Aerospace and Mechanical Engineering Seminar
Special Seminar – Kececioglu Memorial Lecture
Hosted by Dr. Samy Missoum

Kyung K. Choi
Professor
Mechanical and Industrial Engineering Department
University of Iowa
Kyung-choi@uiowa.edu

Developments of Reliability-Based Design Optimization and Confidence-Based Uncertainty Quantification and Reliability Assessment

Basic research for reliability-analysis and reliability-based design optimization (RBDO) methods have been carried out at the University of Iowa in collaboration with the Automotive Research Center (ARC), which is funded by the U.S. Army TARDEC. Comprehensive capabilities are developed including: (1) input distribution modeling for both independent and correlated variables using input test data; (2) variable screening method for high dimensional problems; (3) performance measure approach (PMA) and dimension reduction method (DRM)-based PMA for sensitivity-based RBDO; (4) dynamic-Kriging (DKG) and local window method (to mitigate curse-of-dimension) for sampling-based RBDO; (5) confidence-based uncertainty quantification (UQ) and reliability assessment for insufficient input data; and (6) simulation model validation against insufficient output test data for confidence-based UQ and reliability assessment. Some examples are presented to demonstrate effectiveness and accuracy of the developed methods.

With successful research and development of reliability analysis and RBDO methods, the Iowa team established a small start-up company to develop a commercial Reliability Analysis & Multidisciplinary Design Optimization (RAMDO) software. RAMDO is integrated with various solvers such as FEA, MBD, CFD, casting code, etc. The company was awarded a U.S. Army SBIR Phases II for the funding of $1 million in June 2015. The success of basic research and development is highlighted by taking the significant multi-year project and demonstrating a full transition of the technology to the commercial marketplace and DoD.

Bio:

Dr. K.K. Choi is Roy J. Carver Professor in the Mechanical and Industrial Engineering Department at the University of Iowa (UI). His research areas are uncertainty quantification, reliability analysis, reliability-based design optimization, design sensitivity analysis, and mathematical theory of optimization and its applications. He has co-authored 368 papers, including 159 journal papers in leading national and international engineering journals. He has co-authored several graduate engineering texts (Design Sensitivity Analysis of Structural System, 1986; Methods of Engineering Mathematics, 1993; Design Sensitivity Analysis of Linear and Nonlinear Structural Systems - Two Volume, 2004). At the University of Iowa, he is a founding member of the Iowa Board of Regents approved Center for Computer Aided Design (CCAD). He has served as Associate Director (1990-93), Deputy Director (1993-95), and Director (1995-2003) of CCAD. He is associate editor of five national and international journals. He is Fellow of American Society of Mechanical Engineers (ASME), Fellow of American Institute of Aeronautics and Astronautics (AIAA), Fellow of Society of Automotive Engineering (SAE), and President Elect of the International Society for Structural and Multidisciplinary Optimization (ISSMO, 2007-2011). He was appointed as a World Class University Professor at the Seoul National University in Korea during 2008-2013.

AME Lecture Hall, Room S212
Thursday, March 30, 2017
4:00 pm
Reception to follow lecture at the east end of the AME Courtyard