

University of Wyoming
COURSE SYLLABUS
GEOL 2120 – Quantitative Geo-methods
Spring 2021

Instructor Information:

Instructor: Dario Grana
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Office: Geology 223

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Office Hours: T-W-Th 2.00-3.00

Course Information:

Credit hours: 3

Dates: January 18, 2021 – May 4, 2021

Online course.

Prerequisites:

Level 5 in Math Placement Test OR 23 in Math ACT OR 600 in Math SAT.

Course Description:

The purpose of this course is to strengthen the quantitative skills of students in geosciences by reviewing basic concepts of trigonometry, linear algebra, precalculus, derivation and integration through applications to real datasets and problem sets. The course will give students insight into theory and applications of fundamental mathematical concepts commonly used in Geology, Geophysics, and Environmental Sciences. In this course, students will learn the basic theory of each topics and the quantitative tools for their applications to practical problem sets. This course fulfills the Quantitative Reasoning (Q) requirement of the 2015 University Studies Program, by providing the students the tools to reason and solve quantitative problems in geosciences applications. Students should demonstrate mathematical and logical skills needed to formulate, analyze, and interpret quantitative arguments in a variety of settings.

Objectives/Outcomes/Standards:

During the class students will learn the basic notions of mathematical modeling in geosciences. Students are expected at the end of the class to be able to apply basic mathematical tools of algebra, geometry, and calculus to modeling problems in Geology, Geophysics, and Environmental Sciences. The Learning Outcomes include:

- 1) Formulate, analyze, and interpret quantitative arguments in a variety of settings;*
- 2) Solve quantitative problems from a wide array of authentic contexts and everyday situations.*
- 3) Communicate arguments in a variety of formats (e.g., words, tables, graphs, mathematical equations).*

Text(s) and Readings:

- The instructor will distribute handouts in class

Course Requirements/Assignments:

The class includes 6 assignments. The class also includes a final of the duration of 2 hours.

Grading Standards:

- *Homework: 60%*
- *Final: 40%*

The final letter grade is given based on the numerical grade:

A	B	C	D	F
≥90	80-89	70-79	60-69	<60

Attendance/Participation Policy:

University sponsored absences are cleared through the Office of Student Life.

Course Outline:

- Review of basic linear algebra
 - Fractions
 - Example (density, porosity,...)
 - Vectors
 - Matrices
 - Basic operations
 - Examples (forces, stress, strain)
 - Equations
 - Unit conversions
- Review of pre-calculus:
 - Functions
 - Polynomials
 - Logarithm and exponential
 - Maximum and minimum
- Mathematical models
 - What is a model?
 - Why do we need a model?
- Numerical data and graphing
 - Histograms
 - Plot data y versus data x
 - Example: plot elevation in a 2D space
 - Example: plot elevation in a 3D space

- Plot datasets and models
- Linear regression
- Example: fit data with a straight line
- Computing averages
- Recap example: linear motion
- Trigonometry
 - Basic rules
 - Computing distances with trigonometry
 - Computing angles with trigonometry
 - Examples (structural geology, seismology, topography,...)
- Introduction to calculus
 - Rates
 - Computing rates
 - Plotting rates
 - Examples (velocity, tectonics, fluid flow,...)
 - Slopes
 - Example: topographic maps
 - Concept of derivative
 - Concept of integral

The instructor may make changes to the syllabus as the course proceeds. If necessary, these changes will be announced in class. Substantive changes made to the syllabus shall be communicated in writing to the students.

Classroom climate and conduct:

Classroom Behavior Policy: At all times, treat your presence in the classroom and your enrollment in this course as you would a job. Act professionally, arrive on time, pay attention, complete your work in a timely and professional manner, and treat all deadlines seriously. You will be respectful towards your classmates and instructor. Spirited debate and disagreement are to be expected in any classroom and all views will be heard fully, but at all times we will behave civilly and with respect towards one another. Personal attacks, offensive language, name-calling, and dismissive gestures are not warranted in a learning atmosphere. As the instructor, I have the right to dismiss you from the classroom, study sessions, electronic forums, and other areas where disruptive behavior occurs.

Classroom Statement on Diversity: The University of Wyoming values an educational environment that is diverse, equitable, and inclusive. The diversity that students and faculty bring to class, including age, country of origin, culture, disability, economic class, ethnicity, gender identity, immigration status, linguistic, political affiliation, race, religion, sexual orientation, veteran status, worldview, and other social and cultural diversity is valued, respected, and considered a resource for learning.

Academic Dishonesty Policies: Academic dishonesty will not be tolerated in this class. Cases of academic dishonesty will be treated in accordance with UW Regulation 2-114. The penalties for academic dishonesty can include, at my discretion, an "F" on an exam, an "F" on the class component exercise, and/or an "F" in the entire course. Academic dishonesty means anything that represents someone else's ideas as your own without attribution. It is intellectual theft – stealing - and includes (but is not limited to) unapproved assistance on examinations, plagiarism (use of any amount of another person's writings, blog posts, publications, and other materials without attributing that material to that person with citations), or fabrication of referenced

information. Facilitation of another person's academic dishonesty is also considered academic dishonesty and will be treated identically.

Duty to Report: UW faculty are committed to supporting students and upholding the University's non-discrimination policy. Under Title IX, discrimination based upon sex and gender is prohibited. If you experience an incident of sex- or gender-based discrimination, we encourage you to report it. While you may talk to a faculty member, understand that as a "Responsible Employee" of the University, the faculty member MUST report information you share about the incident to the university's Title IX Coordinator (you may choose whether you or anyone involved is identified by name). If you would like to speak with someone who may be able to afford you privacy or confidentiality, there are people who can meet with you. Faculty can help direct you or you may find info about UW policy and resources at <http://www.uwyo.edu/reportit>.

You do not have to go through the experience alone. Assistance and resources are available, and you are not required to make a formal complaint or participate in an investigation to access them. However, please be aware that I have some reporting requirements that are part of my job requirements at UW.

Learning Effectiveness Tools:

Substantive changes to syllabus: This syllabus is a guide. Circumstances may alter the reading and/or test schedules. You are required to check WyoCourses and your email at least once a week.

Disability Support: The University of Wyoming is committed to providing equitable access to learning opportunities for all students. If you have a disability, including but not limited to physical, learning, sensory or psychological disabilities, and would like to request accommodations in this course due to your disability, please register with and provide documentation of your disability as soon as possible to Disability Support Services (DSS), Room 128 Knight Hall. You may also contact DSS at (307) 766-3073 or udss@uwyo.edu. It is in the student's best interest to request accommodations within the first week of classes, understanding that accommodations are not retroactive. Visit the DSS website for more information at: www.uwyo.edu/udss.

Student Resources:

DISABILITY SUPPORT SERVICES: udss@uwyo.edu, 766-3073, 128 Knight Hall, www.uwyo.edu/udss

COUNSELING CENTER: uccstaff@uwyo.edu, 766-2187, 766-8989 (After hours), 341 Knight Hall, www.uwyo.edu/ucc

ACADEMIC AFFAIRS: 766-4286, 312 Old Main, www.uwyo.edu/acadaffairs

DEAN OF STUDENTS OFFICE: dos@uwyo.edu, 766-3296, 128 Knight Hall, www.uwyo.edu/dos

UW POLICE DEPARTMENT: uwpd@uwyo.edu, 766-5179, 1426 E Flint St, www.uwyo.edu/uwpc

STUDENT CODE OF CONDUCT WEBSITE: www.uwyo.edu/dos/conduct