PhD programme in Structural Engineering, Geotechnics and Seismic Risk

Disaster resilience assessment of urban networks (D-RUN 2025)

Lecturers: Prof. Fulvio Parisi, Prof. Andrea Miano

Exercises: Dr. Fabrizio Aloschi

Period: 31st March – 11th April 2025

Syllabus:

Urban infrastructure is threatened by various hazards, which affect the functionality, damage and recovery of interconnected urban networks. Cities with dense populations and complex systems of roads, bridges, and buildings face increasing risk due to their physical vulnerability and high exposure to earthquakes. To understand the seismic resilience and plan actions for preserving the safety of property, and consequently, the safety of people, these complex systems are first modelled as networks, and statistical tools are employed to simulate real-world scenarios. The D-RUN 2025 course will provide essential tools to perform these simulations and to evaluate the disaster resilience of urban networks. Participants will be taught how to integrate models for hazards, physical exposure, and infrastructure vulnerability via QGIS, particularly focusing on disaster resilience to natural hazards such as earthquakes, landslides or floods. Through hands-on and numerical exercises via MATLAB, participants will simulate natural events in urban environments, analysing the post-disaster functionality of urban networks and simulating recovery process according to different reconstruction strategies.

Course schedule

Date		Lecture
Monday	31/03/2025	Introduction to disaster resilience and networks (3 hrs – Prof. Parisi/Miano)
Tuesday	01/04/2025	Prioritization analysis (2 hrs – Prof. Parisi/Miano)
Wednesday	02/04/2025	Assessment of recovery time (3 hrs – Prof. Parisi/Miano)
Thursday	03/04/2025	Exercise: application of recovery time analysis (3 hrs – Dr. Aloschi)
Monday	07/04/2025	Disaster resilience assessment (3 hrs – Prof. Parisi/Miano)
Tuesday	08/04/2025	Network model updating through satellite data and GIS tools (2 hrs – Prof. Miano)
Wednesday	09/04/2025	Exercise: urban modelling of vulnerability and exposure (2 hrs – Dr. Aloschi)
Thursday	10/04/2025	Efficiency and resilience assessment of urban networks (3 hrs – Prof. Parisi/Miano)
Friday	11/04/2025	Exercise: earthquake scenarios in urban networks (3 hrs – Dr. Aloschi)

- ✓ Lectures will be held in blended mode, both in person and online via Microsoft Teams. The duration of each lecture will be 2 hours (from 11:00 to 13:00) or 3 hours (from 10:00 to 13:00).

- ✓ The date of the final exam (mandatory for PhD students who need a certificate of exam) will be communicated during the course to ensure compatibility with students' schedule.

- ✓ Those who are interested in attending the course should send an email to phd.dist@unina.it (for registration), cc'ing fulvio.parisi@unina.it and andrea.miano@unina.it (lecturers).