

**Course offered for the PhD program  
in Civil, Chemical and Environmental Engineering  
Curriculum in Structural and Geotechnical Engineering, Mechanics and Materials  
a.a. 2019/2020 (XXXV ciclo)**

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

**1. Title**

Probabilistic seismic assessment of existing masonry buildings

**2. Course Description**

1.5h

- Course introduction
- Basics of the hazard characterization
- Motivations for a probabilistic seismic assessment of existing buildings: 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 final choice of the uncertain variable to be assumed in the assessment

1.5h

- Probabilistic approach for the seismic assessment: total probability decomposition in the time-independent framework (contributions related to hazard, structural response and losses)
- SAC FEMA 2000 Method –Cornell theory

4h

- Probabilistic assessment through nonlinear dynamic analysis: Incremental Dynamic Analysis (IDA), Multiple Stripe Analysis (MSA) o Cloud Method, applied to SDOF and MDOF systems (2h);
- Probabilistic assessment through nonlinear dynamic analysis and the Response Surface Technique: Incremental Static Analysis (ISA) applied to MDOF systems (2h);

8h

- Seismic global in-plane response of masonry buildings: critical issues on nonlinear response modelling (particular attention is paid to the equivalent frame approach and the modelling of piers and spandrels); critical issues in case of irregular configuration and/or with flexible diaphragms
- Criteria for the definition of performance levels and engineering demand parameters to be adopted for the probabilistic assessment
- Application of the probabilistic assessment through the three methods proposed (IDA on SDOF and MDOF systems, ISA on MDOF system)

### **3. Course Organization**

The course is held by means of theoretical lessons on the principles of the seismic probabilistic assessment of existing buildings (7 hours) and lessons focused on their application to the URM buildings (8 hours).

### **4. Teacher**

Prof. Serena Cattari

### **5. Duration and credits**

15 hours (3 CFU)

### **6. Activation mode and teaching period**

The course will be held in English in September 2020

### **7. Deadline for registration**

Two weeks before the beginning of the course

### **8. Final exam**

Oral only, in the date requested by the student.