UNICUSANO
Università degli Studi Niccolò Cusano - Telematica Roma

PhD program
in Industrial and Civil Engineering

Seismic behavior of existing masonry building and strength resource due to the rocking contribution

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Mission of the course ***Main topics***	The course deals with the assessment of the dynamical behavior of masonry elements during earthquakes. Housner developed in 1963 the first analytical formulation of the problem, studying the behavior of inverted pendulum structures, modelled as rigid blocks oscillating about the two edges of their base section. For this type of structure is reasonable to neglect body deformability, since their response mainly depends on rigid oscillations. In fact, the displacements due to elasticity are generally orders of magnitude smaller and consequently they do not greatly affect the global behavior of the element. The course starts with a description of the main typologies of out-of-plane mechanisms, typically observed in masonry structures during earthquakes. In the second part of the course, the equations of the motion of the masonry block are derived for both cases of free and forced oscillations. The course then moves with a description of the classical models to account for dissipation energy phenomena occurring at impacts. Finally, the course concludes dealing with the response of the masonry element to ground motion, by means of numerical and experimental examples.

Teaching staff

Fabio Di Carlo obtained his PhD in Structural Engineering at the University of Rome Tor Vergata in 2015, with a dissertation titled “Strength reduction factor for rocking masonry structures”. He is an Assistant Professor at the Faculty of Engineering of the University of Rome Tor Vergata, focusing his research interests on the behaviour of masonry, reinforced concrete and fibre reinforced structures. He collaborates with the chairs of “Structural Analysis and Design”, “Bridges and Tunnels”, “Statics of Historic Masonry Constructions” and “Existing RC Structures”.

Course organization	The course has a duration of 10 hours.
Course outline	*Lesson 1 – 01/04/2020 – 10:30-13:30* Seismic vulnerability assessment and seismic hazard for masonry structures. Main typologies of out-of-plane local mechanisms. *Lesson 2 – 01/04/2020 – 15:00-17:00* Equation of the free oscillatory motion of the masonry block. Models for energy dissipation phenomena: definition of the coefficient of restitution. Numerical examples. *Lesson 3 – 08/04/2020 – 10:30-13:30* Equation of the forced oscillatory motion of the masonry block, for simple pulse excitations. Numerical examples. *Lesson 4 – 08/04/2020 – 15:00-17:00* Response to ground motion. Numerical and experimental examples.
Learning evaluation	Students are required to prepare a final report on a subject agreed upon with the teacher and to present the numerical application developed during the course.

Location: *Niccolò Cusano University- Department of Engineering. Via Don Carlo Gnocchi, 3 Rome.*
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