ROSE School | Earthquake Engineering

Risk Assessment and Loss Estimation

Lecturers: **P. Bazzurro, D. Vamvatsikos & M. Kohrangi**
Date: 21/09/2026 – 21/10/2026
Credits: 6 ECTS (CFU)

Course Description

This course will start with a very succinct overview of the basics of probability and statistics that are commonly used in the field of hazard and risk assessment. The knowledge of the subject is a pre-requisite of the course. After this preamble, in the first part we will move on to describe the basics of risk assessment and loss estimation for assets subject to natural events such as earthquakes and tropical cyclones. In this part we will also review the fundamentals of seismic hazard analysis and we will cover both probabilistic and deterministic approaches. Then we will deal with the theory behind catastrophe risk modelling of portfolios of structures mostly for earthquakes but will briefly discuss tropical cyclones as well. The applications discussed are typical of those found in the insurance/reinsurance industry, capital markets, and sovereign disaster risk financing. Therefore, some fundamentals of insurance/reinsurance will also be provided. Then we will introduce the concepts of seismic risk for single structures and we will compare and contrast them with the approach for portfolio of assets. Time permitting, we will discuss the risk assessment of networks and of nuclear power plants. These cases have special aspects that are not found in the previous applications discussed during the course.

The second part will focus on the application of the portfolio seismic risk assessment theory to real case studies. In this part you will be using models already built and the emphasis will be in learning how to compute and interpret correctly their results.

Finally the third and final part of the course will tackle in detail the state-of-the art approach to assess seismic risk of single buildings for both collapse and loss estimation purposes. The techniques that you will learn here are applicable both to the design of new buildings and to the assessment of existing ones.