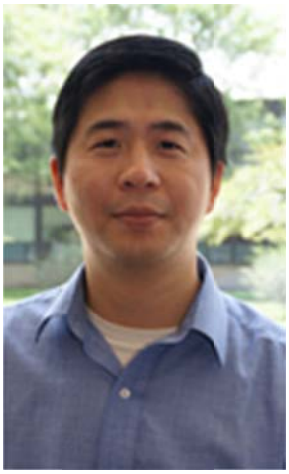
EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Topology Optimization of Multi-physics Systems

ABSTRACT – Rapid advancement of finite element (FE) and numerical computing techniques has led to software systems where weak forms of generic partial differential equations can be converted automatically into linear algebraic systems. In this talk, I will discuss techniques for exploiting such advanced software systems for topology optimization of multi-physics systems.

More specifically, I will present our recent work on developing a density distribution based method for topology optimization of electromechanical actuators and topology optimization of thermal fluid systems. In both cases, governing state equations are converted into weak form and solved via FE. The weak form of the adjoint equations and the gradient expressions are derived analytically. In order to ensure the length control of the resulting designs, a Helmholtz partial differential equation based density filter is used.

I will conclude this talk with some brief discussions on future opportunities and challenges with this optimization approach.



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SPEAKER BIO – Dr. Xiaoping Qian is an Associate Professor in the Department of Mechanical Engineering at the University of Wisconsin, Madison. He obtained his Ph.D. in Mechanical Engineering from the University of Michigan, Ann Arbor. His research interests lie in geometric computing and optimization and their applications in design and manufacturing. His research activities are supported by various grants from NSF, AFOSR and others. He has received multiple best papers awards from ASME and the Solid Modeling Association. He is an Associate Editor of the ASME *Journal of Computing and Information Science in Engineering*, ASME *Journal of Manufacturing Science and Engineering*, and he also serves on the editorial board of the journal *Computer-Aided Design.*

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3:30PM – 4:50PM
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