

UTEP Spring 2024 · Critical Minerals

GEOL 4351 (CRN 23357), GEOL 5309 (CRN 26984), GEOL 6309 (CRN 27034)

Lecture room: GEOL 404 (Geology Bldg.)

Time: Thursday, 13:30-16:20PM

Instructor: Antonio Arribas (Dept. of Earth, Environmental and Resource Sciences)

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Course Goals

Students will learn about the role and impact of Earth's mineral resources on our everyday life, from pre-historic times to the current high-tech world we live in, which relies heavily on a large number of mineral resources deemed 'critical'. The student will leave this course with a basic understanding of the complex and timely topic of critical or strategic minerals, which involves a fascinating variety of areas of interest, such as engineering and physics, geology and ore formation in the widest possible sense, economics, geopolitics, and national and international conflict. Ultimately, the goal is for the students to become better informed citizens.

Learning Outcomes

Among other outcomes, at the end of the course students will:

- Understand the interrelationship between Earth processes and human development.
 - Learn about some of the basic technological and engineering breakthroughs that are widely regarded as an integral part of the solutions to some of society's most pressing concerns, such as the transition to non-carbon energy sources.
 - Recognize the main processes that lead to the concentration of chemical elements and minerals in nature and be able to correlate the source of common metals and critical minerals (e.g., Cu, Fe, Pb-Zn, Co, Ni, PGE, REE, Li, Ta, Ga, Se, Te, potash, etc.) with different ore forming environments and specific mineral deposit types.
 - Appreciate the importance of supply chain issues versus, e.g., simple discovery and extraction of raw materials and understand the many complexities and uncertainties associated with the assessment of criticality.
 - Consider the strategic issues and concerns, including geopolitical competition and conflict, that guide how different countries and economies react to the issue of critical minerals.
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Course Format and Grading

This course will combine lectures with student group assignments. Grading will be based on two in-class group assignments and one final exam (33.3 pts each). Class total = 100 pts.

Textbook. No textbook is required, but useful references are:

- Mineral Resources, Economics, and the Environment', by Stephen E. Kesler and Adam Simon
- Mineral Exploration and Mining Essentials', by Robert Stevens.
- Several reference research reports on Critical Minerals by organizations such as the US Geological Survey, World Bank, International Energy Agency, and the Center for Strategic and International Studies will be uploaded to Blackboard.

Critical Minerals - Spring 2024 - Calendar (Subject to Change)

Wk	Dates	Class	
1	Jan. 18	Introduction to Course	
2	Jan. 25	Mineral Resources and Society	
3	Feb. 1	Introduction to Critical Minerals. Assignment 1 Engineering: Topics given	
4	Feb. 8	Assignment 1 (Engineering): Research	
5	Feb. 15	Assignment 1 (Engineering): Practice	
6	Feb. 22	Assignment 1 (Engineering): Presentations	
7	Feb. 29	Mineral Deposits: Ore Forming Processes	
8	Mar. 7	Mineral Deposits: Magmatic and Hydrothermal Deposits	
	Mar. 14	Spring break	
9	Mar. 21	Mineral Deposits: Sedimentary and Weathering Deposits	
10	Mar. 28	Mineral Exploration and Mineral Economics	
11	Apr. 4	Mining, Processing and Environmental Issues	
12	Apr. 11	Criticality and Complexities. Assignment 2 Geopolitics: Topics given	
13	Apr. 18	Assignment 2 (Geopolitics): Research	
14	Apr. 25	Assignment 2 (Geopolitics): Practice	
15	May 2	Assignment 2 (Geopolitics): Presentations	
16	May 9	Exam	