

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	NGPD501	Geophysics of Mineral Exploration	3	0	0	3

### Course Objective

Understand the mineral system concept and its implications for geophysical exploration, especially when exploring for blind targets. Know how to recognise responses from components of mineral system in their geophysical datasets. Understand how to use analyse petro-physical data to predict geophysical responses of mineral system components. Be familiar with the geophysical characteristics of metamorphic orogenic deposits.

### Learning Outcomes

- The purpose of this course is to familiarise mineral exploration geoscientists with the very latest developments in our understanding of the geophysical responses of mineral systems.
- The course discusses the mineral system concept and considers these ideas in a geophysical context. The geophysical responses of key mineral system components are considered from first principles.
- Physical property contrasts expected to be associated with different components are described and new methods of analysing petro-physical data are demonstrated.
- Further, the course discusses the synergy between geophysics and geology for effective exploration strategy and mineral discrimination. Finally exploring mineral systems using geophysical methods is demonstrated using examples from metamorphic deposits and in VMS Setting.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Introduction to geophysics: Geophysical methods used in mineral exploration, Geophysical anomalies and their sources, Ambiguity, Geophysical exploration practice.	6	Introduction to geophysical survey
2	Synergy between geophysics and geology for effective exploration strategy and mineral discrimination.	7	Relation between geology and geophysics
3	Key mineral systems targets (major faults, craton margins, mantle metasomatism, fluid reservoirs, major magma chambers) and their geophysical expression. Potential field data (responses from mineral system components). Magnetotelluric data (responses from mineral system components). Active source seismic methods - deep reflection, refraction data (responses from mineral system components). Passive seismic methods – teleseismic, ambient noise methods (responses from mineral system components).	7	Mineralogical setup and geophysical method for exploration

4	Description of the concept and implications for mineral exploration Mineral system classification schemes	7	Description of the concept and implications for mineral exploration
	The importance of geographically widespread data and deep penetrating geophysical methods New targets suggested by the mineral systems concept: source, reservoirs, pathways and the importance of associated alteration		
5	Petrophysics: Bulk-grain-texture, Importance of proper sampling, Rock and mineral density and magnetism, Physical properties and common geological processes, Importance of analyzing the data in a geochemical/petrological/geological framework, Workflow for petro physical data in a mineral systems context: analysis in context of lithology, stratigraphy, metamorphism/alteration, location.	8	Petrophysical analysis for mineral exploration
6	Geophysics of metamorphic orogenic deposits and VMS Setting	7	Analysis of metamorphic deposits and VMS study
	<b>Total Classes</b>	<b>42</b>	

### Text Books

1. McCuaig, T.C. and Hronsky, J.M.A., 2014. The Mineral System Concept: The Key to Exploration Targeting Society of Economic Geologists Special Publication 18, pp. 153– 175.

### Reference Books

1. Michael , D., and Mudge, S. T., 2014, Geophysics for the Mineral Exploration Geoscientist, Cambridge University Press