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Course Syllabus

GEL 4050 Intro to Igneous & Metamorphic Petrology

Spring 2025

sec. 001 - 33797: MW 10:00-12:15pm Rm: SI2012

COURSE(S) ADMINISTERED THROUGH THE **CANVAS** PLATFORM
Please log in through your MSU DENVER account!
Ancillary Course URL: http://college.earthscienceeducation.net/IMP/index.html

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

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Course Description

This course involves the study of the nature, composition, origin, and history of igneous and metamorphic rocks. Students will be introduced to the principles that govern the mineralogical and textural diagenesis of these systems and their unique mineral assemblages. Lab exercises in optical microscopy, geochemical data interpretation, graphical analysis and classification modalities are essential components. Prior working knowledge of polarized optical microscopy, mineralogy, and chemistry is prerequisite. Familiarity with programming simple electronic spreadsheet algorithms is highly recommended. A fieldtrip is required.

Prerequisits:

GEL 1010, GEL3050, CHE1800 or permission / override of instructor.

Highly Recommended Courses: Basic algebra concepts as well as some trig

Outline of Course Content

Major Topics & Subtopics

Igneous Rocks

1. Igneous Mineralogy & Bowen's Reaction Series
2. Identifying Igneous Rx - Macroscopic Samples
3. Igneous Rx Thin Section Analysis (PLM)
4. Whole Rock Geochemical Analysis
   a. CIPW Norm calculations
5. Evolution of Magmas / Minerals in Ign. Systems

Metamorphic Rocks

1. Metamorphic Mineralogy
2. P/T Diagrams
3. Identifying Metam. Rx – Macroscopic Samples
4. Metamorphic Rx Thin Section Analysis (PLM)
5. Metamorphic Rx Interpretation – Geobarometer & Geothermometer

Specific (Measurable) Student Behavioral Learning Objectives

Upon completion of the course the student should be able to:

1. Calculate CIPW normative igneous mineralogies from geochemical data
2. Evaluate igneous rock formative processes from observed mineral assemblages
3. Compare Bowen's Reaction Series to observed minerals
4. Construct the mineralogy of igneous rocks using multi-phase solid solution diagrams
5. Correctly estimate igneous classifications from hand samples and optical microscopy
6. Differentiate between various minerals, both in igneous and metamorphic samples
7. Diagram the mineral diagenesis in appropriate metamorphic P/T systems
8. Assess pressure and temperature conditions of metamorphic formations from observed mineralogies

Required Course Materials:

1. COMPUTER REQUIRED, PC preferred since many specialized software packets do NOT run on MAC!
2. Thin Section Kit + previous tools from GEL1010 and GEL3050!
3. Kackstaetter, U.R., 2019, 1st ed., Manual of Rapid Mineral Identification - Vol I, ISBN 978-0-9820580-2-2
4. Open Source / FREE Textooks:
   a. 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
   b. Johnson, E. & Liu, J.C., 2021, Introduction to Petrology https://open.umn.edu/opentextbooks/textbooks/1000
   c. Perkins, D., 2020, Mineralogy https://opengeology.org/Mineralogy/
5. COMPUTER REQUIRED! If you are in the market to purchase a computer, a Windows system is preferred because specific Geology software used in advanced courses is not always available for Mac
6. FREE Software:
   a. Zotero (https://www.zotero.org/) Citation Manager! Integrates with MSWord!
   b. GCD kit (http://www.gcdkit.org/) Geochemical Data processor for I; Zotero (https://www.zotero.org/)
   c. Optical Mineral Microscope Simulator - EXE file, PC only. Most likely abandonware. Simulator of the Polarized Light Petrographic microscope.
   d. Brucker S1PXRF Software - ZIP file, PC only. XRF software for data collected with Handheld XRF.
7. Download & Purchase the **iClicker** Cell Phone **App**. YOUR PARTICIPATION GRADE DEPENDS ON IT!
8. Field Notebook, Rockhammer, Camera

Ancillary Materials:

9. *If you can find it cheap/used, buy it:* Raymond, L.A. (2007). Petrology: The Study of Igneous, Sedimentary, and Metamorphic Rocks. 2nd ed., Illinois: Waveland Press
10. http://microckscopic.ro/ Online Atlas of Rocks and Minerals in thin section
11. Petrology Course Material from other universities (PPTs, text, labs, assignments, videos):
    a. http://www2.ess.ucla.edu/~ejohnson/ess103a/ess103a_2006.htm
    b. http://www.science.marshall.edu/elshazly/Igmet.htm
    c. https://www.whitman.edu/geology/winter/JDW_PetClass.htm
12. Virtual Petrographic Microscopes & Collections. Great for learning and practicing mineral ID in thin-sections:
    a. https://learn5.open.ac.uk/course/format/sciencelab/section.php?name=petro_vm Free account registration required! Mostly UK samples!
    b. https://www.virtualmicroscope.org/content/uk-virtual-microscope Mostly UK samples. They also have a virtual collection on meteorites and lunar and Martian rocks.
    c. https://planetearth.utsc.utoronto.ca/VirtualMic/ Large selection of interactive igneous & metamorphic thin sections as well as hand samples.
13. Other FREE Software:
    a. Java Virtual Petrographic Microscope http://jvpm.sourceforge.net/ Java based software, will run on almost any system with a Java runtime environment.
    b. https://college.earthscienceeducation.net/IMP/Software/Magma_Install.exe Most likely Abandonware, PC only. Magma is a simple utility that calculates silicate magma/lava classifications and properties from user-entered major-element compositions. Software instructions.
    c. Excel Spreadsheet for Normative Calculations by Kurt Hollocher: https://www.eoas.ubc.ca/courses/eosc321/NormCalculator.xls or https://www.geo.arizona.edu/tectonics/Ducea/tecpet/homework/norm.xls or https://ewalexander.com/wp-content/uploads/2021/02/cipw-norm-hollacher.xlsx

Required iClicker Electronic Device App for Face-to-Face classes

The F2F 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 GEL4050

	Max. Points
Participation: iClicker questions (130 pts) + 1 Online Lab Safety Quiz (20 pts)	150
LAB: Exsolution Modeling Lab	50
GROUP LAB: Crystallization of an M&M Magma Chamber	100
LAB: Volcanic Igneous Norm Calculation & ID Lab	50
PreReq.: ONLINE Chemistry, Math, Mineralogy & Optical Mineralogy Review Test	50
PreReq.: IN-CLASS Practical Mineral ID Exam	100
ONLINE EXAM: Igneous Rock	50
ONLINE EXAM: Metamorphic Rock	50
GROUP PRACTICAL: Applied Analytical Igneous Rocks	150
FIELD LECTURE & CLASS HANDOUT:	150
FINAL EXAM (electronic, but in-class)	100
TOTAL	**1000**

Final Grade Distribution Scale by Points

A+ > 970	**A = 930-969**	**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 are processed through CANVAS. Please log in to see your grade updates as they become available.

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!

ELECTRONIC DEVICES:
This course requires access to a computer, the internet and a printer. If you do not own 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 also 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

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. AI can and does "invent" data. Experts call this "AI hallucinations" and it is real. 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. 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. AI is used in academia and employment offices to spot work generated by AI with a high degree of accuracy. AI generated resumes, for example, especially electronic ones, can be auto-rejected by 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 and when to use AI.

4. AI and Exams: **Obviously, I do NOT allow AI as a source for taking open book online exams!** 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 serious "can of worms" you do NOT want to open. Think in terms of "felony" rather than a "misdemeanor".

PARTICIPATION:

You are EXPECTED to attend lectures & labs and PAY ATTENTION in both.

Face-to-Face (F2F) in-person or synchronous online classes: 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 daily course credits 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 45 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, the mentioned late penalties 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.

LATE WORK / MISSING ASSIGNMENTS:

There is a **GENEROUS Late Work grace period** after each due date which is 10 days. A Late Penalty of -10% / day will apply, though, which is automatically processed through the CANVAS grading system. After this generous 10 day grace period 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!*

IMPORTANT WARNING: Having a ZERO in any of your assignments will preclude you from ANY extra credit work. Thus you will no longer be eligible to earn extra credit. YOU HAVE BEEN WARNED!

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 your 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 80%, 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.

FIELD TRIP TO WYOMING:

There is a REQUIRED one day field excursion in this course. As an upper division course there are two course projects tied to this one day field trip.

A. GROUP PLUTONIC IGNEOUS PROJECT: This is a GROUP project and everyone in the group will receive the same grade. Your group will need to collect ONE igneous sample during the field trip, make assessments / measurements about it in the field and bring a representative sample back to the lab for thin section and geochemical analysis. Then a final product concerning your results and their interpretation will need to be submitted.

B. INDIVIDUAL FIELD LECTURE & HANDOUT: During the field trip we will see a great variety of plutonic igneous rocks traveling along Wyoming Highway 34. You will need to select one of these igneous rock units, create a handout for your fellow students and give a short field lecture (15 min max.) about your unit at a field stop you will determine.

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!

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.

EXAMS:

Some Exams are online, some take-home, some in-class. 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. 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.

A LOWER GRADE ON EXAM RETAKES: A few students have managed to get a lower score on a retake. While rare, it does happen. 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 copy the correct answers to the wrong question on the retake (e.g. question 2 to question 3, question 3 to question 4, and so forth). 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 MINUS -1pt, which defaults to NO points received on your retake for this particular question.

LAB TIME:

This class requires a lot of lab time if you want to be successful. While some time for lab exercises will be given during the assigned course time block, there will NEVER be enough time to complete ALL labs during the scheduled course time. You will need to complete the labs in many instances outside the course time on your own. In this Upper Division Course you will have lab access. Use it wisely!

LABORATORY KITS:

In this course you will need your Lab Kits from GEL1010. The ADVANCED LABORATORY KIT from GEL3050 is optional. You also will need to have passed a lab safety lecture and exam presented asynchronously by our departmental lab coordinator, Dr. Josh McGrath. (See CANVAS for details and to access the video lectures). **In addition, by enrolling in GEL4050 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?:

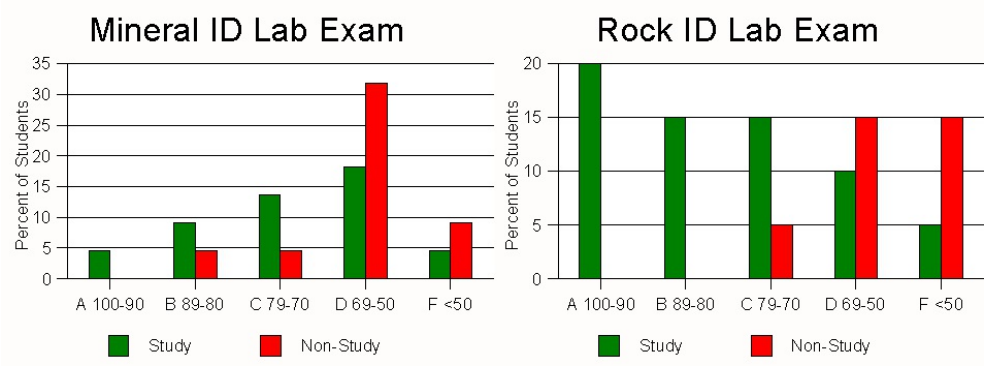
Without preaching a long sermon, here are my observations which can predict with a high degree of accuracy which students PASS and which ones FAIL the course. They are listed in order of importance:

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 (see below)
   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.

STUDY GROUPS:

Facilitating a Study Group is a great way to boost grades. You can start a study group yourself or be guided by a course Teaching Assistant, if one is assigned. Working seriously in a study group has a significant impact on grades, especially for practical in-class hands-on lab examinations. The following graphic shows real results of grade distributions in my introductory geolohy courses for both Lab Exams for students who participated in study groups (**green**) vs those who did not (**red**)



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!

It is assumed that you have acquired the following general knowledge skills in the sciences, language, and math through your current education and similar venues. 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. For this upper division course you should be familiar with basic Excel programming skills.

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.

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)