

ENS-221 MINERAL RESOURCES 3(3+0)

COURSE CODE: ENS-221
COURSE NAME: Mineral Resources
CREDIT HOURS: Theory = 03 Practical = 0 Total = 03
CONTACT HOURS: Theory = 48 Practical = 0 Total = 48
PREREQUISITE: None

MODE OF TEACHING: 3 hours of Lecture per week (100%)

COURSE DESCRIPTION:

Minerals are fundamental components of the Earth's crust, playing vital roles in both natural processes and human applications. This undergraduate course offers a foundational understanding of mineral properties, classification, crystallography, and geochemical behavior, essential for further studies in environmental science and sustainable resource management.

COURSE LEARNING OUTCOMES:

By the end of this course, students will be able to:

- a) Understand the formation, classification, and distribution of mineral resources on Earth.
- b) Analyze the environmental and socio-economic implications of mineral exploration, extraction, and use.
- c) Evaluate strategies for sustainable management and conservation of mineral resources.

TOPICS COVERED:

Theory:

Week	Topics to be covered
1-2	Introduction to Mineral Resources: Definition, scope in environmental sciences, historical significance, and basic properties (color, streak, luster, hardness).
3	Mineral Classification & Identification: Silicates, oxides, carbonates, sulfides; Mohs scale; hand specimen identification; diagnostic tools.
4-5	Silicate Minerals: Framework, chain, sheet, and island silicates (e.g., feldspars, pyroxenes, amphiboles, micas).
6-7	Non-silicate Minerals: Halides, carbonates, sulfates, phosphates, and native elements (e.g., calcite, halite, gypsum).
8	Mineral Resources of Pakistan
9	Mid Semester Exam
10	Mineral Exploration Techniques: Geological, geophysical, and geochemical methods,
11	Mining Methods: Surface and subsurface mining, small vs large scale operations
12	Mineral Processing and Beneficiation Techniques: Crushing, grinding, separation
14-15	Economic and Environmental Relevance of Minerals: Ore-forming

Week	Topics to be covered
	processes, environmental impact of mineral extraction, sustainability issues.
16-17	Mineral Resource Management and Policy: Global mineral governance, Pakistan's mineral policy
18	End Semester Exam

TEXT AND MATERIAL:

Textbooks:

1. Martin Okrusch, Hartwig E. Frimmel (2020) Mineralogy An Introduction to Minerals, Rocks, and Mineral Deposits Springer Publishers.

Reference Books:

1. Mineral Deposits and Earth Evolution by Geoffrey J. G. G. Morrison, 2017, published by Elsevier
2. Introduction to Mineral Deposits Geology by Dr. Moses A Olade, 2022, published by Amazon
3. Metallogeny and mineral deposits of Pakistan. Islamabad, Pakistan: Kazmi, A. H., & Abbas, S. G. (2001). Orient Petroleum.

ASSESSMENT SYSTEM:

Theoretical/ Instruction		
Assessment Category	Marks Distribution (%)	
	Without Project	With Project
Quiz	15	10-15
Assignment	10	5-10
MSE	25	25
Project	-	5-10
ESE	50	45-50