

**Course offered for the PhD program
in Civil, Chemical and Environmental Engineering
Curriculum in Structural and Geotechnical Engineering, Mechanics and Materials
a.a. 2022/2023 (XXXVIII cycle)**

(Course is open for participation of students from other PhD cycles or programs)

1. Title

Seismic assessment of existing masonry buildings: modelling, analysis and safety verifications

2. Course Description

3h

- Course introduction
- Damage observation of masonry buildings after recent earthquakes
- Safety and preservation in seismic prone areas: definition of performance levels and critical issues in historical monumental buildings
- Classification of possible modelling approaches of masonry structures: in-plane and out-of-plane behaviour of masonry walls

3h

- Critical issues on the assessment of existing buildings based on a deterministic approach (limits/drawbacks of procedures based on the use of Confidence Factors)
- Definition and modelling of aleatory and epistemic uncertainties and use of sensitivity analysis to address the investigation plan and the choice of the uncertain variables to be assumed in the assessment

4h

- Modelling and analysis of the global response: global modelling or sub-structuring into macroelements.
- Methods of analysis: linear Vs nonlinear; static Vs dynamic
- Basics of pushover analysis and verification in local or global terms (displacement-based assessment). Applicability in the case of irregular structures (in-plan or in-elevation). Critical issues related to the in-plane stiffness of horizontal diaphragms.

4h

- Modelling and analysis of local mechanisms
- The limit analysis of masonry structures: application to the limit equilibrium of arches and the activation of rocking under seismic actions
- Displacement-based assessment of rocking systems (linear and nonlinear kinematic analysis)
- Floor response spectra for the verification of local mechanisms

3. Course Organization

The course is made by theoretical lessons (14 hours) and a workshop with application to case studies (6 hours).

4. Teacher

Sergio Lagomarsino, Professor of Structural Engineering, DICCA – University of Genoa

Serena Cattari, Associate Professor of Structural Engineering, DICCA – University of Genoa

5. Duration and credits

20 hours (4 CFU)

6. Activation mode and teaching period

The course will be held in English in February 2023

7. Deadline for registration

Two weeks before the beginning of the course

8. Final exam

Oral only, in the date requested by the student.