



Direzione Ricerca,
Innovazione e
Internazionalizzazione

**UNIVERSITÀ
DI TORINO**

ID

VP_205_TER

Visiting Professor Program Academic Year 2025/2026

TEACHING COMMITMENT: 12 hours

COURSE TITLE

Seismology and Earthquake Mechanics

TEACHING PERIOD

II semester

SCIENTIFIC AREA

Geophysics of the Solid Earth

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

The course aims to provide theoretical and experimental tools finalised to the knowledge of earthquakes generation processes and waves propagation. Students will be introduced to the processes driving earthquake ruptures, to the analysis and modelling of seismic data to determine the main source parameters and to the seismotectonically active areas for big earthquakes, and the methodologies for seismic hazard mitigation and earthquakes forecasting. In detail laboratory techniques will be developed finalised to the measurement of rocks physico-mechanical parameters and to the description of the rheological behaviour during the pre-failure and coseismic deformation processes.

LEARNING OBJECTIVES

Waves propagation in elastic media -Stress tensor – Deformation tensor – Relationships between stresses and deformations – Equations of motion in terms of displacement – Equations of waves – Compressional and shear waves

Seismic waves – Classification of seismic waves – Propagation of seismic waves – Earth inner structure – Earthquakes localisation – Lithosphere structure – Lithosphere dynamics
Deformation and failure - Stress and strain analysis - Fracture mechanics and elastic moduli.
Ground motion records - Definition and general principles – Response curve of seismographs – Main types of seismographs
Seismic source – Dynamical parameters of the seismic source – Fault propagation - Elastic rebound theory and focal mechanisms - Maths representation of hypocenter phenomena
Inverse problem and seismic tomography – Problem inverse definition – Data and model spaces
Seismic Tomography – earthquakes Localization
Earthquakes size – Earthquakes magnitude – Earthquakes

OTHER ACTIVITIES BESIDE THE COURSE

Seminar to Ph.D students and research fellows.

VISITING PROFESSOR PROFILE

A profile is required that can cover the aspects of rock deformation laboratory experiments aimed at constraining earthquake mechanics in the laboratory. Expertise should focus on the experimental determination of mechanical parameters under uniaxial, triaxial, extension, and shear strength conditions. This includes elastic deformation, brittle and ductile behavior, mechanical anisotropy, and micromechanical models. The profile should also encompass deformation mechanisms, physical properties, and the experimental determination of physical parameters (density, porosity, elastic wave velocity). Additionally, knowledge of friction and laboratory experiments is required. The profile should include expertise in seismic signals, thermo-chemical reactions, the mechanical behavior of rock masses, and the monitoring of slow deformation before rupture.

CONTACT REFERENT

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