

Course Code	Course Name	Credits
26PH109	EARTH SCIENCE	04

Course Objectives

- To understand the origin and structure of the Earth and the solar system
- To learn internal processes like earthquakes, volcanism, and plate tectonics
- To study the composition and geochemical cycles of the Earth
- To understand geological time scale and stratigraphic records

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Explain the origin and structure of the Earth and solar system
- Understand earthquakes, volcanoes, and plate tectonics
- Analyze Earth's composition and geochemical cycles
- Interpret geological time scale and stratigraphic data
- Apply basic concepts of radiometric dating

Unit 1 - Branches of Earth Sciences (12 Hrs.)

General characteristics and origin of the Universe, Solar System and its planets. The terrestrial and jovian planets. Meteorites and Asteroids. Earth in the solar system - origin, size, shape, mass, density, rotational and revolution parameters. Origin of atmosphere, ocean and life.

Unit 2 – Mechanical layering of the Earth (12 Hrs.)

Lithosphere, asthenosphere, mantle and core. Earthquake and earthquake belts: seismic waves and internal constitution of the Earth. Volcanoes and volcanism, distribution of volcanoes. Concept of isostasy. Formation of core, mantle, crust, atmosphere, hydrosphere and biosphere. Convection in Earth's core and production of its magnetic field. Geothermal gradient and internal heat of the Earth.

Unit 3 - Earth (12 Hrs.)

Distribution of elements in solar system and in Earth. Composition of the Earth. General concepts about geochemical cycles. Properties of common elements in Earth. Concepts of geochemical cycles.

Unit 4 – Plate Tectonics (12 Hrs.)

Historical development of the concept of continental drift and plate tectonics. Plates and plate boundaries. Geodynamic elements of Earth: mid oceanic ridges, trenches, transform faults and island arcs. Plate tectonics: mountain belts and rift valleys.

Unit 5 - Understanding the past from Stratigraphic records (12 Hrs.)

Nature of stratigraphic records. Fundamental laws of stratigraphy: laws of superposition and faunal succession. Absolute and relative time in Geology. Concept of time and geological time scale Concept of radiometric dating. Radiometric dating of rocks and minerals: U-Pb, Pb-Pb, K-Ar, Rb-Sr, Sm-Nd methods. Dating igneous and sedimentary rocks. Concepts of neptunism, plutonism, uniformitarianism, and catastrophism. Geological time scale.

Reference Books:

1. Duff, P. M. D. and Duff, D. (Eds.) (1993). Holmes' principles of physical geology. Taylor and Francis.
2. Emiliani, C. (1992). Planet Earth: cosmology, geology, and the evolution of life and environment. Cambridge University Press.
3. Gross, M. G. (1977). Oceanography: A view of the earth.
4. Tarback, E. J. and Lutgens, F.K. (2006). Earth Science. Pearson Prentice Hall, New Jersey.

Websites and eLearning Sources:

1. <https://nptel.ac.in/courses/105104224>
2. <https://youtu.be/libKVRa01L8?si=Ih7YBD24Kok2ncRn>
3. https://youtu.be/qhwpBxPwlj8?si=U1pstrY4xh_rigP

COs and Bloom's Taxonomy Mapping – 26PH109

Course Outcomes	On successful completion of this course, students will be able to	BTL
CO1	Recall and describe key concepts, laws, and characteristics related to Earth sciences, including the origin of the universe, solar system formation, and mechanical layering of the Earth.	K1
CO2	Explain the principles behind plate tectonics, earthquake mechanics, and the geological time scale, demonstrating a clear understanding of these foundational concepts.	K2
CO3	Apply geochemical concepts and principles to analyze the distribution of elements in the solar system and the Earth, as well as solve standard problems related to radiometric dating methods.	K3
CO4	Analyze stratigraphic records to identify geological time periods and interpret the historical development of the Earth's structure through the lens of plate tectonics and geodynamic elements.	K4
CO5	Critically evaluate scientific literature on geological phenomena and propose innovative research projects or experiments to address existing challenges in understanding Earth sciences.	K5, K6

BTL (Bloom's Taxonomy Level) - K1 – Remembering, K2 – Understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6 - Create

Relationship Matrix – 26PH109

Course Outcomes	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)						Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	2	1	1	1	1	3	1	1	1	1	1	1.42
CO2	3	2	2	1	1	1	3	3	2	1	1	1	1.75
CO3	2	3	3	2	1	2	1	2	3	2	1	2	2.00
CO4	2	3	3	1	1	2	1	2	3	2	2	2	2.00
CO5	2	3	2	2	1	3	1	2	2	3	3	3	2.25
Total													1.88

Mean Score: 3- High, 2- Medium/Moderate, 1-Low