UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Applied Seismology

2627-1-F7402Q018

Aims

The objective of the course is to provide students with the basic concepts of seismology and applied seismology necessary for interpreting seismic hazard models and for producing documents required for land-use planning, such as seismic microzonation maps.

With reference to the Dublin Descriptors:

a) Knowledge and understanding:
Applications of geology in the field of engineering and in the assessment of geological and environmental hazards for risk mitigation purposes.

This theoretical and practical knowledge is acquired through attendance at lectures, practical classes, laboratory and field activities, also supported by tutoring activities and group work.
The level of learning, in terms of knowledge and understanding, is assessed through examinations, oral tests, and written reports.

b) Ability to apply knowledge and understanding:
Study of geological issues through the use of modern instruments and the application of qualitative and semi-quantitative methods.

These skills will be achieved through attendance at laboratory sessions, which include the use of specific software and the preparation of individually written reports.

Contents

- Evaluate the parameters that quantify the size of an earthquake and the ground shaking with an applied perspective

- Empirical techniques for the estimation of ground shaking and local site response oriented to engineering design
- Concept of probabilistic and deterministic seismic hazard
- Basics of the Italian building code (sections of interest for geologists)
- Earthquake induced hazards: landslides, liquefaction and surface faulting
- Basics of seismic microzonation, a tool for urban and land planning in a seismic prone area
- Realization of a first level microzonation study

Detailed program

Basics of earthquake characterization: size of an earthquake, fault characterization and seismic waves; seismic catalogues (historical and instrumental)

Ground motion intensity measures and ground motion prediction equations: parameters that quantify the ground shaking (peak, integral and frequency dependent)

Site effects: basic theory on site amplification and numerical and empirical techniques to quantify site amplification; acquisition of seismic noise in the field

Ground motion prediction: empirical ground motion models (derivation and applications) and realization of an earthquake scenario

Earthquake induced hazards (landslides, liquefaction and surface faulting): basic concepts and empirical techniques to qunatify earthquake induced hazards

Fundamentals of deterministic and probabilistic seismic hazard: basic concepts on probablistic seismic hazard (Gutemberg-Richter equation, Poisson assumptions and interpretation of a hazard curve

The Italian seismic hazard map (MPS04) and introduction to the Italian seismic code (sections of interest to geologists): interpretation of MPS04 to characterize the seismic hazard of a site and derivation of design spectra

Seismic microzonation: principles of seismic microzonation and realization of a first level seismic hazard map

Prerequisites

None

Teaching form

4 ECTS credits, corresponding to 48 hours of in-person Interactive Teaching (IT), during which virtual laboratories

are used.

Textbook and teaching resource

Lecture slides

Recommended textbooks:
Faccioli E, Paolucci R, (2005) Elementi di sismologia applicata all'ingegneria, Pitagora Editrice Bologna (ISBN: 8837115008)
Lanzo G., Silvestri E. (1999) Risposta Sismica Locale. Hevelius Edizioni ISBN 978-88-86977-91-3

Free pdf
F. Bramerini, G. Di Pasquale, G. Naso, M. Severino (2008) Indirizzi e criteri per la microzonazione sismica (Parte I, II, III), Dipartimento della Protezione Civile

Semester

Second semester (March 2026 - May 2026)

Assessment method

Oral exam
DISCUSSION AND EVALUATION OF THE REPORT OF THE LAB PRACTICALS
DISCUSSION ON THE TOPICS OF THE LECTURES.

Office hours

By appointment Thursday 9:30 -11:30 (at INGV department via Corti 12, Milano)

Sustainable Development Goals

QUALITY EDUCATION | INDUSTRY, INNOVATION AND INFRASTRUCTURE | SUSTAINABLE CITIES AND COMMUNITIES