Course Type	Course Code	Name of Course	L	T	P	Credit
DC4 (Minor)	NGLC522	Metamorphic Petrology	3	1	0	4

Course Objective
The primary objective of the course is to introduce fundamental understanding of process, reaction, mineral assemblage formed in different protoliths during metamorphism. Constructing and being able to understand different graphical representations used in metamorphic petrology. Relation between tectonics and metamorphism.
Learning Outcomes
Upon completion of the course, students will be able to: • Process and control of physico-chemical and compositional control on metamorphism of rocks. • Application of thermodynamics on stability of minerals during metamorphism. • Evaluating P-T-t path from textural relation and geothermobarometry. • Relating tectonic setting with metamorphism.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Basics of metamorphism**: Definition, agent, classification of metamorphism.	3L	Understanding processes involved in metamorphism
2	**Texture of metamorphism:** Textures developed during metamorphic processes	5L + 5T	Interpreting implications of metamorphic texture
3	**Rock Nomenclature**: Identifying metamorphic rocks depending on texture and composition	1L	Metamorphic rock identification
4	**Thermodynamics:** Definition of fundamental thermodynamic parameters, phase rule, First, second and third law of thermodynamics, Gibb's free energy, chemical potential, activity, Equilibrium Constant, deduction of geothermobarometry	8L + 4T	Fundamental concepts of thermodynamics and geothermobarometry
5	**Metamorphic facies:** The concept of metamorphic facies and their relationship with geothermal gradient	3L	Understanding Metamorphic facies
6	**P-T-t path:**Introduction to ifferent types of P-T-t path and their description	2L	The principle behind P-T-t path derivation and their interpretation
7	**Chemographic projections:** ACF, AFM, AKFM, CMS Compatible diagram and Schrienmaker's rule	5L + 5T	Performing of chemigraphic projection for appropriate assemblage
8	**Metamorphic reactions:** Types of solid-solid reaction that occur during metamorphic process	3L	Learning about the reactions involved in metamorphism
9	**Metamorphism of different protoliths:** Development of characteristic mineral assemblage in pelitic, mafic, ultramafic and calcareous rock durimg metamorphism.	8L	Metamorphic assemblage developed in different protolith
10	**Metasomatism**: Role of fluid in metamorphism and the processes involved.	2L	Understanding fluid rock interaction
11	**Relationship with tectonics:** Description of typical metamorphic assemblage/facies in relation to different tectonic setup	2L	Link between metamorphism and tectonics

	Total Classes	42L + 14T = 56	

Textbooks:

1. John D. Winter., 2015. Edition 2nd, Principles of Igneous and Metamorphic Petrology. Pearson Education India.
2. Vernon, R.H. and Clarke, G.L., 2008. Principles of metamorphic petrology. Cambridge University Press.
3. Vernon, R.H., 2018. Edition 2nd. A practical guide to rock microstructure. Cambridge university press.

Reference Books:

1. Philpotts, A.R., Ague, J.J., 2022. Edition. 3rd, Principles of Igneous and Metamorphic Petrology, Cambridge University Press, New York.
2. Metamorphic Petrology, by Francis J. Turner, 1980, by Taylor & Francis Inc .
3. Igneous and Metamorphic Petrology, Myron G. Best, 2002, by Wiley, John & Sons