JOHNS HOPKINS
WHITING SCHOOL
of ENGINEERING

Department of Civil Engineering and

CISMMS
Center for Integrated Structure-Materials
Modeling and Simulation

GRADUATE SEMINAR

Parametric Nonlinear Model Reduction and Impact on Uncertainty Quantification and Multiscale Modeling

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Vivian Church Hoff Professor of Aircraft Structures,
Chairman of the Department of Aeronautics and Astronautics
Stanford University

Parametric, Projection-based, Model Order Reduction (PMOR) is a mathematical tool for constructing a parametric, low-dimensional model by projecting a high-dimensional counterpart onto a reduced-order basis. It is rapidly becoming indispensable for a large number of applications including, among others, computational-based design and optimization, multiscale analysis, statistical analysis, uncertainty quantification, and model predictive control. It is also essential for scenarios where real-time simulation responses are desired. During the last two decades, linear, parametric PMOR has matured and made a major impact in many fields of engineering including electrical engineering, acoustics, structural acoustics and structural dynamics, to name only a few. By comparison, parametric, _nonlinear_ PMOR remains in its infancy. Nevertheless, giant strides have been recently achieved in many of its theoretical, algorithmic, and offline/online organizational aspects. The main purpose of this lecture is twofold. First, to highlight some of these advances and discuss their mathematical and computer science underpinnings. Second, and most importantly, to report on their significant impact for an important class of problems in uncertainty quantification and multiscale modeling.

Dr. Charbel Farhat is the Vivian Church Hoff Professor of Aircraft Structures, Chairman of the Department of Aeronautics and Astronautics, Director of the Army High Performance Computing Research Center, and Director of the of the King Abdullah City of Science and Technology Center of Excellence for Aeronautics and Astronautics at Stanford University. He is the recipient of many professional and academic distinctions including the Lifetime Achievement Award from ASME, the Structures, Structural Dynamics and Materials Award from AIAA, the John von Neumann Medal from USACM, the Gauss-Newton Medal from IACM, the Gordon Bell Prize and Sidney Fernbach Award from IEEE, and the Modeling and Simulation Award from DoD.

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Seminar is <u>FREE and open to the public.</u> Attendance is required for all enrolled Civil Engineering graduate students. For parking please see link for visitors at www.jhu.edu and select information on Homewood Campus.