香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMINAR

STOCHASTIC MECHANICS, GLOBAL RELIABILITY AND OPTIMIZATION OF COMPLEX STRUCTURES VIA PHYSICALLY DRIVEN PROBABILITY DENSITY EVOLUTION METHOD

Speaker
Prof. Jianbing Chen
College of Civil Engineering, Tongji University

Abstract

Full uncertainty quantification and propagation are the basis for the reliability evaluation of complex systems, while the damage and failure from materials to structures should also be incorporated. This leads to the major difficulty lying in the coupling of randomness and nonlinearity for real-world structures and systems, which are generally high-dimensional systems. Incorporating the underlying physics of the system and the principle of preservation of probability will lead to a physically driven full probabilistic uncertainty propagation method. Some new advances will be outlined, including: (1) The generalized density evolution equation and the dimension-reduced probability density evolution equation for high-dimensional nonlinear systems based on the principle of preservation of probability; (2) The effects of randomness of structural parameters observed from experimental studies; and (3) Global reliability and design optimization of structures in the context of uncertainty. Challenging problems to be studied further will also be discussed.

Biography

Jianbing Chen is currently University Distinguished Professor of Tongji University in the College of Civil Engineering. He is the Academic Committee member of Tongji University and vice director of the State Key Laboratory of Disaster Reduction in Civil Engineering. Dr. Chen specializes in the area of uncertainty quantification, stochastic mechanics and reliability, and published 4 books and over 210 journal papers. He received the Natural Science Award of China (2016), the IASSAR Early Achievement Award (2017), the National Science Fund for Distinguished Young Scholars (2017) and the Humboldt Research Award (2023). Prof. Chen now serves as the Chair of the Executive Board of the International Association for Structural Safety and Reliability (IASSAR), member of Board of Directors of the International Civil Engineering Risk and Reliability (CERRA), the Board member of the International Joint Committee on Structural Safety (JCSS) and reporter of WP1, and the vice President of Chinese Society for Vibration Engineering. He also serves as the Co-Editor-in-Chief of the journal Probabilistic Engineering Mechanics, and the associate editors of ASCE-ASME Journal of Uncertainty and Risk in Engineering Systems, Structure and Infrastructure Engineering, and Chinese Journal on Vibration Engineering and is in the editorial board of Structural Safety, and Reliability Engineering and System Safety, etc.

24 November 2025
Monday

11:00am - 12:00noon

Room 3598 (Lift 27/28), Academic Building, HKUST

Enquiry:

Ms. Crystal Lau
cecrystal@ust.hk