ILLINOIS

Special Topics Course: Dynamic System Modeling and Design

GE 598: Dynamic System Modeling and Design
Spring 2012, Tu/Th 2-3:50 pm
Instructor: Prof. James Allison (jtalliso@illinois.edu, www.systemdesign.illinois.edu)

Designing dynamic engineering systems is challenging, especially as system complexity continues to increase. Dynamic behavior leads to interesting and sometimes surprising outcomes. Model-based design approaches help manage complexity and often reduce design time, but the interface between components of the model-based design process are often not well understood. Deeper knowledge of these interfaces can help improve the performance of existing systems and enable the development of new system capabilities.

In this course we will explore the relationships between dynamic system modeling, simulation, control, design, and optimization. Possible applications include, but are limited to, active automotive suspensions, powertrain design, robotics, aircraft and spacecraft design, and renewable energy systems. By the end of the course you will have the tools you need to design dynamic systems, both active and passive, in an integrated way that often leads to significantly improved system performance. We will study system modeling and simulation from a design perspective, and learn state-of-the-art methods for integrated physical system and control system design. The course will be project-based, and reading and homework assignments will be designed to help you be successful in your term design project.

Course Summary:
Integrated approaches to the modeling, analysis, and design of linear and nonlinear dynamic systems. Emphasis on engineering applications and energy efficiency. Techniques for whole-systems design, accounting for interactions and synergies between subsystems, between modeling and design tasks, and between physical system design and control system design. Students propose term projects that utilize course methodology for the solution of a dynamic system design problem.

Prerequisites:
It is expected that students enrolled in this course are familiar with ordinary differential equations (MATH 284/285/286) and multivariate calculus (MATH 241). Experience with nonlinear programing (for example, IE 310, IE 510, ECE 490, or MATH 484) and linear algebra (for example, MATH 225 or 415) would also be helpful. Please contact the instructor with any questions about prerequisites.