Louisiana Tech University
Department of Electrical Engineering

ELEN 479 – Automatic Control Systems Lab

Course Information — Fall 2016

Description:	Laboratory design, simulations and testing of automatic control systems. MATLAB simulations of nonlinear systems, performance measures, state-variable feedback, op-amp feedback systems, root locus design, PID/lead/lag controller design, LQR design, real-time control systems implementation.
Instructors:	Dr. Rastko R. Selmic, rselmic@latech.edu http://www.latech.edu/~rselmic/Courses/ Tel: 318-257-4641, Office: Tech Pointe 208B
	This term we will be using Piazza for class discussion. The system is highly catered to getting you help fast and efficiently from classmates, the TA, and myself. Rather than emailing questions, I encourage you to post your questions on Piazza. Find our class page at: https://piazza.com/latech/fall2016/elen479/home
Class Hours:	Thursday, Friday 2:00pm–5:00pm, NETH 243, NETH 232
Office Hours:	MTWRF 8:00am–10:00am
Prerequisites:	ELEN 471 (co-requisite)
Textbook:	R.C. Dorf and R.H. Bishop, *Modern Control Systems*, 13th ed., Pearson Prentice Hall, Upper Saddle River, NJ, 2016.
Recommended Software:	MATLAB student version + Control Systems Toolbox
Grading:	There will be 7 lab reports, and the grade will be computed based on lab reports. If you have a question on grading of a lab report, please contact grader about your question within one week of the time the grade is received. Scale used: A = 100-90%, B = 89-80%, C = 79-70%, D = 69-60%, F = below 60%. Students must keep a **notebook** of all their graded assignments and turn it in at the end of the quarter, otherwise receive incomplete grade "I".

Laboratory Policy:

Lab reports will be graded. No late report will be accepted. Lab experiments may require computer simulation using MATLAB and Simulink. For the full grade, show all of your simulation code in the report, well documented with inline comments. Include required figures in the report. Students will be given one week after the date of the lab to prepare and submit a complete lab report. No food or drinks are permitted in the room during labs.

Laboratory Reports:

1. Type your report. Equations should be word processed in MS Word Equation Editor or LaTex.
2. All reports should contain the following sections:
   A. Title Sheet - (2 pts). Must contain the date of the lab experiment, the lab number, the lab title, and the names of your coworkers.
   B. Procedure - (3 pts) A record of what you and your group did and the results that were obtained. (This record is not a copy of the lab handout, but rather a statement of what you did in your own words.)
   C. Simulation/Experimental Results - (5 pts) Lab should have simulation or experimental results including figures with clearly shown signals.
   D. Analysis - (5 pts). An analysis of the results obtained in the laboratory. It should contain comparisons to what was expected based upon theoretical analysis as well as any inconsistencies.
   E. Documented Source Code - (5 pts = 2pts for source code + 3pts for comments and code documentation). Simulation source code needs to be well documented (one of the most important engineering practice/skill). In case of MATLAB code, it needs to be clearly commented and explained. In case of Simulink code, block diagrams need to be documented. If students work in groups, every member of the group needs to have separate code documentation.

Other Policy:

a. Class attendance is governed by the university regulations published each year in the university bulletin (page 26).
b. In the event of the appeal, student is responsible for keeping all original graded materials (exams, homework, and projects).
c. Students with disabilities needing testing or classroom accommodations based on a disability are encouraged to discuss those needs with instructor as soon as possible. Please check www.latech.edu/ods for assistance.
d. In accordance with the Academic Honor Code, students pledge the following: “Being a student of higher standards, I pledge to embody the principles of academic integrity.”
e. Emergency Notification System (ENS): All Louisiana Tech students are strongly encouraged to enroll and update their contact information in the Emergency Notification System. It takes just a few seconds to ensure you’re able to receive important text and voice alerts in the event of a campus emergency. For more information on the Emergency Notification System, please visit http://ert.latech.edu

Lab Topics:

1. Introduction to MATLAB
2. Simulation of Dynamic Nonlinear Systems
3. Impulse and Step Response, Poles and Zeros, Introduction to Simulink
4. Systems Performance, Second-Order Systems, Rise-Time, POV, Settling-Time
5. Steady-State Error, Simulink Simulations
6. Real-Time Control Implementation (Simulink and Quanser hardware modules)
7. Root-Locus based Feedback Control Design