Geochemistry

- 1.1. Course Number: GE 211
- 1.2. Contact Hours: 3-0-0 Credits: 9
- 1.3. Semester Offered: 2nd Year -Odd
- 1.4. Prerequisite: Basic knowledge of Geology, Physics, and Chemistry
- 1.5. Syllabus Committee Members: Dr. Alok Kumar Singh & Dr. Hemant Kumar Singh
- 2. Objective: The course aims to give an introduction in how chemical principles are used to explain the mechanisms that control the large geological systems such as the Earth's mantle, crust, ocean and atmosphere, and chemistry of organic matter.

Unit	Topics	Sub-topics	Lectures
1	Concepts of geochemistry	Introduction to properties of elements: The periodic table, Chemical bonding, states of matter and atomic environment of elements, Geochemical classification of elements.	8
2	Geochemistry of Rocks	Distribution coefficients and its application with numerical examples. Behavior of major and trace including rare earth elements during magmatic crystallization and its application in petrogenesis and as tectonic discriminants.	9
3	Element Transport	Advection and diffusion, Chromatography, Aqueous geochemistry- basic concepts and speciation in solutions, Eh, pH relations, Elements of marine chemistry, Mineral reactions- diagenesis and hydrothermal reactions, Principal of chemical mass balance and rock- cycle; Chemical weathering of minerals and rocks.	8
4	Chemistry of Organic Matter	Carbon, the Earth and life, The carbon cycle and climate, Chemical composition of organic matter, Controls on the preservation and distribution of organic matter, Types of organic matter in coal, oil shales and source rocks and their geochemistry, Characterization of organic matter, Classification of organic matter, applications of organic compounds and with inorganic and stable isotopic parameters, Chemistry of oil field water.	15
Total			40

3. Course Content: Unit-wise distribution of content and number of lectures

4. Readings:

4.1. Textbook:

• Mason, B (1986). Principles of Geochemistry. 3rd Edition, Wiley New York.

- Rollinson H. (2007) Using geochemical data-evaluation. Presentation and interpretation. 2nd Edition. Publisher Longman Scientific & Technical.
- Walther John, V., 2009 Essentials of geochemistry, student edition. Jones and Bartlett Publishers
- Stephen Killops and Vanessa Killops (1995) Introduction to Organic Geochemistry, 2nd Edition. Blackwell publication.

4.2. Reference Books:

- Dickins, A. P., 1995, Radiogenic Isotope Geology, Cambridge University Press
- Faure, G., 1986. Principle of Isotope Geology, J. Wiley & Sons.
- Henderson, P., 1982. Inorganic Geochemistry, Pergamon Press, Oxford.
- Krauskopf, K. B., 1979 Introduction to Geochemistry. McGraw Hill.
- Mason, B. 1982 Principles of Isotope Geology, J. Willey & Sons.

5. Outcome of the course:

By attending this course student will be able:

- to understand evolution of the early Earth from proto-planetary material and its differentiation to present day state.
- to explain element fractionation and how this can be used to understand geochemical processes.
- to demonstrate their ability to obtain, analyze and synthesize information relevant to Geochemistry.
- to understand the chemistry of organic matter.