The Ohio State University
Department of Electrical & Computer Engineering

ECE 557: *Control, Signals, and Systems Laboratory*

808 Dreese Laboratory

Content: This course is meant to accompany ECE 551 as an introduction to signals and systems with emphasis on control applications and feedback. In this course, MATLAB, *Simulink*, and *dSPACE* are used to build feedback controllers for real plants (e.g., motors, joints, and links). The course covers data acquisition (DAQ), digital signal processing (DSP), gain compensation, lead-lag compensation, and proportional–integral–derivative (PID) control.

Text: Students are required to purchase the lab book, *Control Systems Technology Lab* by Yurkovich and Abiakel. It is available at most university bookstores. Its content has not changed significantly since 1998, and so most used or borrowed copies will be sufficient.

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 (e.g., floppy disk, portable USB drive).

Grading (instructor policy takes precedence): The numeric grade for the course is weighted as follows:

- Pre-lab assignments (individual): 30%
- Lab reports (group): 40%
- Lab clean-up (group): 10%
- Final exam (individual): 20%

Pre-lab Assignments (instructor policy takes precedence): Each lab includes a *Laboratory Preparation* section that must be completed **individually** (i.e., not in the lab groups) by **each** student. Pre-lab assignments are due at the beginning of the corresponding lab.

Daily Lecture: There may be a short (i.e., approximately 45 minutes or less) lecture at the beginning of each class. The purpose of the lecture is to explain content relevant to the completion of the lab and subsequent lab report.

Lab Reports (instructor policy takes precedence): Each lab **group** must submit a single lab report at the beginning of the next class after the lab is completed. Lab reports will be penalized 10% per day late.

Groups (instructor policy takes precedence): Each lab group will be made up of **two students**. Lab groups are responsible for lab reports. Individual students are responsible for pre-lab assignments.

Final Exam (instructor policy takes precedence): The final exam has both a written theoretical portion and a practical laboratory portion. The final exam will take place during the last day of scheduled classes. Exams will be completed **individually**, and so all students should know how to use **both** the software and the hardware in the lab.

Attendance (instructor policy takes precedence): 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 the instructor at least 24 hours prior to the lab so that the lab work can be made up. The instructor reserves 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.

Sample schedule (instructor's ordering, pre-lab activities, and exams take precedence): Due to limited hardware and time, typically Labs 8 and 9 **are *both* completed** in the same week:

Lab 1: Introduction to Data Acquisition (DAQ)

Lab 2: Introduction to Digital Signal Processing (DSP)

Lab 3: Time Domain System Identification for a DC Servo

Lab 4: Gain Compensation and Feedback for a DC Servo

Lab 5: Lag Compensation for Speed Control of a DC Servo

Lab 6: Lead Compensation for Position Control of a DC Servo

Lab 7: Tuning a Proportional-Integral-Derivative (PID) Controller

Labs 8 AND 9: Position Control for Flexible Joint **AND** Flexible Link

— **:** In-class final exam: theory and practice

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/`).