Department of Mechanical Engineering

MCE484 Mechanical Control Systems Lab

Instructor: Hanz Richter.
Email: h.richter@csuohio.edu
Office Hours: Wednesdays, 1-4 PM (office or labs) and Thursdays, 3:00-4:00 PM (labs).

Reference materials will be supplied by the instructor and posted on the course webpage.

Catalog Description: MCE484 : Mechanical Systems Control Laboratory (2-3-3). Prerequisites: MCE 380, MCE441. Application of linear control theory to experimental study of mechanical, hydraulic, pneumatic control systems, simulation of control systems

Objectives

Apply linear control concepts learned in MCE441 to practical closed-loop control systems. Provide practical introductions to additional techniques such as system identification, rapid control prototyping (RCP) and hardware-in-the-loop (HIL) simulation, observers, basic LQR techniques, nonlinear control and multivariable control. Upon successful completion of the course, the student will be able to:

1. Evaluate the need for feedback in a given control engineering problem and determine equipment and development resources required for the implementation of feedback loops.
2. Determine the need for and the best way to obtain a mathematical model of the controlled plant. Understand the challenges that may be involved in designing controllers for the working plant model.
3. Perform experiments and simple system identification techniques to obtain plant models.
4. Select appropriate control schemes and conduct simulation studies.
5. Prepare real-time interfaces for control prototyping using tools such as dSPACE, Quanser, and so on.
6. Be able to design and implement sensor interface electronics: op-amps and filters and actuator interfaces (PWM and analog output from DAQ).

Grading

Evaluation will be based on lab projects, quizzes and a final project. A lab project grade will be assigned on the basis of 3 criteria: project execution (a group grade), oral questioning of each student at the completion of the project and a lab notebook that students will maintain (the last 2 are individual grades).

Quizzes will be straightforward and based on essential concepts. There will be as many quizzes as lab projects. Some may be take-home, if significant computer time is needed. The final project carries the largest weight. Students will work on various aspects of the project from the start of the semester. A single web-based report will be produced for the entire class. See the project from MCE371, Fall 2011 for an example:

http://academic.csuohio.edu/richter_h/project371/

The project requires that students behave as a team of engineers in charge of one objective. Therefore, communication, organization and task-sharing is essential. These characteristics will be observed by the instructor and used in grading.

Students must purchase a good-quality 200-page lab notebook and maintain a clean record of their lab findings and relevant calculations. This replaces lab reports, so it must contain the same information as a
report. Computer-generated charts, photos, etc. can be attached to a notebook page or maintained in a separate folder.

Lab projects have a weight of 30%, quizzes 30% and the final project 40%.

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Course website
http://academic.csuohio.edu/richter_h/courses/mce484
Class notes, announcements and other materials will be posted.

Academic Integrity Academic dishonesty will not be tolerated and will be handled according to University policy: http://www.csuohio.edu/studentlife/StudentCodeOfConduct.pdf