

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

Earthquakes are one of the most unpredictable natural catastrophes, wreaking havoc on human lives and property. A substantial portion of the population of India and the world is living at risk of earthquakes. The susceptibility of this population can be significantly lowered by mitigation measures such as earthquake microzonation, earthquake resistant design, raising awareness and preparing for earthquake safety. This course covers the principles of earthquake science for students interested in earth sciences, disaster management, seismology, earthquakes and geotechnical engineering, among other fields.

Learning outcomes

Introduction to the basics of the earthquake sources, size and their determination. Understating the nature of different type of earthquake waves in terms of their property and hazard potential. Understanding the role of geological structures and processes in earthquake hazards. Introduction to the advance techniques of crustal deformation measurement for earthquake analysis. Understanding the basic disaster terminology their significance. Secondary hazards associated with the earthquake. Concept of earthquake safety for people and structure.

SYLLABUS OF DSE-6

Earthquake Geology (L3, P1) (4 credits)

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: safety of structure; awareness.

Practical: 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. Wysession. (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