SEMESTER 1

GEOLOGY MJ Major 1

GEO-MJ-1: Earth System Science

Total Credits:4

FM:100

(End Sem + Internal Exam) 75+25=100 Marks

Unit 1: Earth as a planet:

Introduction to various branches of Earth Science; General characteristics and origin of the Universe, Solar System and its planets; Meteorites and Asteroids; Cosmic abundance of elements; Origin of Earth- atmosphere, ocean, and life.

Unit 2: Solid Earth:

Seismic waves and internal constitution of the Earth; Concept of isostasy; Earth's magnetic field; Geothermal gradient and internal heat of the Earth. Introduction to structure: Structural elements: planar and linear structures, concept of strike and dip, trend and plunge, rake/pitch

Unit 3: Plate Tectonics:

Concept of plate tectonics, sea-floor spreading and continental drift; Plate boundaries; Earthquake and earthquake belts; Volcanoes- types, products and their distribution.

Unit 4: Hydrosphere and Atmosphere:

Atmospheric circulations; Oceanic currents, tides and waves. Climate System and the Changing Climate from rock record; Concepts of eustasy.

Unit 5: Rock types and Soils:

Igneous, Sedimentary and Metamorphic rocks; Diastrophic and non-diastrophic Structures; Application of primary sedimentary and igneous structures in structural geology. Concept of scale of observation of structures. Weathering and Erosion; Soil formation.

Unit 6: Understanding Stratigraphic records:

Stratigraphy and nature of stratigraphic records; Fundamental laws of stratigraphy: laws of superposition and faunal succession; Concepts of neptunism, plutonism, uniformitarianism, and catastrophism; Absolute and relative time in Geology. Unconformity and its types, recognition of unconformity. Concept of radiometric dating. Radiometric dating of rocks and minerals: U-Pb, Rb- Sr, Sm-Nd, C-14 methods. Geological time scale; Fossil record and Mass Extinction.

Unit 7: Natural Resources:

Mineral resources; hydrocarbon; Renewable energy resources.

SUGGESTED READINGS:

1 Brian J. Skinner, B. J. & Porter, S. C.: (2012). The Blue Planet: An Introduction to Earth System Science John Wiley & Sons. Inc.

2 Thompson G.R.R., Turk J. (1997) Introduction to Physical Geology. Brooks Cole.

3 Tarbuck, E. J. &Lutgens, F. K. (1998). Earth: An Introduction to Physical Geology. Pearson

4 Charles, C. P., Carlson, D., &Mcgeary, D. (2009) Physical Geology. McGraw-Hill Higher Education

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3/5/2024

5 Duff, P. M. D., & Duff, D. (Eds.). (1993). Holmes' principles of physical geology. Taylor &Francis.

6 Emiliani, C. (1992). Planet earth: cosmology, geology, and the evolution of life and environment.Cambridge University Press.

Suggested Reference Books:

1 Grotzinger, J., Jordan, T.H., Press, F., Siever, R. (2007): Understanding Earth. W.H. Freeman & Co., New York, 5 th Ed.
2 Skinner, B.J., Porter, S.C., Botkin, D.B. (1999): The Blue Planet – An Introduction to Earth System Science. John Wiley & Sons, Inc. New York. P.552.
3 Mathez, E.A. and Webster, J.D. (2004): The Earth machine – The Science of a Dynamic Planet. Columbia University Press, New York. P.335.
4 Gross, M. G. (1977). Oceanography: A view of the earth