CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSE-6 **Earthquake Geology (L3, P1)**	**4**	**3**	**0**	**1**	**12th pass with science**	**Studied Earth System Science and Structural Geology, Hydrogeology or Equivalent**

Learning Objectives

This course aims to:

- Highlight the unpredictability and catastrophic impact of earthquakes on human life and infrastructure.
- Emphasize that a significant portion of the population in India and globally is at risk from earthquakes.
- Explain how mitigation strategies such as: Earthquake microzonation, Earthquake-resistant design etc. can help reduce earthquake-related vulnerabilities.
- Provide foundational knowledge in earthquake science for students interested in: Earth sciences, Seismology, Disaster management, Geotechnical engineering and related fields.

Learning outcomes

Upon completing the course, students will be able to:

- Understand the basics of earthquake sources, their size, and how they are determined.
- Distinguish between different types of earthquake waves, their properties, and hazard potential.
- Explain the influence of geological structures and processes on earthquake hazards.
- Gain an introductory understanding of advanced techniques for crustal deformation measurement used in earthquake analysis.
- Learn and apply basic disaster-related terminology and recognize its significance.
- Identify and assess secondary hazards associated with earthquakes (e.g., landslides, tsunamis, liquefaction).

THEORY (45 Hours)

UNIT – I **(10 Hours)**

Earthquake definition and parameters: Earthquake definition and sources. Earthquake parameters- epicenter, focus, magnitude and intensity.

UNIT –II **(10 Hours)**

Seismic waves and instrumentation: Types of seismic waves- body waves and surface waves; Seismograph and seismogram; Determining the epicenter and magnitude. Ground motion parameters: peak ground acceleration (PGA).

UNIT –III **(12 Hours)**

Seismotectonics: Plate-boundaries and earthquakes, Style of faulting, active faults, Earthquake source zone in Indian subcontinents. Historical large earthquake of India.

UNIT –IV **(13 Hours)**

Geodetic measurement of crustal deformation: Geodetic data/measurement of interseismic deformation, trilateration, SAR interferometry of earthquake.

Earthquake hazard and mitigation measures: Concepts of earthquake Hazard and Risk and disaster, Secondary hazards of earthquake: liquefaction, landslides, Avalanches, Tsunami; seismic hazard zonation, basics of earthquake safety: safely of structure; awareness.

PRACTICALS: **30 hours**

Earthquake size determination and calculation: Calculation of earthquake magnitude and intensity. Identification of different phases of earthquake wave in seismogram. Calculation of epicenter location using triangulation method. Earthquakes and plate boundaries: Plotting of important earthquake epicenters on the tectonic map. Plotting of seismic source zones and important historical earthquakes of India. Plotting fault plane solutions.

Essential Readings

- Lowrie, W., (1997). Fundamental of Geophysics. Cambridge University Press. The Edinburgh Building, Cambridge CB2 8RU, UK
- Kayal, J.R., (2008). Microearthquake Seismology and seismotectonics of south Asia. Springer. Capital Publishing Company, New Delhi

Recommended Readings

- S. Stein and M. Wysessions. (2003). An Introduction to Seismology, Earthquakes, and Earth Structure. Blackwell Publishing, Boston; ISBN 0-865-42078-5.
- Yeats, R.S., Sieh, K. and Allen, C.R., (1997). The Geology of Earthquakes. Oxford University Press