

Solid Earth Geophysics

1.1. Course Number: GE221

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. Satish Sinha and Dr. Piyush Sarkar

2. Objective: Comprehensive understanding of various physical properties of interior of the earth, plate tectonics and thermal characteristics of earth. Students are exposed to fundamental concepts of seismology, Radiometric dating techniques and geomagnetism.

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

Unit	Topics	Sub-topics	Lectures
1	Earth and Planetary System	History of development and scope of geophysics, monistic and dualistic hypotheses for the origin of solar system, Kepler's law of planetary motion, planet, and satellites of the system and their characteristics, shape and size of the earth, international gravity formula and rotation of the earth.	8
2	Internal Structure of Earth and Plate Tectonics	Internal constitution of the earth, characteristics of lithosphere and asthenosphere, Introduction to Geoid and Spheroid. Derivation and explanation of Geoid and Spheroid at different locations of earth surface. Its significance to dynamics of the earth. Causes of geodynamical process, geodynamic models, continental drift, ocean floor spreading, plate tectonics and its geological implications, new global tectonics and plate margin process, geomagnetic time scale, Benioff zones, oceanic ridges, evolution of the triple junction, trenches and island arcs, hot spots, geodynamics of Indian subcontinents and formation of Himalayas, 90°E ridge, concept of isostasy, Airy, Heiskanen and Pratt-Hayford hypotheses.	14
3	Earth's Heat	Introduction to thermal history of the earth, Thermodynamics Principle, Importance of heat flow, sources of heat generation and temperature distribution inside the earth, Jacob's hypothesis for liquid nature of the outer core.	8

4	Geochronology and Geomagnetism	Origin of geomagnetic field, polar wandering, secular variations and westward drift, reversals of geomagnetic field, geomagnetic storms, earth's current, sunspot, solar flares, lunar and solar variations, palaeomagnetic studies of rock samples and their applications in geophysics, radiometric dating principles and ages of rocks and the earth.	10
Total			40

4. Readings:

4.1. Textbook:

- Anderson, D., New Theory of the Earth, Cambridge University Press, 2007
- Fowler, C.M.R., Solid Earth: An Introduction to Global Geophysics, Cambridge University Press, 2005.

4.2. Reference Books:

- Lowrie, W., Fundamentals of Geophysics, Cambridge Univ. Press, 2007.
- Howell, B. F., An Introduction to Geophysics, Mc-Graw Hill
- Jacobs, J. A., A Text Book of Geonomy, Adam-Hilger
- Tucker, R. H., Cook, A. H., Iyer, H. M. and Stacey, F. D., Global Geophysics, English
- Stacey F. and Davis P., Physics of the Earth, Cambridge University Press, 2008.

5. Outcome of the course:

This course module introduces basic concepts of plate tectonics and also provides comprehensive understanding of internal structure of the earth. The student will also get familiarized with thermal characteristics of earth, heat transport mechanisms and various radiometric dating techniques.