

SYLLABUS

GEOC589, GEOL589, ME589, ME589D Advanced Topics—Geology and Economics of Industrial Minerals (3 credits)

Spring 2023

Room Headen 253
Tuesdays 4-7 PM

Instructor: Dr. Virginia T. McLemore

Office: Headen 268

Phone: 835-5521

E-mail: virginia.mclemore@nmt.edu

Office Hours: by appointment

Course Description: Industrial minerals and rocks are literally the building blocks of our way of life and they are an exceptionally diverse and vital group of raw materials that underpin almost all aspects of human activity, infrastructure, and standard of living. Industrial minerals and rocks are used in the manufacture of many products, from ceramics to plastics and refractories to paper. Although industrial minerals permeate every aspect of daily life, their presence and their role are typically invisible. A widely used definition of industrial minerals and rocks is “any rock, mineral, or other naturally occurring substance of economic value, exclusive of metal ores, mineral fuels, and gemstones: one of the non-metallics”. This class will explore the different commodities that are considered industrial rocks and minerals, from exploration, development, mining, processing, and marketing. Many critical minerals are also industrial minerals and we will include many of them in this course. Field trips to industrial mineral mines will be included.

A critical mineral is defined by Presidential Executive Order No. 13817 as “a mineral (1) identified to be a nonfuel mineral or mineral material essential to the economic and national security of the United States, (2) from a supply chain that is vulnerable to disruption, and (3) that serves an essential function in the manufacturing of a product, the absence of which would have substantial consequences for the U.S. economy or national security”. Critical minerals are mineral resources that are mostly imported into the U.S., are essential to our economy, and whose supply may be disrupted. Disruptions in supply chains can arise for any number of reasons, including natural disasters, labor strife, trade disputes, resource nationalism, conflict, and so on. Strategic minerals are commodities that are essential to the national defense, but are subject to potential supply disruptions. The list of critical and strategic minerals consists of, but is not limited to: rare earth elements (REE), lithium, platinum group elements (PGM), antimony, rhenium, beryllium, tantalum, cobalt, chromium, tin, tantalum, tellurium, niobium, tungsten, gallium, yttrium, bauxite, nickel, zinc and germanium.

Pre-requisites/Co-requisites: Introduction to Geology, Mineralogy

Course Learning Outcomes: Understand what industrial and critical minerals are, how to explore for them, how to market them, how to mine them and how to reclaim the mines.

Course Requirements:

Kogel, J.E, Trivedi, N.C., Barker, J.M., and Krukowski, S.T., 2006, ed., *Industrial Minerals and Rocks*, 7th edition: Society for Mining, Metallurgy, and Exploration, Littleton, Colorado—available online from SME at student price \$193 if you become a member online (use McLemore member #2142500 as recommendation) to get this price (save more \$ than membership costs plus you should all be members of SME anyway) NOTE: I also have this on CD for anyone not wanting to buy it.

McLemore, V.T. and Austin, G.S., 2017, *Industrial minerals and rocks*; *in* McLemore, V.T., Timmons, S., and Wilks, M., eds., *Energy and Mineral deposits in New Mexico: New Mexico Bureau of Geology and Mineral Resources Memoir 50 and New Mexico Geological Society Special Publication 13*, 128 p.—available at the Bureau bookstore

Grade criteria:

Exams: Midterm and Final—both are take home exams that will emphasize short answer and essay questions.

Term project—you are required to do a research project that will involve some original work. You can work on this as a team. You can use a portion of your thesis (even if not related to industrial minerals).

Safety—each class will start with a safety share, prepared by one of you. Everyone will do 2 safety shares. Powerpoint or short discussion.

Discussion—Each student will research papers on Industrial Minerals and select one to be read prior to class by everyone. You will lead the discussion on the paper. A presentation is required.

Those that attend SME will be required to discuss 1 or more talks they went to. If you did not go to SME, come see me for your assignment.

Field trips—there will be 1 or more field trips and a field report on each trip will be required. Accommodations will be made if you cannot make the field trips.

Link to lectures and assignments: <https://geoinfo.nmt.edu/staff/mclemore/teaching/Critical.html>

Tentative Course Schedule:

January	17—Introduction: IM definition and overview
	24—Basic concepts: Geology, mining, and processing
	31— Basic concepts: Geology, mining, and processing
February	7— Critical minerals
	14— Transportation, marketing
	21— Commodities
	28— Midterm exam (Take Home) Annual SME meeting in Denver, NO CLASS
March	7— NO CLASS
	14— spring break NO CLASS

	21— SME, summaries, Commodities
	28— Commodities
April	4—Commodities
	11—Sustainable development
	14—New Mexico Geological Society Spring meeting, Socorro
	18—Commodities
	25—Commodities
	30— Present research results in class
May	2— Present research results in class (15 mins); Final exam (Take Home)
	9— Final Exam due by noon on May 9

Grading:

Final (comprehensive)	15%
Midterm	15%
Safety share	10%
Lab exercises	10%
Paper Presentations	10%
Term project presentation	20%
Field trip reports, lab report	10%
Class Participation, SME report	10%

Academic Honesty: New Mexico Tech’s Academic Honesty Policy for undergraduate and graduate students is found in the catalog, which can be found at: <https://www.nmt.edu/registrar/catalogs.php/>. Further information about academic honesty can be found on the Associate Vice President for Academic Affairs website: https://www.nmt.edu/academicaffairs/avpaa/academic_honesty.php
You are responsible for knowing, understanding, and following this policy.

Reasonable Accommodations: New Mexico Tech is committed to protecting the rights of individuals with disabilities and providing access and full participation in the educational experience. Students with disabilities who require reasonable accommodations are invited to make their needs known to the Office for Student Access Services (SAS) as soon as possible. Accommodations are not retroactive and may take some time to implement. The process for requesting accommodations can be found at their website <https://www.nmt.edu/ds/academicaccommodations.php>.

You can contact SAS in person at the Fidel Center Room 245, call 575-835-6209, email access@nmt.edu or book through the link on our [website](#).

Counseling Services: New Mexico Tech offers individual and couples counseling, safety assessments, crisis intervention, outreach and consultations through the Counseling Center. These confidential services are provided free of charge by licensed professionals. Please note that changes in the delivery of counseling services may still be on going. For more information on how to access services, please call 835-6619, email counseling@nmt.edu or check out our website at <https://www.nmt.edu/cds/> .

Respect Statement: New Mexico Tech supports freedom of expression within the parameters of a respectful learning environment. As stated in the *New Mexico Tech Guide to Conduct and Citizenship* (Student Handbook): “New Mexico Tech’s primary purpose is education, which includes teaching, research, discussion, learning, and service. An atmosphere of free and open inquiry is essential to the pursuit of education. Tech seeks to protect academic freedom and build on individual responsibility to create and maintain an academic atmosphere that is a purposeful, just, open, disciplined, and caring community.”

COVID-19 and other Health-Related Safety Issues for Face-to-Face Instruction: Please note: provisions on masks, vaccines or other possible COVID-related requirements are subject to change as the situation evolves, based on guidance from the Centers for Disease Control, the State of New Mexico, and university officials (i.e., the President and the Board of Regents). For the most up-to-date guidelines, please consult NMT’s COVID-19 information page: <https://www.nmt.edu/covid19/>.

Students should not come to class if they are feeling ill and should follow any quarantine guidelines that they are given in the event of exposure to COVID-19. If you are sick, you should contact your instructor immediately with a request for making up any missed work and assignments, contact the Student Health Center, and consider getting tested for COVID-19 (as applicable). Please note the Student Health Center does not provide sick notes to students who are not seen by them.

Title IX Reporting: Sexual misconduct, sexual violence and other forms of sexual misconduct and gender-based discrimination are contrary to the University’s mission and core values, violate university policies, and may also violate state and federal law (Title IX). Faculty members are considered “Responsible Employees” and are required to report incidents of these prohibited behaviors. Any such reports should be directed to Tech’s Title IX Coordinator (Dr. Peter Phaiiah, 122 West Hall, 575-835-5953 (O), 575-322-0001 (C), titleixcoordinator@nmt.edu) or reports can be filed online to [Tech’s Title IX & Sexual Misconduct Report](#). Please visit [Tech’s Title IX Website](#) (www.nmt.edu/titleix) for additional information and resources.

Student Success: New Mexico Tech offers numerous peer tutoring services for students who are struggling in their courses, or who just wish to receive friendly advice, including the Office of Student Learning (Skeen Library, <https://www.nmt.edu/osl/>), the Writing and Communication Lab (Skeen Library, <https://www.nmt.edu/academics/class/center.php>), and numerous department-run centers. These services are free of charge to students! Students may also consult the Associate Dean of Student Success, Elaine Debrine Howell (elaine.debrinehowell@nmt.edu) or may receive emails from her if they are struggling in class.

To read about the services a student will need to be successful **visit MyNMT:**
<https://www.nmt.edu/mynmt.php>