AEROSPACE & MECHANICAL ENGINEERING

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INFORMAL COFFEE PERIOD BEFORE THE SEMINAR IN ROOM 365 FITZPATRICK HALL

UNIVERSITY OF NOTRE DAME, NOTRE DAME, INDIANA 46556

SPEAKER: **Diane L. Peters**
Post-doctoral Scholar
Department of Electrical Engineering and Computer Science
University of Michigan
Ann Arbor, Michigan

TOPIC: **SEQUENTIAL DESIGN AND CONTROL OPTIMIZATION OF COUPLED SYSTEMS**

DATE: Tuesday, February 8, 2011

TIME: 3:30 p.m.

PLACE: 138 DeBartolo Hall

ABSTRACT

"Smart" products have the potential to dramatically improve life and transform the world we live in. Many of these systems exhibit coupling between the artifact and its controller – the performance of the device itself may depend upon the controller, and the performance of the controller depends on the physical configuration of the device. In such systems where the design and control are coupled, conventional sequential optimization (i.e., design the artifact first, then design its controller) does not always generate the best solution; the solution found may be optimal for one objective, but not for the other. A simultaneous design formulation, or co-design, will provide system optimal solutions, but is far more complex and presents both computational and organizational challenges. A variety of methods used to optimize such systems are presented, and the advantages and disadvantages of each are discussed. One of the methods presented is a new modified sequential optimization formulation, incorporating ease of control into the design of the physical system through upon a Control Proxy Function (CPF). Once the device has been optimized using such a modified objective function, the controller can then be designed. Such a modified sequential approach is easy to solve, but provides a set of solutions that are close to, or identical with, the system optimal solutions. This talk will present the theoretical basis for selecting an appropriate Control Proxy Function, as well as several specific CPFs that are useful for certain types of problems, such as a CPF based on the controllability Grammian matrix of a system. The method will be illustrated through the optimal design and control of a MEMS actuator.

NOTE: *If you are interested in meeting individually with Diane Peters, please contact Evelyn at 631-5431*