

**Course offered by the PhD program
in Civil, Chemical and Environmental Engineering
a.y. 2026/2027 (42 cycle)**

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

1. Title

Seismic vulnerability and risk of existing unreinforced masonry structures

2. Course Objectives and Description

The aim of the course is to provide theoretical and practical insights on seismic vulnerability and risk assesment.

Fragility curves constitute an essential tool in risk analyses. Together with the hazard representation and exposed assets databases, they are used to provide an estimate of physical damage and losses. The latter are typically achieved by introducing consequence functions, which correlate the probability of attainment specific damage states (DS) – estimated via the fragility curves – with the losses under consideration.

Critical issues on the development of fragility curves will be discussed by considering various possible approaches, such as empirical, mechanical-analytical, mechanical-numerical and hybrid. After a general overview of these methods, then more detailed insights will be presented focusing on masonry existing buildings. Then, also some of procedures available in literature for the evaluation of seismic losses and consequences will be presented.

The experience made in Italy by the ReLUIS consortium within the MARS project to support the Department of Civil Protection in developing the Seismic National Risk Assessment will serve as example to practically debate these issues.

An assignment will be provided to the students, in order they apply the presented tools for deriving and applying fragility curves to a specific case study.

3. Course Organization

Frontal lessons and workshop classes in the numerical lab

4. Teacher

Lagomarsino Sergio
Cattari Serena

5. Duration and credits

15 hours – 3 CFU

6. Activation mode and teaching period

June 2027

7. Deadline for registration

End of May 2027, by email message to the teachers (sergio.lagomarsino@unige.it or serena.cattari@unige.it)

8. Final exam

Presentation of the laboratory work and discussion of the theoretical basis.