



UNIVERSITÀ DEGLI STUDI DI TORINO

ID

VP142_DIP_TER

Visiting Professor Program Academic year 2022/2023

TEACHING COMMITMENT: 12 hours

COURSE TITLE

Seismology and Earthquake Mechanics

TEACHING PERIOD

2nd term

SCIENTIFIC AREA

Geophysics

LANGUAGE USED TO TEACH

English

COURSE SUMMARY

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 intensity – Earthquakes statistics - Clustering parameters – Microseismicity and applications.

Earthquakes mechanics in laboratory. Experimental determination of mechanical parameters in uniaxial, triaxial, extension and shear strength. Elastic deformation, brittle and ductile. Mechanical

anisotropy and micromechanical models. Deformation mechanisms and physical properties. Experimental determination of physical parameters (density, porosity, elastic waves velocity). Friction and laborator.

LEARNING OBJECTIVES

The course aims to provide theoretical and experimental tools finalised to the knowledge of earthquakes generation processes and waves propagation. The student 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

TUTORSHIP ACTIVITIES

N/A

LAB ACTIVITIES

N/A

OTHER ACTIVITIES BESIDES THE COURSE

1 Seminar to PhD students and research fellows

VISITING PROFESSOR PROFILE

Expert in small scale seismology and laboratory rock deformation experiments with measurements of geophysical and seismological properties. Specific knowledges on experimental earthquake mechanics applied to the (i) understanding of rock mass stability and fault friction, and (ii) the investigation of fluid-driven seismicity in the shallow crust with particular focus on seismicity in active volcanoes and geothermal areas.

CONTACT PERSON AT THE DEPARTMENT

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