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Engineering Technology & Industrial Distribution Seminar Series

SYSTEM-LEVEL INTEGRATED AND MULTIDISCIPLINARY DESIGN ON FLOATING OFFSHORE WIND TURBINE AND ENGINEERED MATERIALS APPLICATIONS

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ABSTRACT

Engineering design often involves various decision-making activities spanning interdisciplinary domains. Understanding interactions between disciplinary areas opens opportunities for unprecedented design innovations. Integrated design is a holistic approach that aims to solve design problems with many complications, e.g., hierarchical system structure, conflicting design decisions, and multidisciplinary involvement. Also, it is possible to observe and extract nonintuitive design knowledge by comprehensively solving and investigating the design problem using the integrated design approach.

Designing large-scale floating offshore wind turbines (FOWTs) presents a demonstration of various design challenges in comprehensively solving the integrated design problem mainly due to its complexity. In order to tackle these difficulties and practically solve the system-level design problem, data-driven integrated plant and control co-design (hereafter denoted as control co-design, CCD) model based on the derivative function surrogate model (DFSM) and novel hierarchical CCD formulation are developed.

Another demonstration of design innovation led by integrated design is presented in the rheologically complex materials design application. By setting material properties as design targets for optimizing overall system performance, integrated design formulation is derived to optimize both material characteristics and the geometric structure. This problem also demonstrates how dependent variables can be optimized to effectively solve challenging design problems, which was generally avoided in conventional design practices.

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BIO

Dr. “Yong Hoon” Lee is a Postdoctoral Research Associate at the University of Illinois at Urbana-Champaign. Dr. Lee obtained his B.S. and M.S. degrees from Ajou University in South Korea, and his Ph.D. from the University of Illinois at Urbana-Champaign with the topic of integrated design of viscoelasticity and structural geometry. Before he joined the University of Illinois to pursue his Ph.D. degree, he worked as a design engineer in the nuclear power industry, investigating thermal hydraulic and structural safety of nuclear power plants and spent nuclear fuel casks in the design processes.