

Background and Motivation

The tremendous impact of natural hazards, such as earthquakes, tsunamis, flooding, etc, which triggered technological accidents, referred to as natural-technological (NaTech) events, was demonstrated by: i) the recent Tohoku earthquake and the following Fukushima disaster in 2011; ii) the UK's 2015 winter floods which topped £5bn, with thousands of families and businesses that faced financial problems because of inadequate or non-existent insurance. Therefore, today there is a stronger need than ever to grow researchers/practitioners that combine a robust academic foundation in reliability/resilience with practical experiences, technological expertise with awareness of the socio-economical context and conviction to furthering research with an entrepreneurial spirit.

Scientific Committee

Oreste S. Bursi, Paolo Gardoni, Giuseppe Abbiati, Matjaz Dolsek, Jamie Padgett, Matteo Pozzi, Dimitrios Vamvatsikos

Local Organizing Committee

Oreste S. Bursi, Nicola Tondini, Chiara Nardin, Fabrizio Aloschi

Summer School Chair

Prof. Oreste Bursi, University of Trento, Department of Civil, Environmental and Mechanical Engineering, Via Mesiano 77 38123, Trento, Italy



Session Topics

A. Performance-based engineering and resilience (PBE&R) against wind hazards

Latest developments in the field of performance-based engineering and resilience against wind hazards. Wind fields, turbulence and aerodynamic loads for structural engineering. Dynamic analysis methods for structural response under random wind loads. Applications of probability principles in relation to design of long-span bridges and tall buildings



B. Design of linear and nonlinear lattice materials-based shields for enhanced performance of process plant components.

Equations of motion of saturated soils under dynamic conditions, and their numerical solution with FEM. Basic features of the behaviour of soil subjected to cyclic loading. Overview of constitutive modelling tools for cyclic soil behaviour. Outline of design principles in earthquake geotechnical engineering.



C. Structural control system design.

Passive, semi-active and active control. Structural dynamics in the state-space. Passive system design: passive increment, passive coupling, passive isolation. Active and semi-active enhancement. Model-driven and data-driven design. Applications. Active control of cable oscillations. Nonlinear viscous coupling for seismic retrofitting.



D. Risk-based framework for structures in major hazard facilities.

International standards for structural safety requirements of structures and infrastructures to extreme loads. Definitions of design-basis and beyond-design-basis accidents in major hazard facilities. Setting of a risk-based framework. Fragility curve evaluation of components/subsystems of major hazard plants. Procedures for the definition and propagation of accidents chains in risk analysis.



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N Northeastern University
Civil and Environmental
Engineering

2nd Online International
Summer School on

**MECHANICS AND
PERFORMANCE OF
RESILIENT STRUCTURES AND
INFRASTRUCTURES
(MECHRES20)**

September 7-11, 2020

Organized by the **Department of Civil,
Environmental and Mechanical Engineering
University of Trento (DICAM)**

Chair: prof. Oreste S. Bursi

Seminar H1 Room of Civil Engineering
(Lectures will also be delivered virtually
through web-based platform)

Summer School objective

The main objective of this Summer School is to offer innovative training ground, experience in risk-based simulation/development of structures and infrastructures, vibration reduction and disaster resilience subjected to earthquakes, wind, etc. as well as laboratory experience.

Who should attend

Graduate students, postdoctoral researchers and practitioners willing to acquire a depth knowledge on the subject.

Summer School hands-on tutorials

In order to offer active participation besides theory, the course intends to provide the following tutorials.

- Design of linear and nonlinear lattice materials-based shields for enhanced performance of process plant components (O.S. Bursi)
- Risk-based framework for structures in major hazard facilities (F. Paolacci)
- Structural control systems and design procedure (V. Gattulli)
- Performance-Based engineering and resilience against wind hazards (L. Caracoglia)

Summer School schedule

Meeting times are CEST (Central European Summer Time) or UTC+02:00. Virtual lectures will be delivered synchronously and recorded for off-line distance learning.

Tuesday 8

9.00-9.05 Welcome

Lectures: Session – Oreste S. Bursi

9.05-10.45 Elastodynamics of lattice undamped and damped materials

11.00-12.45 Wave propagation and nonlinear lattice materials

12.45-14.30 Lunch break

Lectures: Session – Vincenzo Gattulli

14.30-16.15 Structural control systems and design procedure - Part 1

16.15-16.30 Coffee break

16.30-18.15 Structural control systems and design procedure - Part 2

Wednesday 9

Lectures: Session – Fabrizio Paolacci

9.00-10.45 Risk estimates in major hazard facilities - Part 1

10.45-11.00 Coffee break

11.00-12.45 Risk estimates in major hazard facilities - Part 2

12.45-14.30 Lunch break

14.30-16.15 Risk estimates in major hazard facilities - Part 3

16.15-16.30 Coffee break

16.30-18.15 Tutorial - Risk estimates in major hazard facilities

Thursday 10

Lectures: Session – Oreste S. Bursi

9.00-10.45 Seismic mitigation for process plant components

10.45-11.00 Coffee break

11.00-12.45 Tutorials - Determination of flexural band gaps in periodic piping systems

12.45-14.30 Lunch break

Lectures: Session – Vincenzo Gattulli

14.30-16.15 Structural control systems and design procedure - Part 3

16.15-16.30 Coffee break

16.30-18.15 Tutorial - Passive and semiactive system design

Friday 11

Lectures: Session – Luca Caracoglia

9.00-10.45 Performance-Based Engineering and Resilience (PBE&R) against wind hazards – Part 1

10.45-11.00 Coffee Break

11.00-12.45 Performance-Based Engineering and Resilience (PBE&R) against wind hazards – Part 2

12.45-14.30 Lunch Break

14.30-16.15 Performance-Based Engineering and Resilience (PBE&R) against wind hazards – Part 3

16.15-16.30 Coffee Break

16.30-18.15 Tutorials – PBE&R against wind hazards

18.15-18.45 Conclusion and adjourn



Registration

The registration fee (€ 100) will cover complete course materials, including slides and hands-on tutorials. It is worth 4 credits with homework assignments. Registration is required.

To register and for more information, please contact the Summer School secretariat, Mrs. Lorena Galante, by August 25th 2020; lorena.galante@unitn.it Tel. +39 0461 282660. Ms. Chiara Nardin may also be contacted: Chiara.nardin@unitn.it tel. +39 0461 282546.