UNIPG
DIPARTIMENTO
DI INGEGNERIA
CIVILE E AMBIENTALE
A.D. 1308

CIVIL AND ENVIRONMENTAL ENGINEERING

DOCTORAL PROGRAM 2022-2023

STOCHASTIC PROCESSES AND EXTREME RARE EVENTS

MODULE 2
ESTIMATES OF PROBABILITIES OF EXTREME RARE EVENTS

Instructors
Mircea Dan Grigoriu, Ph.D., Professor, Cornell University
Massimiliano Gioffrè, Ph.D., Associate Professor, UniPG

Course Description
This module presents essentials 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. Alternatives 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.

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.

Module Schedule (12 hours, 2 CFU)

May, 8th 2023 - 14:00-16:00
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.

May, 9th 2023 - 15:30-17:30
Extreme material response for linear random microstructures, construction of matrix-valued random fields with application to random stiffness/compliance random tensors and numerical illustrations.

May, 11th 2023 - 14:00-16:00
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.

May, 12th 2023 - 14:00-16:00
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.

May, 15th 2023 - 14:00-16:00
Applications of theoretical results of the previous lecture to time-invariant/variant stochastic problems. Illustrations include hands-on MATLAB numerical examples.

May, 16th 2023 - 14:00-16:00
First passage time distribution of Gaussian processes via Slepian models, definition and construction of Slepian models, hands-on MATLAB numerical examples.

Location

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

Room 1 (CEEPhD Team)

Timetable
from May 8th to May 16th, 2023

Registration information

Teams platform - CEEPhD Team (Room 1)
There is no registration fee for the course.

For more info Mrs. Teresa Nocera, Ph.D. Program Secretariat (teresa.nocera@unipg.it)
Prof. Dr. Filippo Ubertini, Ph.D. Program Coordinator (filippo.ubertini@unipg.it)

Follow us on Facebook
https://www.facebook.com/dicaUniPG/