Finanziato dall'Unione europea NextGenerationUE
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
VITALITY

Progetto VITALITY | Programma di Consulenza Specialistica | **Seminario**

Reliability of random material microstructures

Abstract

Reliability of physical systems is defined by the probability that the extreme responses of these systems to deterministic/random actions do not exceed critical levels. Generally, numerical methods are employed to estimate system reliability since the distributions of extreme responses are not available analytically. The lecture presents a three-step numerical method for solution. Suppose that material properties can be described by a random field. The first step of the method constructs finite dimensional (FD) models, i.e., deterministic functions of space and/or time and finite sets of random variables. This step is essential for the implementation of numerical methods since a random field is an uncountable family of random variables and numerical methods can only deal with finite sets of random variables. The second step calculates system responses corresponding to FD material models.. As noted, responses corresponding to target material properties cannot be obtained numerically. The third step establishes conditions under which the distribution of extremes of the response obtained with the FD model converges to the distribution of extremes of the responses corresponding to target material properties. The practical implication of this convergence is that the quantity of interest for reliability analysis, i.e., the distribution of response extremes, can be approximated by the distribution of response extremes obtained by FD models which can be estimated from realizations generated by standard Monte Carlo algorithms.

Giovedì 24 ottobre 2024 - Ore 9.30

Aula Magna - Polo di Ingegneria

Mircea Grigoriu

Cornell University

Mircea Dan Grigoriu is Professor at Cornell University (USA), Department of Civil and Environmental Engineering. He has Degrees in Structural Engineering (Bucharest Institute of Civil Engineering), Mathematics (University of Bucharest), and Ph.D. in Civil Engineering (MIT). He is Author of over 200 technical papers and five books on Random Vibration (1992), Applied Non-Gaussian Processes (1995), Stochastic Calculus. (2002), Stochastic Systems. Uncertainty Quantification and Propagation (2012) and Linear Dynamical Systems (2021). Awards: The 1993 IASSAR Research Prize, the 1998 SAE Distinguished Probabilistic Methods Education Award, the election to the Romanian Academy of Technical Sciences (2004), the 2002 Alfred Freudenthal Medal, the Daniel M. Lazar'29 Excellence in Teaching Award (2003), the title of Doctor Honoris Causa, Technical University of Civil Engineering, Bucharest, Romania (2004), the 2005 Norman Medal of ASCE, the grade of EMI Fellow, 2014, and the 2016 Newmark Medal. Also, he is on the editorial board of numerous technical journals.

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