. Good Study Habits and adequate study time - see *A Study Time Estimator* below

e. Participating in Study Groups

f. Being interested in the subject matter and excited about learning.

2. **FAIL** - watch my video From an F to an A ... no way! Being successful in College Classes 47:35

a. Multiple Late and/or Missing assignments (as few as 2) Probably the **#1 cause for failing the course**.

b. Poor attendance! There is a significant linear correlation between course grade and class attendance!

c. Taking NO or very poor notes! This is also a big one!

d. Disinterest or Boredom!

e. Other factors may contribute! Yet while not insignificant they appear to be less importance.

A STUDY TIME ESTIMATOR

Many students, especially first-time college students, are not aware that enrolling in classes is a serious time commitment way beyond the scheduled course lecture/lab times that your are supposed to attend. Here is a quick summary overview:

While the correlation between grades and the amount studied is obvious, students often have a hard time grasping **how much** is required OUTSIDE of the classroom. Worldwide university suggestions including MSU Denver propose 2 to 3 hours per week of student work outside of the classroom for every credit hour taken. Hence you can expect to spend an average of 8 to 12 additional hours per week outside of our lecture and lab time for this 4-credit course to earn or maintain an average passing grade. Criteria for the data given below assumes no or little prior knowledge of the subject matter as far as exams / quizzes are concerned. The data also assumes that the assignment complexity aligns with point values allotted (e.g., a 100 point exam should approximately require 10 times more effort and constructive engagement than a 10 point quiz in the same course). Be advised that the results are only an approximation of probabilities and are NOT guaranteed. However, they will provide you with a valuable guideline to gauge your time commitment!

In order to receive an AVERAGE GRADE or 75% on an assessment, a student should plan to invest the following minimum times OUTSIDE of the Lab and Class:

Assessment Value		Estimated Minimum Time Investment for 75% Grade
Assessment Value out of 1000 Total Semester Points	Assessment Value (Assignment Weighting) out of 100% of Final Grade	4 Credit Hour Course
10 Points	1 %	1.5 hrs
20 Points	2 %	3.0 hrs
50 Points	5 %	7.5 hrs
100 Points	10 %	15 hrs
150 Points	15 %	22.5 hrs

Those desiring a higher than average grade (>75%) should most likely plan on investing substantially **more** time than indicated.

The indicated time estimation relates best to quizzes and exams, while labs and other assignments may need more flexibility.

Studying means being engaged in the learning process without distraction: NO TV, NO music (headphones), NO conversation or cell phone / texting. It must involve complete concentration on the task at hand, otherwise the given time estimates easily double.

4 Credit Course - 100pt assignment (10%) - 15hrs total	
studying 2hrs per day	about 8 days
studying 3hrs per day	about 5 days
studying 4hrs per day	about 4 days

Students enrolled in a 4 credit hour course and needing to prepare for a 100 point exam (out of 1000 total course points) or 10% assignment weighting, should plan on 15 hrs study time to hope for a C grade. Since daily time is usually limited as indicated in the table the preparation for such a task will need to be stretched over several days.

It is easy to realize that the usual cramming the day or night before an exam will ultimately lead to poor grades and is doomed to fail. The above table summarizes days of study for time allotments per day for a 100 point (10% weight) assignment. Keep in mind that the table indicates a target grade of 75%. **A higher grade requires greater time commitment.**

EAS Social Media Information

Our departmental social media is a great way to get updates on national and international field trip opportunities; find interesting events, outings, and new courses; connect with alumni, professionals, and other students; and network for career, internships, scholarships and travel opportunities.

Facebook: https://www.facebook.com/MSUDenverEAS

Instagram: https://www.instagram.com/eas_msudenver/

LinkedIn: https://www.linkedin.com/company/msu-denver-department-of-earth-and-atmospheric-sciences

LinkedIn is the best way to connect with faculty, alumni, and current students for career opportunities

General Knowledge Prerequisites!

I require the following from students in GEL3050

It is assumed that you have acquired the following general knowledge skills in the sciences, language, and math through your education up to this point. It is the students FULL responsibility to make-up ANY deficiencies in these areas, preferably before enrolling in the course. I will NOT teach, lecture, or tutor any student in these basic High School skills and general knowledge subjects and no further instruction on the topics listed below will be given.

Basic Office Software
Know how to properly use and command MS Word, MS Powerpoint, MS Excel. Graphing with Excel, putting figures / pictures into Word documents, compiling a short presentation using PowerPoint are expected skills in my course.

English Language
Students should be able to write in short, clear, concise sentences when answering questions. Proper syntax becoming to a college student is expected. In many instances you will also be graded on professionalism which includes expressing yourself accordingly in writing. Unless otherwise instructed, always use third person when writing for the sciences. Usage of "I", "we", "my", "mine", "our", is uncommon in technical writing and needs to be avoided.

Basic Mathematical Operations
Students should be able to do the following mathematical operations without any further instructions:

- Round answer to significant digits. *(If you have problems with this, watch the video)*
- Doing unit conversions (e.g.; continental drift happens at about 5.5cm/yr. How fast would this be in mph?)
- Percent calculations (e.g.; you measure 2.58g/cm^3. The actual density is 2.65g/cm^3. What is your percent error?)
- Using units in ALL your operations (*I am real stickler about that!*)
- Solving equations for an unknown value; manipulating equations (basic Algebra)
- Basic Geometry: surface areas, volumes, circumferences, areas, angles
- Scientific notations (e.g.; 1.8×10^{-9}m/s) & scientific prefixes (milli-, mega-, terra-, micro-, etc.)
- Metric system & conversions within (µg, mg, g, kg, t, µm, mm, cm, m, km, m^2, km^2, cm^3, m^3, km^3)
- Weights & Measurements (Both American and Metric)
- Operating a scientific calculator (e.g.; know how to switch between degrees and radians, know how to use the arctangent function) $\theta°$=arctan(rise/run)

Graphing
You are required to be able to differentiate between bar, line and scatter graphs and know how and when each one needs to be constructed. Students should be able to hand-draw curved graphs without being sloppy. Be able to extrapolate values from any graph given, no matter the scale and type.

Physics
Students should be familiar with basic Newtonian laws of motion and understand terms such as velocity, acceleration, inertia, mass vs. weight, force, gravitational constants, kinetic energy, potential energy. Being able to work with the following basic physics equations is a must (Middle School Physics!):
$v=d/t$ $a=d/t^2$ $a=(v_f-v_i)/t$ $F=ma$ $I=mv$ $KE=½mv^2$ $PE=ma_g\Delta h$ $a_g=9.8m/s^2$ or $30ft/s^2$

Chemistry
Background in basic High School chemistry is essential. Students should know element names and associated symbols, how to read atomic weight and atomic mass from the periodic table, difference between covalent, ionic, metallic and hydrogen bonding, meaning of chemical formulas and subscripts. Students also need to understand pH and the difference between oxidizing and reducing environments. Furthermore, a working knowledge of solutions, solubility, mixtures, homogenous and heterogenous systems, and precipitation is a must.

Geography
Students should know basic physical geography, which includes the location of countries, major mountain ranges, and major rivers.

Drawing & Drafting
While the world is moving rapidly to electronic PC drafting, sketching results by hand is a essential skill in geology. Students must be able to use a drawing compass and a protractor. Sketching curves through data points is another required skill.

Citations
Students should know how to properly format and include citations in their work. I highly recommend the FREE citation tracker and database ZOTERO. It will automatically incorporate into your search engine and MSWord, can grab sources from the web at the click of a button and will make citing and creating correctly formatted references a breeze.

UNIVERSITY & COLLEGE OF LETTERS, ARTS, AND SCIENCES SYLLABUS STATEMENTS

A syllabus is a binding contractual document for any course and becomes the guiding legal document when enrolling in a course. Many policies, procedures and resources are university, college and / or department wide and thus are automatically an integral part of THIS SYLLABUS.

To read these additional policies, procedures and resources, log in to your course in CANVAS and look at the always up-to-date material listed under the

University Policies and Resources Module

for further information.

In case of disagreements between the student and the university faculty and staff, students are responsible for full knowledge of the provisions and regulations pertaining to all aspects of their attendance at MSU Denver, and should familiarize themselves with the policies found in the
University Policies and Resources Course Module

FYI:
For this course you are part of the
COLLEGE OF LETTERS, ARTS, AND SCIENCES (CLAS)
and the
DEPARTMENT OF EARTH & ATMOSPHERIC SCIENCES (EAS)