



UNIVERSITÀ DEGLI STUDI
DI PERUGIA



CIVIL AND ENVIRONMENTAL ENGINEERING

DOCTORAL PROGRAM

STOCHASTIC PROCESSES AND EXTREME RARE EVENTS

MODULE 2 ESTIMATES OF PROBABILITIES OF EXTREME RARE EVENTS

Instructor:

Mircea Dan Grigoriu, Ph.D., Professor, Cornell University

Course Description: The course presents essential concepts of the extreme value theory (EVT) and applies these concepts to characterize extremes of sequences of random variables, responses in random microstructures and other random functions. Alternative methods for estimating extremes are also discussed, e.g., the first passage time of stochastic processes via Slepian models. Hands-on MATLAB numerical examples are used to facilitate understanding.

MODULE SCHEDULE

January, 25th 2021 - 11:30-13:30

A primer of the extreme value theory (EVT), features/limitations of the generalized extreme value (GEV) distribution, illustration for polycrystals based on measurements and hands-on MATLAB numerical examples.

January, 26th 2021 - 11:30-13:30

Extreme material response for linear random microstructures, construction of matrix-valued random fields with application to random stiffness/compliance random tensors and numerical illustrations.

January, 27th 2021 - 11:30-13:30

On weaknesses of the weakest link model with applications to reliability and fatigue. Construction of distribution of minima. Effects of correlation on extreme distributions, hands-on MATLAB numerical examples.

January, 28th 2021 - 11:30-13:30

Data-based importance sampling for extreme events based on multi-fidelity models. The estimates are constructed from large sets of low fidelity samples and relatively small sets of high fidelity models.

January, 29th 2021 - 11:30-13:30

Applications of theoretical results of the previous lecture to time-invariant/variant stochastic problems. Illustrations include hands-on MATLAB numerical examples.

January, 30th 2021 - 11:30-13:30

First passage time distribution of Gaussian processes via Slepian models, definition and construction of Slepian models, hands-on MATLAB numerical examples.



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.

Location: Campus of Engineering of University of Perugia
Latitude: 43.118177 Longitude: 12.357942

Timetable: January 25, 26, 27, 28, 29, 30 - 11:30 a.m.
Room 1 (CEEPHD Team)

