

**Engineering 410 Lab
Control Systems
Spring 2019 Syllabus**

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Office Hours: M 12:30 – 3:30; Tu 2:00 – 3:30; W 12:00 – 1:30

Co-requisites: The lab is part of the course EGR 410 (Control Systems.)

Textbook: R.C. Dorf and R.H. Bishop, *Modern Control Systems*, 12th edition, Pearson Prentice-Hall, 2011.

Lab Description: Design and analysis of continuous time-domain control systems using system modeling techniques, simulation software and physical systems (plants) for control algorithms. Evaluation of control system performance and design criteria including feedback, stability, sensitivity, time and frequency response.

Lab Content and Learning Objectives: Students will use Matlab, Simulink, Quanser plant and additional tools to analyze, design and implement control systems for a variety of modeled and physical electro-mechanical systems. Students will present engineering lab work and solutions clearly in formal written technical reports and lab notes, while working in small groups of two or three students. These activities will serve the following Learning Objectives:

- L1: Apply principles learned in the co-requisite course Control Systems – EGR410 by modeling, solving problems and simulating a variety of plants and systems (ABET 1, ABET 6)
- L2: Improve skills in Matlab, Simulink and additional Control Toolbox items (ABET 1).
- L3: Specifically learn simulation, analysis and design of control systems in frequency domain models, in state space models, in time response analysis, in closed-loop response, in stability analysis and pole location, in root-locus analysis, and more (ABET 6, ABET 1, ABET 2).
- L4: Improve collaboration by completing above work in pairs (ABET 5)
- L5: Improve written communication skills by preparing 11 lab reports (ABET 3)

Tentative Topics and Schedule

Week	Date	
1	W 1/16 – H 1/17	Organizational meeting
2	W 1/23 – H 1/24	Matlab/Simulink – introduction – LAB #1
3	W 1/30 – H 1/31	Matlab – models in the frequency domain – LAB #2
4	W 2/6 – H 2/7	Matlab – state space models – LAB #3
5	W 2/13 – H 2/14	Matlab/Simulink – time response – LAB #4
6	W 2/20 – H 2/21	Matlab/Simulink – feedback control, equivalent forms – LAB #5
7	W 2/27 – H 2/28	Matlab – steady-state errors – LAB #7
	W 3/6 – H 3/7	Spring Break – No Labs
8	W 3/13 – H 3/14	Introduction to Quanser plant – LAB Q1 (a)
9	W 3/20 – H 3/21	Introduction to Quanser plant – LAB Q1 (b)
10	W 3/27 – H 3/28	Matlab/Simulink – stability and pole location – LAB #6
11	W 4/3 – H 4/4	Matlab – root locus analysis – LAB #8
12	W 4/10 – H 4/11	Position Control with Quanser plant – LAB Q2
	W 4/17 – H 4/18	SCAD/Easter – No Labs
13	W 4/24 – H 4/25	Velocity Control with Quanser plant – LAB Q3
14	W 5/1 – H 5/2	As needed make-up and lab summary

Grading: Grades will be based on submitted lab reports (80%) and overall instructor's assessment of lab preparation and performance of each student (20%). The grade in the lab will count as 20% of the final grade of the course EGR 410.

Lab policies: All students should perform all experiments in order to complete the lab. Only justified absences (medical or personal) will be allowed to make up labs. If you have a medical or important personal situation that forces you to miss a lab, please inform the instructor by email as soon as possible, and then talk the instructor to plan for make-up. Lab reports (one per team) are due the following week. They should be descriptive of all details, with an effort to be concise and essential. They should be computer generated and include, for each problem:

- 1) A main section that provides the narrative about the problem and the method of solution; then displays the results and eventual considerations on the meaning of the results and possible variations of parameters, when relevant. This section should include tables and graphs when appropriate.
- 2) A printout of the m-file and/or Simulink schematics in an appendix.
- 3) A printout of the computer output in an appendix.

The reports will be graded on a scale of 100, mainly on content and correctness of the solutions; however sloppy writing, language, format and/or presentation can hinder the report; in such case the report (even a perfect report as for content) can be assessed a deduction of up to 20%.

No food, cell phone use or texting in lab.

Every member of the team should be involved in actively participating and working on the solutions both in the lab and when writing the reports. One computer is available per team in the lab. Additional laptops can be brought to the lab to allow all team members to actively participate.

Ethics: Students are to act in accordance with the Pledge of Integrity as stated in the student handbook on all course assignments.

Elizabethtown College is a community engaged in a living and learning experience, the foundation of which is mutual trust and respect, Therefore, we will strive to behave toward one another with civility and with respect for the rights of others, and we promise to represent as our work only that which is indeed our own, refraining from all forms of lying, plagiarizing, and cheating.

and the NSPE code of ethics (Cannons attached).

They will be asked to reaffirm their commitment to the pledge and code with their signature on each exam. Dishonest practice can result in failure of the course and possibly expulsion from the college.

All work should represent each student's individual efforts, with the exception of group assignments (group design and simulation project), which should reflect the combined efforts of all members of the group. Students are encouraged to discuss assignments with other students and/or the instructor, however submitted assignments should reflect the student's own work and understanding (what each student is able to complete without concurrent help from others).

Dishonest practice can result in failure of the course and possibly expulsion from the college. If in doubt, just ask!

Re-Grade: Written requests with full rationale for re-grading of all course-work will be accepted the next class period after original materials are returned.

Disabilities Statement:

Elizabethtown College welcomes otherwise qualified students with disabilities to participate in all of its courses, programs, services, and activities. If you have a documented disability and would like to request accommodations in order to access course material, activities, or requirements, please contact the Director of Disability Services, Lynne Davies, by phone (361-1227) or e-mail daviesl@etown.edu. If your documentation meets the college's documentation guidelines, you will be given a letter from Disability Services for each of your professors. Students experiencing certain documented temporary conditions, such as post-concussive symptoms, may also qualify for temporary academic accommodations and adjustments. As early as possible in the semester, set up an appointment to meet with me, the instructor, to discuss the academic adjustments specified in your accommodations letter as they pertain to my class.

Religious Observance: The College is willing to accommodate individual religious beliefs and practices. It is your responsibility to meet with the class instructor in advance to request accommodation related to your religious observances that may conflict with this class, and to make appropriate plans to make up any missed work.

School Closure: In the event that the school is closed during regularly scheduled class time, a virtual learning experience, independent reading, or extra session will be provided to make up for any missed content.

Fine Print: The above information represents the intent of the course and is subject to change at the discretion of the instructor.

Elizabethtown Engineering Program Code of Ethics

- I. **Hold paramount the safety, health, and welfare of fellow students.**
- II. **Perform project tasks and assignments only in the areas of their competence.**
- III. **Submit assignments only in an objective and truthful manner.**
- IV. **Act for team members, instructors, or employers as faithful agents or trustees.**
- V. **Avoid deceptive acts.**
- VI. **Conduct themselves responsibly, ethically, lawfully, and in line with the integrity policy so as to enhance the honor, reputation, and usefulness of the profession and college's engineering department.**

Professional Obligations (Etown Engineering Students)

1. **Engineering students shall be guided in all their relations by the highest standards of honesty and integrity.**
 - A. Be honest about your mistakes.
 - B. Do not cheat on exams or assignments.
 - C. Do not plagiarize or falsify data.
 - D. Do not aid or abet another student in unethical behavior.
2. **Engineers shall at all times strive to gain the knowledge to serve the public's interest.**
 - A. Your goal in class should be to gain knowledge to justify your intended degree, not just to obtain a high grade.
 - B. Work for the advancement of society and the profession by engaging in the community, and recruiting youth to the engineering profession.
 - C. Inform professors of unethical requests from other students.
3. **Engineers shall avoid all conduct or practice that deceives other students, instructors, or the public.**
 - A. In lab work, be truthful with ALL data, even if it is not favorable.
 - B. All assignments should be your own original work unless otherwise noted.
 - C. Do not finish and submit team projects without the approval of ALL your other team members.

4. **Engineers shall not disclose confidential information concerning their own group work to any person outside of their group except for the professor.**
 - A. Do not put individual assignments in your public folder.
 - B. Do not spread the word of quiz questions or unannounced assignments to later sections of a course.
 - C. Engineering students who are or have been a TA shall not disclose information about tests and grades of other students.
 - D. Do not disclose or use information learned from the internships that have to do with processes, or techniques of production.
5. **Engineering students shall not be influenced in their scholastic duties by conflicting interests.**
 - A. Do not attempt to receive a favorable grade or recommendation by establishing an unprofessional relationship with a professor.
 - B. In peer assessments or as a TA, do not allow friendships or grades to sway judgment
 - C. Do not attempt to gain favor in class or for assignments through flattery of professors.
6. **Students should not attempt to gain advancement by downgrading other students' work or by other questionable methods.**
 - A. Credit should be awarded where it is deserved when submitting group work.
 - B. If another student does exceptional work, do not take credit for it if it is not your work.
 - C. If another student is performing inadequate work, calmly confront them about it before addressing it to the professor.
 - D. Students shall not sabotage the projects or advancements done by other students.
 - E. Do not blame group members for their own behavior.
 - F. Do not blame professors or staff for their grades.
7. **Engineering students should not attempt to injure the reputation of the engineering department or the reputation of professors and engineers in the department.**
 - A. If other engineering students are injuring the reputation of the department, you should inform the head of the department or the professor of their actions.
 - B. Every student in the department's actions should coincide with the integrity policy of the college to avoid degrading the department.
 - C. Students shall report malicious activities to the Head of the Engineering Department, or appropriate instructor. Yet, the student shall not tell others of the issue.
8. **Engineering students should accept personal responsibility for all of the work they do for the department and for their group.**
 - A. Students shall act truthfully when accused of misconduct.
 - B. Blame for violations of the integrity policy should not be placed on the department or professors, but rather on the individual who committed them.
 - C. Students should also accept the blame if their group submits unethical work because it is their responsibility to ensure any submission with their name on it is held to high ethical standards.
9. **Engineering students shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.**
 - A. Students shall not steal programs or work from other engineers or students from the internet through illegal networks.
 - B. Students shall properly cite information in all manners of presentation such as research papers, essays, PowerPoints, etc.

*Obligations written by Etown Engineering students Class of 2021
Cannons adapted from: <https://www.nspe.org/resources/ethics/code-ethics>*