The Ohio State University
Department of Electrical & Computer Engineering

ECE 758: *Control System Implementation Laboratory*

Spring 2009
Lab sections: Tuesday *or* Thursday, 8:30AM–12:18N, 808 Dreese Laboratory

General Course Information: See lecturer's course web page for general information about course organization and content.

Grader/Lab Instructor: Ted Pavlic, 351 Caldwell Laboratory (CL), `pavlic.3@osu.edu`
`http://www.ece.ohio-state.edu/~pavlict/`

E-mail Policy: Be sure to include **ECE758** in the subject of your e-mail. Otherwise, your e-mail may be accidentally misfiled (e.g., automatically marked as spam). Do not hesitate to e-mail me; I am happy to help.

Content: This course is meant to provide students with an opportunity to implement several modern control techniques. It extends ECE 557 to be appropriate for both graduate students and advanced undergraduate students looking for practical experience with control systems.

Web Pages:

- Instructor/lecturer's course web page: `http://www.ece.ohio-state.edu/~passino/ee758.html`
- Grader/TA's course web page: `http://www.ece.ohio-state.edu/~pavlict/ece758/`
- Carmen (`http://carmen.osu.edu`) will be used to distribute grade information.

Office Hours: By appointment. Appointments can be made by e-mail. Alternatively, I welcome walk-ins (i.e., office visit without appointment) provided that I have a few minutes to help.

Text: None required to purchase. Necessary documents will be distributed on instructor's course web page and in class. Students are encouraged to print out these documents before class.

Data Storage: Local hard disk space is available for in class use at each bench. However, data will need to be gathered for each lab report. Machines are on the department network, and so network file transfers can be a good solution. Otherwise, students should have a means of transporting the data.

Pre- and Post-lab Assignments: Each lab includes a pre-lab and a post-lab assignment (posted on instructor's course web page). These assignments are to be completed **individually** by **each student** (i.e., not by lab groups). Pre-lab assignments are due at the beginning of the corresponding lab. Post-lab assignments are due one week after the conclusion of the corresponding lab.

Late Policy: Assignments will be penalized 10% per day late unless special arrangements are made at least 24 hours prior to date due.

Pop Quizzes: Unannounced pop quizzes are used as necessary to keep students up to speed on all aspects of the laboratory.

Lab Project: After the final lab, each student will complete a control system implementation project. Two students may work together on a project, or students can work alone. All students will be given open access (via keycard) to the laboratory to do their work in the second half of the course. Project grades will be given after an oral presentation to the grader and instructor at the end of the quarter.

Groups: Each lab group will be made up of **no more than two students**. However, all written assignments are to be submitted by **individual students.** Each week, students will switch partners to form different lab groups.

Attendance: Students are responsible for all assignments, change of assignments, announcements, and other course-related materials. If a lab needs to be missed, arrangements should be made with me at least 24 hours prior to the lab so that the lab work can be made up. I reserve the right to determine when make-up work is allowed.

Honor System: The ECE Honor System rules apply to all student work. All lab reports must reflect the understanding of the lab group. All other written work must reflect the understanding of the individual student. Otherwise, discussions on course material are encouraged.

Schedule:

> **Week 1 (Mar 31 *or* Apr 2):** Overview of Lab/Plants/Challenges, Tutorial on dSPACE/Simulink
>
> **Week 2 (Apr 7 *or* Apr 9):** Modeling and System Identification of a Thermal Process
>
> **Week 3 (Apr 14 *or* Apr 16):** DC Servo PID with Derivative Filtering and Integral Antiwindup
>
> **Week 4 (Apr 21 *or* Apr 23):** Flexible Joint Linear Quadratic Regulator (LQR)/Observer Design
>
> **Week 5 (Apr 28 *or* Apr 30):** Nonlinear Control for a Flexible Joint
>
> **Week 6 (May 5 *or* May 7):** Multizone Temperature Control: Dist. Dynamic Resource Alloc.
>
> **Weeks 7–10:** Student projects (open lab to students)
>
> **Finals week (June 11):** Last day to give oral presentation of student project

Grading: The numeric grade for the course is weighted as follows:

- Lab 1 (Overview): 10% [post-lab]
- Lab 2 (System ID): 10% [40:60 pre–post split]
- Lab 3 (PID): 10% [50:50 pre–post split]
- Lab 4 (LQR): 10% [50:50 pre–post split]
- Lab 5 (Nonlinear): 10% [75:25 pre–post split]
- Lab 6 (Distributed): 10% [50:50 pre–post split]
- Lab project: 40%

Make-up schedule: If labs cannot be completed on time by a significant portion of the class, I *may* work with the class to schedule a special lab make-up time before the next lab. Students are strongly encouraged to finish labs during the normal lab time. Students should not expect that additional time will be available.

Disability services: Students with disabilities that have been certified by the *Office for Disability Services* will be appropriately accommodated and should inform the instructor as soon as possible of their needs. The Office for Disability Services is located at 150 Pomerene Hall, 1760 Neil Avenue. They can be reached by telephone (614-292-3307) or TDD (614-292-0901) or the web (http://www.ods.osu.edu/).