

Course title:

Performance-based seismic risk analysis of complex infrastructural systems

Duration [number of hours]: ___24___

PhD Program [MERC/MPS/SPACE]: ___MERC___

Name and Contact Details of Lecturer(s):

Iunio Iervolino, Professor of Earthquake Engineering and Structural Dynamics, Università degli Studi di Napoli Federico II, Via Claudio 21, 80125 Naples – Italy, Tel: +39 081 7683488, Fax: +39 081 7685921, iunio.iervolino@unina.it.

Course Description [max 150 words]:

The course will provide the fundamentals of infrastructure risk analysis with respect natural and anthropic hazards. The interaction of natural and industrial hazard will also be addressed. The course develops within the performance-based framework where risk assessment is probabilistic and the risk metrics are computed separating the problem in: hazard, vulnerability and loss.

The course will address the risk as a time-invariant as well as a time-variant problem. The most common stochastic models for the representation of the natural and anthropic hazards will be discussed. Similarly, the models for the physical vulnerability of infrastructure components will be addressed. Options for loss and consequence functions will also be part of the course.

The course will include applications to natural hazards (i.e., earthquakes and tsunamis of natural origin) and to civil infrastructure (e.g., buildings and lifelines) as well as industrial hazard in the process industry.

Syllabus [itemized list of course topics]:

- Fundamentals concepts of stochastic modelling in risk analysis.
- Loss functions and risk metrics.
- Risk-framing equations in time-invariant and time-variant environments.
- Stochastic modelling of natural and anthropic hazards.
- Stochastic modelling of infrastructural components vulnerability.
- Systemic risk analysis.
- Loss accumulation and life-cycle analysis.
- Resilience analysis of infrastructure.

Assessment [form of assessment, e.g. final written/oral exam, solutions of problems during the course, final project to be handed-in etc]:

- Homeworks.
- Written and oral final exam.

Suggested reading and online resources:

1. Lecture notes.
2. Readings provided during the course.