8-10 July 2025

ICS, FEUP Campus, Building B
Porto

Training Course for Structural Engineers (24 hours)

Design of Advanced Techniques for Seismic Protection: Seismic Isolation and Energy Dissipation

COORDINATORS

Humberto Varum *(University of Porto, Portugal)*
Alessandra Aprile *(University of Ferrara, Italy)*

Organization

Sponsor

PRETENSA

LECTURERS

Aprile, Alessandra – *University of Ferrara, WISEcivil, Italy*
Camata, Guido – *University of Chieti-Pescara, ASDEA, Italy*
Guerreiro, Luís – *University of Lisbon, CERIS, Portugal*
Pavese, Alberto – *University of Pavia, EUCENTRE, Italy*
Zerbin, Matteo – *University of Ferrara, WISEcivil, Italy*

COURSE OBJECTIVES

Enable professionals to design structures using passive seismic protection techniques, namely base isolation and energy dissipation systems.

TEACHING MATERIAL

Lecture notes in PDF format.
Spreadsheets for preliminary design of passive protection devices.

PREREQUISITES

Good level of knowledge of Structural Dynamics and Seismic Engineering and good level of knowledge of English.

EDUCATIONAL CREDITS

Participation in the course grants the recognition of 24 educational hours.
To obtain the certificate, participants must pass the final exam.

ORGANIZATION

The administrative organization will be operated by
Mr. Manuel Carvalho & Ms. Amélia Azeredo (manuel@fe.up.pt & ics@fe.up.pt)

REGISTRATION*

Fees	until May 15th	after May 15th
Regular	550,00 €	650,00 €
Ph.D. Students	400,00 €	500,00 €

Link for registration: [link]

* Registrations will only be considered after payment. The course is subject to a minimum of 30 participants. If this requirement is not met, the amount paid will be fully reimbursed.

Program

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Design of Advanced Techniques for Seismic Protection: Seismic Isolation and Energy Dissipation

	DAY 1 – 8 July	DAY 2 – 9 July	DAY 3 – 10 July
8:30-9:00	Greetings from the Course Coordinators (**H. Varum** and **A. Aprile**).		
9:00-10:45	Seismic isolation and energy dissipation: evolution, perspectives, examples and field lessons (**L. Guerreiro**)	Design using the DDBD method for the isolation system of the reinforced concrete frame previously introduced. The case is presented in detail and assigned as an exercise to be completed independently (**M. Zerbin**)	Construction and maintenance aspects. Presentation of case studies of existing buildings seismically retrofitted using seismic isolation and/or energy dissipation (**G. Camata**)
	Coffee break	Coffee break	Coffee break
11:15-13:00	Seismic design in nonlinear field using the DDBD (Direct Displacement-Based Design) method. Method's theoretical background and examples (**A. Aprile**)	Energy dissipation with Hysteretic Dampers (HD), theory and practice. Design criteria using the DDBD Method. Verification Criteria. Regulatory aspects according to EN 1998-1:2024 (**A. Aprile**)	Research frontiers and regulatory aspects (EN 1998-1:2024; EN 15129:2018). Experimental qualification tests and acceptance tests for isolators and dampers (**A. Pavese**)
	Lunch	Lunch	Lunch
14:30-16:15	Presentation of the case study of a reinforced concrete frame structure addressed using the DDBD method. The case is presented in detail and assigned as an exercise to be completed independently (**M. Zerbin**).	Design using the DDBD Method for braces with HD for the reinforced concrete frame previously introduced. The case is presented in detail and assigned as an exercise to be completed independently (**M. Zerbin**)	Structural verification using NLTHA (Nonlinear Time History Analysis). Selection of accelerograms. Nonlinear modelling of reinforced concrete elements, shear walls, isolation devices, and energy dissipation devices (**G. Camata**)
	Coffee break	Coffee break	Coffee break
16:45-18:30	Seismic isolation, theory and practice. Types of isolators. Design criteria using the DDBD Method. Verification Criteria. Regulatory Aspects according to EN 1998-1:2024 (**A. Aprile**).	Dissipation with Viscous Devices (VD), Theory and Practice. Design criteria using the DDBD Method. Verification Criteria. Regulatory aspects according to EN 1998-1:2024 (**A. Aprile**)	Performing NLTHA for the reinforced concrete frame previously introduced using MidasGen software. Discussion of the results obtained from the exercises of the previous lessons (**M. Zerbin**)
18:30-19:00			Final Exam

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PRETENSA