



## Faculty of Earth Sciences



### Department of Mineral Resources & Rocks 3rd & 4th Years Program



The Geological Society  
*Accredited degree courses*

## PRICIPLE OF GEOCHEMISTRY

Course Name	Course ID	Prerequisites
Principle of Geochemistry	EMR 241	EMR 201 and CHEM 110, CHEM 281

### Course Description

1. Atoms – Elements – Periodic Table
2. The chemical composition of earth materials and its relation with universe composition
3. Physiochemical basis controlling abundance and distribution of elements in earth
4. Introduction of geochemistry of igneous, sedimentary and metamorphic rocks, hydrosphere and atmosphere
5. Geochemical cycle
6. Classification of isotopes and their distribution in earth's crust
7. Theory of radioactive decay and its application for age dating of igneous and metamorphic rocks
8. Study of stable isotopes, isotopic fractionation and their applications
9. Determination of physicochemical and environmental conditions prevailing during the formation of rocks.
10. Practical study including exercises on treatment of geochemical data to identify rock age and petrogenesis

### Course Objectives

1. Recognize the abundance and distribution of the chemical elements in the Earth and Universe, the relationship between thermodynamics and crystal chemistry and the element distribution and substitution
2. Study the behavior of major and trace elements during magmatic crystallization, weathering and metamorphism
3. Apply the geochemical data in determining the tectonic setting and origin of igneous rocks
4. Study the changes occurred as a result of radioactive decay and their applications in

age dating of rocks and minerals.

5. Identify the genesis of mineral deposits and rocks using different radioactive and stable isotopes
6. Define isotopic fractionation and discover the fundamental reasons for its occurrence
7. Investigate the effects of different processes on the fractionation of sulfur, carbon, oxygen and hydrogen isotopes.

**General References for the Course:** (Books/Journals...etc.)

1. Gazzaz, M. and Hashad, A. (1420 H). Principles of Geochemistry. Scientific Publication Center, King Abdulaziz Univ. Jeddah (in Arabic).
2. Albarède F. (2003). Geochemistry: An Introduction. Cambridge University Press.
3. Faure G. (1986): Principles of Isotope Geology, John Wiley and Sons

**Journals:**

- 1-Geochemistry International
- 2-Geochimica et Cosmochimica Acta
- 3- Chemical Geology
- 4- Applied Radiation and Isotopes

**List of URLs for this Course**

- 1-<http://www.geokem.com>
- 2-<http://www.geo.cornell.edu/geology/classes/Geochemweblinks.HTML>
- 3-<http://www.onafarawayday.com/Radiogenic/>
- 4-[http://www.sci.uidaho.edu/geol423/topic\\_6.htm](http://www.sci.uidaho.edu/geol423/topic_6.htm)

**Course Outcome**

1. Student can understand the Earth as a chemical system, including observational and theoretical investigations of the solid Earth, hydrosphere, and atmosphere
2. Student can be aware of the geochemical behavior of elements during formation of various rock types
3. Student can be able to use geochemical data to determine the tectonic setting and evolution processes of igneous rocks.
4. Student can familiarize with the changes occurred as a result of radioactive decay
5. Student can know the applications of radioactive decay in age dating of rocks and minerals
6. Student can be able to identify the genesis of some mineral deposits using radioactive and stable isotopes
7. Student can be acquainted with isotopic fractionation and the fundamental reasons for its occurrence
8. Student can familiarize with the effects of different processes on the fractionation of sulfur, carbon, oxygen and hydrogen isotopes.