Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NGLC502	**Applied Geochemistry**	3	1	0	4

Course Objective

In this course the students will study the fundamental concepts, principles and applications of geochemistry and brie introduction in isotope geology.

Learning Outcomes

Upon completion of the course, students will be able to:

- Distribution of various chemical elements in various units of the universe
- Understand how atomic structure of a mineral controls the distribution of elements in rocks and minerals.
- Classification of all type of elements in the periodic table according to their geochemical behavior.
- Principles of distribution of all type of elements in rocks and minerals and their application.
- Geochemical behavior of water; Geochemistry of oceans
- Application of geochemistry in petrogenesis of different types of rocks and mineral exploration.
- Basic principles behind applications of radioactivity in earth sciences
- Principles and application of various types of isotope dating methods
- Systematics of common stable isotopes of some important elements
- Application of principles of stable isotopes of some important elements

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
	Applied Geochemistry		
1	Origin and abundance of elements in the solar system and in the Earth and its constituents. Geochemistry of atmosphere, hydrosphere.	2L + 1T	Distribution of various chemical element in various units of the universe
2	Atomic structures and properties of elements in the periodic table	2L + 1T	Understand how atomic structure of mineral controls the distribution o elements in rocks and minerals.
3	Geochemical classification of elements. Special properties of LILE, HFSE and rear earth elements.	4L + 1T	Classification of all type of elements i the periodic table according to thei geochemical behavior.
4	Principles of ionic substitution in minerals; element partitioning in mineral/rock formation and concept of simple distribution coefficients and exchange reaction distribution coefficients; element partitioning in mineral assemblages and its use in the pressure-temperature estimation.	6L + 2T	Principles of distribution of all type o elements in rocks and minerals and the application.
5	Chemistry of natural waters. Mineral stability in Eh-pH diagram. Elemental mobility in surface environment. Concept of agrochemical-biogeochemical cycling and global climate.	5L + 2T	Geochemical behavior of water
6	Oceans and atmosphere: their compositions, evolution, steady state, and global mass balance, rock-water interaction: congruent and incongruent dissolution.	2L	Geochemistry of oceans
7	Application of Geochemical (major, trace and REE) data: In classification, determination of in tectonic environment and petrogenesis of igneous rocks by using different types of geochemical diagrams. Application of geochemical data in Mineral exploration	5L + 2T	Application of geochemistry i petrogenesis of different types of rock and mineral exploration.
8	Introduction: Discovery of Radioactivity and isotopes as well and its influence on Earth Sciences. Nuclide types, their abundances, and atomic weights. Decay mechanisms of radioactive atoms. Radioactive decay and growth.	5L + 2T	Basic principles behind applications o radioactivity in earth sciences
9	Basic principles of radiometric dating methods of Rocks: Ar-Ar, Rb-Sr, Sm-Nd, U-Th-Pb, Re-Os and Pb-Pb methods of dating	7L + 2T	Principles and application of various type of isotope dating methods
10	Stable isotope systematics: Carbon, Oxygen, Hydrogen and Sulphur and their implication	2L + 1T	Systematics of common stable isotopes of some important elements

11	Application of stable isotope geology in palaeo-climate interpretations, ore geology, mineral and hydrocarbon exploration.	2L	Application of principles of stabl isotopes of some important elements
	Total	42L + 14T = 56	

Recommended Books:

1. Albarède F. (2003) Geochemistry An Introduction; Cambridge University Press.
2. Faure G. (1986) Principles of Isotope Geology; John Wiley and sons 2nd Eds.

Other References:

1. Faure G. (1991) Principles and Applications of Inorganic Geochemistry; Macmillan Publishing Company.
2. Hoefs EJ. (1996) Stable Isotope Geochemistry: Springer,4thEds.
3. Mason B, Moore CB. (1991) Principles of Geochemistry: Willey eastern Ltd,4th Eds.
4. Gopalan K. (2017) Principles of Radiometric dating: Cambridge University Press, 1st edition
5. Hugh Richard Rollinson and Victoria Pease (2021) Using Geochemical Data: To Understand Geological Processes : Cambridge University Press
6. Kaul C. Misra (2012). Introduction to Geochemistry Principles and Applications. Willey and Blackwell A John Wiley & Sons, Ltd., Publication 456pp.