Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGLC521	**Igneous Petrology**	3	0	0	3

Course Objective
This a core course of geology and will help the student learn in detail the different igneous rocks, the petrogenetic processes and tectonic environments for their emplacement.
Learning Outcomes
The student will gain demonstrable ability to : • Learn about the magmatic differentiation processes • Understand the diversity of igneous rocks and the variety of tectonic environments for their emplacement • Understand the petrogenesis of igneous rocks

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Classification of igneous rocks. IUGS classification. Textures and structures of igneous rocks. Origin and evolution of magmas.	8	Classification principles of igneous rocks; textural and structural aspects of igneous rocks and origin and evolution of magmas
2	Compositional variation in magmas. Crystallization of magma and their representations in phase diagrams (binary system and ternary diagrams).	5	The process of magma crystallization and their explanation by phase diagrams
3	Influence of volatiles and role of oxygen fugacities in magmatic crystallizations. Assimilation Fractional Crystallization AFC) processes. Nature and type of partial melting in the mantle. Magmatic differentiation and fractionation models.	8	Various chemical parameters controlling magma crystallization, fractional crystallization and partial melting
4	Representation of chemical analysis of igneous rocks. Major and Trace element systematics in igneous rocks. Silica/alumina saturation, variation diagrams, their applications and limitations.	5	Chemographic projection of igneous rocks; trace element variation diagrams
5	Granites and their origin, I-, S-, A- type granites. Pegmatites, their nature, occurrence and petrogenesis. Alkaline rocks and their origin. Anorthosites and their petrogenesis.	5	Different types of granites and their chemical characteristics and origin
6	Lamprophyres and their petrography and origin. Ultramafic and layered rocks, nature and origin. Carbonatites, Petrography and their petrogenesis. Kimberlites and their origin.	5	Different types of igneous rocks (except granites) and their origin
7	Lunar rocks. Magmatism in relation to plate tectonics. Petrographic and chemical characteristics of igneous rocks in the following tectonic settings: Mid Oceanic Ridge, Island Arcs, Oceanic plateaus, Continental Margins, Continental Rifts and Continental intraplates.	6	Igneous features in Lunar rocks
	Total Classes	42	

Reference Books:

1. McBirney, A.R., 1993. Igneous Petrology, Jones & Bartlett Publishers, Boston 508 p.
2. Cox, K.G., Bell, J.D., Pankhurst, R.J., 1993. The Interpretation of Igneous Rocks, Chapman and Hall, London; 450 p.

Other References:

1. Philpotts, A.R., Ague, J.J., 2009. Principles of Igneous and Metamorphic Petrology, Cambridge University Press, New York; 684 p.
2. Best, M.G., 2003. Igneous and Metamorphic Petrology, Blackwell Publishing; 729 p.
3. Wilson, M., 2007. Igneous Petrogenesis – A Global Tectonic Approach, Springer, Dordrecht; 466 p.
4. Gill, R., 2010. Igneous Rocks and Processes: A Practical Guide, Wiley-Blackwell, Oxford; 428 p.
5. Winter, J.D., 2014. Principles of Igneous and Metamorphic Petrology, PHI Learning Private Limited, Delhi; 702 p.