SSM
Scuola Superiore Meridionale

Course title:

Probability calculus and elements of stochastic modelling

Duration [number of hours]**: 24**

PhD Program [MERC/MPHS/SPACE]**: MERC**

Name and Contact details of unit organizer(s):

Prof. Pasquale Cito
Affiliation(s): Scuola Superiore Meridionale
Website: https://www.ssmeridionale.it/pasquale-cito/
Email: p.cito@ssmeridionale.it

Course Description [max 150 words]**:**

The course provides students with the fundamental concepts of probability calculus and an introduction to stochastic processes, which underpin many engineering applications, including quantitative risk analysis. It begins by reviewing the basic notions of random experiment, event, and probability. The main rules of probability calculus are then introduced, followed by random variables and (some) probability models. The final part provides an introduction to stochastic processes, including the Poisson process. The course combines theoretical lectures with applications and problem assignments. Students will be required to use MATLAB, Excel, or Python for the practical activities and assignments. Assignment solutions will be discussed in dedicated lessons. The assignments will be assessed together with a final written examination.

Syllabus [itemized list of course topics]**:**

Random experiments
Events' algebra and Venn's diagrams
Probability definitions and interpretations
Axioms of probability and calculus' rules
Discrete and continuous random variables
Marginal and joint probability distribution models
Introduction to stochastic processes: the Poisson process and applications to risk analysis.

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

Assessment will be based on problem assignments completed during the course and a final written examination. The assignments and the written examination will jointly contribute to the final grade.

Suggested reading and online resources:

Suggested books:
Ross, Sheldon. *Introduction to Probability Models*. 11th ed. San Diego: Academic Press, 2014.
Benjamin, J. R., & Cornell, C. A. (2014). Probability, statistics, and decision for civil engineers. Courier Corporation.
Iervolino, I. (2021). Dinamica delle strutture e ingegneria sismica: Principi e applicazioni. HOEPLI EDITORE (In Italian).
Additional references will be given during the lectures.