



Course: Seismic isolation and dissipation [509689]

a.y. 2024/25

Lectures: Prof. A. Pavese, Prof. M. Furinghetti

Date: 3 Feb 2025 - 28 Feb 2025

Course schedule

Week	Date	Lectures hours			Tutorial hours			Lectures	Tutorials	Exams
		From	To	Classroom	From	To	Classroom			
1	3-Feb-25	9:30	12:30	TBD				3:00		
	4-Feb-25	9:30	12:30	TBD				3:00		
	5-Feb-25	9:30	12:30	TBD				3:00		
	6-Feb-25	9:30	12:30	TBD	14:00	17:00	TBD	3:00	3:00	
	7-Feb-25									
2	10-Feb-25	9:30	12:30	TBD				3:00		
	11-Feb-25	9:30	12:30	TBD				3:00		
	12-Feb-25	9:30	12:30	TBD	14:00	17:00	TBD	3:00	3:00	
	13-Feb-25	9:30	12:30	TBD	14:00	17:00	TBD	3:00	3:00	
	14-Feb-25									
3	17-Feb-25	9:30	12:30	TBD				3:00		
	18-Feb-25	9:30	12:30	TBD				3:00		
	19-Feb-25	9:30	12:30	TBD	14:00	17:00	TBD	3:00	3:00	
	20-Feb-25				14:00	17:00	TBD		3:00	
	21-Feb-25									
4	24-Feb-25				14:00	17:00	TBD		3:00	
	25-Feb-25				14:00	17:00	TBD		3:00	
	26-Feb-25									
	27-Feb-25	9:30	12:30							3:00
	28-Feb-25									

Final exam

Objectives of the course

The course focuses on the seismic protection of structures through isolation techniques (structural-foundation and structure-structure decoupling) and additional damping (dissipation). Isolation and damping are advanced design methods that rely on mechanical devices integrated into the structure to modify its dynamic response. The goals of these techniques are twofold: to reduce the impact of seismic shaking, enabling a simpler and more cost-effective structural design, and to localize potential damage within the isolation and damping devices, minimizing the time and cost required to restore the functionality of technologically advanced structures. These methods have been widely applied in the design of new structures in high-seismic-risk areas for many years and are increasingly recognized as competitive alternatives to traditional methods for retrofitting existing buildings



Contents of the course

- Decoupling and damping effects on the dynamic response of systems subjected to seismic actions
- Basis of advanced design and analysis of advantages compared to the traditional approach
- Dissipation mechanisms characterizing the behavior of devices used in practical applications: viscosity, hysteresis, and friction
- Rubber, lead-core rubber, and devices sliding on flat and curved surfaces
- Displacement and velocity-dependent additional damping devices
- Dynamic restraint devices
- Study of device behavior through experimental tests
- Linear and non linear models for antiseismic devices (isolation and dissipation)
- Design of seismic isolation systems
- Design of additional damping systems
- Examples of application

References

- Dynamics of Structures, R.W. Clough, J. Penzien, McGraw-Hill, 1975
- Principles of Passive Supplemental Damping and Seismic Isolation, C. Christopoulos, A. Filiatrault. IUSS Press, 2006
- EN15129:2009 “Antiseismic devices”

Requirements

Basic knowledge of structural engineering, design of structures, and structural dynamics is required, with a specific focus on topics related to seismic behavior of structures

ASSESSMENT	% of Final Mark	Documentation
Assignments	30%	Open
Final Examination	70%	Closed books and notes