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Course Syllabus
**GEL 4970 Undergraduate Research in
Geology**
- A Senior Experience Course -
Spring 2025

sec. 001 - 31253: TR 11:00 - 13:15pm
One-on-One Student Consultations TBD

COURSE(S) ADMINISTERED THROUGH THE CANVAS PLATFORM

Please log in through your MSU DENVER account!

Ancillary Course URL: <http://college.earthscienceeducation.net/UR/index.html>

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Face-to-Face: M W 12:15 - 2:00 PM;
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This syllabus may be modified at any time without prior notice.

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Course Description

This senior-level capstone course focuses on independent research into a geological problem involving field and/or laboratory observations. A paper or poster of a student's research suitable for professional presentation is required (Senior Experience). Presentation at an undergraduate research conference or a paper publication is preferred. Students demonstrate broad entry-level geoscientific proficiency covering all program topics through a modified ASBOG (Association of State Boards of Geology) written exam.

Prerequisites:

MTH1210, GEL3050, senior standing or permission / override of instructor.

Highly Recommended Courses: 4 hrs GEL field coursework, 9 hrs upper-division GEL courses, or written permission of instructor; completion of all Level I and Level II General Studies course requirements

Outline of Course Content

Major Topics & Subtopics

- | | |
|---|--|
| <p>I. Introduction to Undergraduate Research</p> <p>A. Designing a research question</p> <p>B. Field / laboratory investigations and techniques</p> <p>C. Writing a scientific paper</p> <p>D. Getting published and presenting</p> <p>E. Working individually or with one or multiple partners</p> <p>II. Library Resources</p> <p>A. Library research</p> <p>B. Internet research</p> <p>C. Citations</p> <p>D. Plagiarism</p> <p>III. Project Prospectus</p> <p>A. Research proposal</p> <p>B. Research groups or individualized research?</p> <p>1. Lead researcher</p> <p>2. Contributions contract</p> <p>3. First author</p> <p>C. The timeline</p> <p>D. Budget, funding, grants</p> <p>IV. Lab & Field Equipment</p> <p>A. Overview of available instrumentation</p> <p>Instrument training</p> <p>Liability</p> | <p>V. Data Collection</p> <p>A. Sampling techniques</p> <p>B. Precision, accuracy and error - when to redo your analysis.</p> <p>C. Field time / Field visits</p> <p>VI. Data Evaluation and Compilation</p> <p>A. Nominal vs. Ordinal Data</p> <p>B. Simple Statistics</p> <p>C. Regression analysis</p> <p>D. Correlation analysis</p> <p>VII. Graphic Arts</p> <p>A. Beyond simple graphs</p> <p>B. Presentation aesthetics</p> <p>C. Map and poster making</p> <p>VIII. Oral / Written Presentation Preparation</p> <p>A. Writing an abstract</p> <p>B. Research posters</p> <p>C. Effective PowerPoints - beyond writing</p> <p>D. Paper rough drafts and formatting</p> <p>E. Writing and proof reading</p> <p>F. In-class "peer-review"</p> <p>IX. Project Presentations</p> <p>A. Presenting at an undergraduate conference</p> <p>1. Registration</p> <p>2. Abstracts and deadlines</p> <p>3. Attendance</p> <p>B. Submitting the paper</p> <p>1. Revisions</p> |
|---|--|

Specific (Measurable) Student Behavioral Learning Objectives

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

1. Select a focused and definite research project in the geosciences that can be concluded within a specified time frame.
2. Compose a project prospectus which includes a written investigation outline and timeline, hypotheses, methodology, budget if applicable, and expected contribution of each group member if applicable.

3. Plan and execute publication research relevant to the project using library resources.
4. Prepare and conduct detailed laboratory and/or field investigations utilizing multiple research specific equipment and techniques.
5. Evaluate collected data from investigations according to precision, accuracy, and standard statistical methods.
6. Construct useful figures, charts, graphs from collected data and results from associated computational analytical approaches.
7. Prepare a complete report of the research which includes introduction, methods, results, discussion, and conclusion, as well as any pertinent tabulated or graphic displays and submit the report in the correct format to a pertinent publication of choice (e.g.; science journal accepting student work).
8. Design a professional oral and/or poster presentation and present at a conference of choice (e.g.; Metropolitan State University of Denver Undergraduate Research Conference) and/or in class.

Required Course Materials:

Reading material is varied according to student selected, and therefore individualized research topics. Students are to perform a literature review as part of the course to generate their own reading materials list under the tutelage of the instructing professor.

Grading in GEL4970

	Max. Points
Undergraduate Research Contract (P/F)	10
10 MODULE PROGRESS REPORTS w/ Time Log (6pts ea)	60
2 Face-to-Face Research Consultations (20pts ea.)	40
RESEARCH QUESTION / TOPIC	40
Phase Ia: LITERATURE REVIEW	60
Phase Ib: PROSPECTUS	80
Phase IIb: TABLES & FIGURES	60
Phase III: 1 st Draft Presentation - Product Presentation to Class for Peer Review.	100
1 st Draft Presentation Grade from Peer Review	60
Peer Reviewer Grade for completion of Peer Reviews	50
Phase III: Final Product <i>Product to present</i> (check ONE): <input type="checkbox"/> Oral Presentation in front of an audience: PPT <input type="checkbox"/> Poster Presentation: Completed quality print large scale poster <input type="checkbox"/> Journal Paper: w/ abstract & figures, maps, photos, tables, etc.	250
Oral Defense (Video chat)	50
Modified ASBOG FINAL EXAM	140
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		

Course Communication & Course Grade:

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

Course Involvement & Time Commitment

GEL4070 is a senior capstone course and a requirement to present your knowledge, skills and problem solving abilities gained through your program training. This course is less lecture and more one-on-one professor-student consultation guiding you on your path to create a presentable undergraduate research product during the 15 short weeks of the course.

The credit hours for the course have been reduced to 3 aligning it with other senior capstone courses in the department. However, please note, that 3 credits do IN NO WAY reflect the work commitment for this course.

The more courses you have taken, the greater your research choices and abilities will be. Those who have already collected data and worked on their project BEFORE enrolling in the course will have an obvious advantage and will better mitigate their stress level and time commitment for the course. Even though we do not meet regularly as a class, this course requires a very large time commitment 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 12 weekly extra hours outside of our assigned lecture blocks to spend in labs, the field or at home working on your projects. This is usually in addition to the ASBOG test preparation.

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.

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 Authentication 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

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 unproctored 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”.

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. For F2F classes, recorded lectures may be available if you missed an in-class lecture.

Late Work / Missing Assignments:

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 be 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 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.

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".

MODULE REPORTS (60 pts): <http://college.earthscienceeducation.net/UR/URmodulereport.pdf>

During the course of the semester you will submit 10 module reports (6 pts ea.) addressing your week's activities, including highlights, accomplishments, breakthroughs and problems, drawbacks, glitches encountered during the execution of your project. A completed Time Log must also be compiled and attached every week. Complete according to instruction and submit through CANVAS by the deadline.

FACE-TO-FACE RESEARCH CONSULTATIONS (40 pts):

<https://college.earthscienceeducation.net/UR/URF2FConsult.pdf>

These two in-person research consultations (20 pts ea.) are to be scheduled by you at least two weeks apart, where progress and technical issues will be discussed. There is nothing to submit. Your instructor will grade each meeting as it occurs. There is no rescheduling of a botched meeting for a better grade.

UR CONTRACT (10 pts Pass/Fail): <http://college.earthscienceeducation.net/UR/URcontract.pdf>

Complete a SIGNED Undergraduate Research contract and submit by the deadline. This is a Pass / Fail assignment. If submitted by the deadline with all elements completed you get the points. If elements are missing or are incomplete you receive a ZERO. However, you are allowed to resubmit. Note that Late Penalties will apply if the resubmittal is past the deadline.

RESEARCH QUESTION (40 pts): <http://college.earthscienceeducation.net/UR/URresearchquestion.pdf>

The core idea or question around which you center your research. It is the heart of your project and needs to be well written and defined early on. Complete according to instruction and submit through CANVAS by the deadline.

PHASE IA: LITERATURE REVIEW (60 pts): <http://college.earthscienceeducation.net/UR/URLitreview.pdf>

Please download **Zotero**, a free, easy-to-use tool to help you collect, organize, cite, and share your research sources. Use **Zotero** to generate a complete list of possible sources to be used in your research. Do not forget maps, figures, photographs, software, and similar (e.g.; Google Earth w/ Geology kmz plug in). Complete according to instruction and submit through CANVAS in PDF format by the deadline.

PHASE IB: PROSPECTUS - Experimental / Lab / Fieldwork Design (80 pts):

<http://college.earthscienceeducation.net/UR/URprospectus.pdf>

A Research Proposal, Outline and “Sales Pitch” of your proposed project. It is the equivalent of a marketing or business plan in the world of finance. This includes a completed design of your anticipated lab and field work. Don’t forget simple things like lab access or materials list. Also transportation and lodging plans if applicable. Complete according to instruction and submit through CANVAS in PDF format by the deadline.

Note: This is a fairly involved assignment. Do NOT wait too long or procrastinate!

PHASE II: EXECUTING YOUR RESEARCH:

Much course time is devoted to your research, While NO formal lecture will be given during many of our meeting times, you should be ACTIVELY and CONSISTENTLY engaged in your research field and/or lab work. While you will not be graded on attendance and performance **do NOT, and I mean DO NOT, procrastinate!!!!** You MUST complete all your work by the end of the semester.

PHASE III: TABLES, FIGURES, EQUATIONS - Compiling your Results (60 pts):

<http://college.earthscienceeducation.net/UR/URtabfig.pdf>

Graphics and Data Presentation are the heart of any project. Your raw data can be much better interpreted through the use of visuals, such as graphs, charts and maps. Complete according to instruction and submit through CANVAS in PDF format by the deadline.

PHASE IIIA: FIRST PROJECT SUBMITTAL (100 pts):

<http://college.earthscienceeducation.net/UR/URproject.pdf>

Mandatory Submittal by Deadline! Submit the compilation of your paper, poster or power point through the CANVAS PLATFORM at the indicated date and present to your fellow students and instructor. You will receive feedback / critique and be graded by your instructor and selected PEER REVIEWER students.

Note: The majority of students select a **Poster Presentation** to showcase their research. We have the ability to print posters in our Earth Science department at MSU Denver FREE of charge (contact our Lab Coordinator). Standard Size is 48" w x 36" h. You can download a Template at <https://college.earthscienceeducation.net/UR/URPosterPresentationsTemplate-36x48.pptx>. Additional Templates and instructions are available from <https://www.posterpresentations.com/free-poster-templates.html>. Instructional videos on how to craft science research posters are available at <https://youtu.be/m02leV4gxE> and <https://youtu.be/WnhoIbfc0M>. For Poster Printing your final copy should be exported as a high quality PDF file which can also be uploaded to CANVAS.

PHASE IIIA: PEER REVIEWER (50 pts): <http://college.earthscienceeducation.net/UR/URPeerReviewer.pdf>

Mandatory Submittal! You are to complete a Peer Review for other students / groups in the course and you will be graded on the quality of your review according to the linked document above. Your reviews are graded according to your evidence of thought, involvement and constructive criticism.

PHASE IIIA: FIRST PROJECT SUBMITTAL PEER REVIEWER GRADE (60 pts):

There is nothing to submit or do on your part. This grade of your first draft will be applied based on the grade you have received from the Peer Reviewers assigned to your project.

PHASE IIIB: FINAL PRODUCT (250 pts):

<http://college.earthscienceeducation.net/UR/URproject.pdf>

Your final product will be graded by the instructor. By then you have hopefully included the suggestions from the PEER REVIEWERS and the INSTRUCTORS from the 1st Draft to improve your grade.

PHASE IIIB: ORAL DEFENSE (50 pts):

You will need to schedule a 1 on 1 meeting with the instructor close to or during finals week, after having completed your project. You will need to explain and defend your research during an oral interview. Therefore, you will need to schedule a virtual meeting with your instructor. You will need to answer / explain the following during this interview and you will be graded accordingly:

1. Summarize your project in your own words without looking at written material and highlight accomplishments
2. How has this UR project impacted your career, continuing education, or profession and how will you use it for future endeavors?
3. Science related questions specific to your project probing the understanding of your research!

FINAL - MODIFIED ASBOG FG EXAM (140 pts):

<https://college.earthscienceeducation.net/UR/URASBOG.pdf>

To prepare you for the Geology State board licensure exam (ASBOG FG: Association of State Boards of Geology - Fundamentals of Geology) a Final Exam based on the scope and content of the actual FG test will be given in the Senior Capstone course. This exam covers ALL of your geology education from all your courses and training and is not GEL4970 class specific.

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 Senior Course you will have lab access. Use it wisely!

LAB RULES:

ALL STUDENTS WORKING IN THE LAB MUST SIGN IN, STATE THE PURPOSE OF THEIR ACTIVITIES AND WEAR AN APPROPRIATE NAME BADGE IDENTIFYING YOUR LEGITIMACY TO BE IN THE LAB. Students must follow instructions of the Lab Assistants and are responsible for thoroughly cleaning their work space and lab equipment used after the completion of the lab exercise. **BE AWARE: LAB INFRACTIONS CONCERNING EQUIPMENT & CLEAN-UP CARRY MINUS POINTS FOR THE COURSE!** ALL students must read and sign 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, the undersigned 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. In filling out this form, 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. The undersigned also indicate with their signature that they 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.

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.

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/cm³. The actual density is 2.65g/cm³. 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.; 1.8×10⁻⁹m/s) & scientific prefixes (milli-, mega-, terra-, micro-, etc.)
- Metric system & conversions within (μg, mg, g, kg, t, μm, mm, cm, m, km, m², km², cm³, m³, km³)
- 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) $\theta^\circ = \arctan(\text{rise/run})$ *Warning: NO cell phone calculators are allowed!*

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!):

$$v=d/t \quad a=d/t^2 \quad a=(v_f-v_i)/t \quad F=ma \quad I=mv \quad KE=1/2mv^2 \quad PE=ma_g\Delta h \quad a_g=9.8m/s^2 \text{ or } 30ft/s^2$$

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)*