FIRST SEMESTER

MGH 401: MINERALOGY AND GEOCHEMISTRY

Skills, employability and entrepreneurship: This subject is a good opportunity for students not only to know about the formation of mineral from elements, useful to identify in the field. Students exit with course have skills to work in quarrying, mining, rock polishing, cement, silica/glass, sand mining, brick, ceramic, pottery and refractory industries. They will be exposed to start their own entrepreneurship. Students are encouraged to undergo internships after the regular offline classes as well as during the vacation.

MINERALOGY		
Unit 1	Introduction to crystallography: Crystal systems and Elements of symmetry (32 classes). Principles of X-ray diffraction and its applications.	4 hrs
Unit 2	Introduction and Principles of Mineralogy: Definition and importance of minerals for sustainable development. Properties of minerals: chemical, physical, electrical, magnetic and thermal.	4 hrs
Unit 3	Principles of optical mineralogy: Introduction to optical mineralogy, polarized light and crossed nicols. Behaviour of isotropic and anisotropic minerals, refractive index, double refraction, birefringence, sign of elongation, interference figures, 2V, dispersion in minerals. Classification of minerals based on optical properties. Ore and ore forming minerals.	8 hrs
Unit 4	Descriptive Mineralogy: Silicates-Structural classifications. Description of major rock forming minerals of the following groups; Olivine, Pyroxene, Amphibole, Garnet, Mica, Feldspar, Quartz, Aluminosilicate, Zeolites, Clay minerals. Interactive sessions of teaching to enhance students-teacher interactions through hands-on demonstrations and exercises in the recent advancement of the subject related to the curriculum.	10 hrs
GEOCHEMISTRY		
Unit 5	Introduction to geochemistry and cosmochemistry: Origin of elements and their abundance in the universe. Structure and atomic properties of elements, Periodic Table. Chemical and geochemical classification of elements. Meteorites and their applications. Composition of planets and the Earth's interior.	6 hrs
Unit 6	Distribution of elements in igneous, sedimentary and metamorphic processes with an importance of magmatic and weathering and sedimentary processes. Aerosols, their composition, classification and importance. Brief geochemical aspects of soils and sediments.	6 hrs
Unit 7	Biogeochemistry: Introduction and the current relevance of biogeochemistry. Principles of geochemical cycle including human activity in altering the earth system. Bio-geochemical cycles of carbon, nitrogen and phosphorous.	6 hrs
Unit 8	Isotope geochemistry and principles of geochronology. Radioactive, stable isotopes and fission products; and their classifications, principles in determining ages of rocks, sediments, and applications in different fields of the earth science including paleoclimate. Interactive sessions of teaching to enhance students-teacher interactions	8 hrs

	through hands-on demonstrations and exercises in the recent advancement of the subject related to the curriculum.	

List of References:

1. Rock Forming Minerals – Deer, Howie and Zussman: Longman Publishers (1983).
2. Text Book of Mineralogy – J. D. Dana, E. S. Asia Publ House (1985).
3. Elements of X-ray Crystallography – Azaraoff
4. Elements of Mineralogy – Rutley – CBS Publications
5. Elements of Optical Mineralogy – Winchell, Wiley eastern Limited (1937).
6. Mineralogy – Berry I. G. and Masson, B. Freeman and Co. (1959).
7. Introduction to Geochemistry – Krauskopf, E. B. McGraw Hill (1979).
8. Principles of Geochemistry – Brain Massan, Wiley eastern limited (1958).
9. Inorganic Geochemistry – Henderson P (1982) – Oxford – Pergamon.
10. Hand Book of Geochemistry – Goldchmidt, V. M. (1958).
11. Geochemistry – Hammer Fmiza (2008).

Free online books

12. Fundamentals of Geochemistry, W. M. White
    http://www.soest.hawaii.edu/krubin/GG325/ textbook/
13. Geochemistry Earth's System Processes Dionisios Panagiotaras
    Online | 512 Pages
14. Geochemistry Lecture Notes by Glen S. Mattioli and Ralph K. Davis
15. Geochemistry Lecture Notes W. M. Whit
16. Trace Element Geochemistry, Frederick Frey