

Course Type	Course Code	Name of Course	L	T	P	Credit
DP3	NGLC214	Fundamentals of Crystallography, Mineralogy, and Geochemistry Practical	0	0	2	1
Course Objective						
The primary objective of the course is to develop a 3D visualization of crystal structures, learn mineral identification through logical reasoning (not memorization), understand geochemical reasoning, and apply concepts to real geological problems.						
Learning Outcomes						
Upon successful completion of this course, students will be able to:						
<ol style="list-style-type: none"> 1. Identify crystal structures, symmetry, and apply Miller indices for crystallographic analysis. 2. Classify and identify common minerals based on physical, chemical, and structural properties. 3. Apply basic principles of mineral chemistry to interpret mineral formation. 4. Interpret elemental distribution and geochemical processes. 						

Unit No.	Topics to be Covered	Practical	Learning Outcome
1.	Study of crystal models and symmetrical elements (rotation, mirror, inversion)	2	This unit will help students understand crystal symmetry and visualize different crystal systems using models.
2.	Crystal systems and Bravais lattices; stereographic projection (basic plotting)	1	This unit will enable students to represent crystallographic data and interpret angular relationships using stereographic projection.
3.	Miller indices (planes & directions) and zone axis determination	1	This unit will help students apply crystallographic principles to determine Miller indices and solve zone axis problems.
4.	Ionic radii, coordination number, and application of Pauling's rules	2	This unit will enable students to interpret mineral structures and predict stability using crystal chemistry concepts.
5.	Study of physical properties: hardness, cleavage, fracture, luster, streak	2	This unit will help students identify minerals based on diagnostic physical properties.
6.	Identification of minerals in hand specimen (common rock-forming minerals)	2	This unit will enable students to classify and identify minerals using systematic observation and reasoning.
7.	Optical mineralogy: microscope introduction, birefringence, interference colors, extinction	2	This unit will help students interpret optical properties of minerals and relate them to mineral structure.
8.	Basic geochemical interpretation and Goldschmidt classification	1	This unit will enable students to classify elements and interpret geochemical behavior using fundamental concepts.
9.	Practical examination	1	
Total		14	

Textbooks:

1. E S Dana and W E Ford. *A Textbook of Mineralogy*. John Willey and Sons Inc. 3rd edition, 1922.
2. W D Nesse. *Introduction to Optical Mineralogy*. Oxford University Press, 4th edition, 2012, 361 p.

Reference Books:

1. F D Bloss. *Crystallography and Crystal Chemistry*. Cambridge University Press. 1971, 543 p.
2. M M Raith, P Rasse and J Reinhardt. *Guide to Thin Section Microscopy*. 2nd edition. Mineralogical Society of America Monograph series books.