Louisiana Tech University
Department of Electrical Engineering

ELEN 471 – Automatic Control Systems

Course Information Fall 2007

Description:	Analysis and design of linear feedback systems. Mathematical modeling. Transfer functions and signal-flow graphs. State variable analysis. Time domain analysis and design of linear control systems. Frequency domain analysis and design of linear control systems.
Instructor:	Dr. Rastko R. Selmic, Email: rselmic@latech.edu, Web: http://www.latech.edu/~rselmic/Courses/ Tel: 257-4641, Office: Nethken Hall 229.
Class Hours:	MWF, 11:00am–12:15pm, NH 120
Office Hours:	MTWRF 9:00am–11:00am
Prerequisites:	ELEN 321, MATH 244, or consent of instructor.
Textbook:	R.C. Dorf and R.H. Bishop, *Modern Control Systems*, 10th ed., Pearson Prentice Hall, Upper Saddle River, NJ, 2005.
Recommended Software:	MATLAB Student Version, Control Systems Toolbox
Grading:	There will be homework, two exams and the final exam. If you have a question on grading of an assignment or an exam, please contact instructor about your question within one week of the time the grade is received. The weighting of grades is: - Homework -- 20% (Graduate students: 10% homework + 10% project) - Exam I -- 25% (1 sheet one side), Monday, October 8 - Exam II -- 25% (1 sheet one side), Monday, October 29 - Final Exam -- 30% (1 sheet one side), Monday, November 12 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".
Tests:	All tests will be closed book and closed notes. You will be allowed to bring one sheet of notes (8.5" x 11") one side and a calculator. No make up exams unless approval is obtained prior to the scheduled test date.
Homework:	Weekly homework will be assigned. Homework will be graded. No late homework will be accepted. Some homework may require computer simulation using MATLAB.

Other Policy:
a. Class attendance is governed by 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).

Graduate Students: Graduate students will need to do a research and propose a project until Friday, October 6. Project report is due Friday, November 10. Biweekly reports are required showing the progress of the project.

Course Topics:

1. Linear Systems and Linear Approximations to Nonlinear Systems:
    a. Linear Approximation of Nonlinear Systems
    b. Laplace Transform
    c. Inverse Laplace Transform
    d. Simulation of Dynamic Systems Using MATLAB
2. Block Diagrams and Signal-Flow Graphs
3. Performance of Second Order Systems
4. State variable analysis
    a. Transfer Function From the State Equation
    b. The Time Response
5. Stability of Linear Systems
    a. Input/Output Stability
    b. Routh-Hurwitz Stability Test
    c. Stability of State-Variable Systems
6. Feedback Control Systems
    a. Closed-Loop Control Systems
    b. Sensitivity of Control Systems
    c. Disturbance Rejection
    d. Steady-State Error
7. State-Variable Feedback
8. Root Locus Analysis and Design of Feedback Systems
    a. Root Locus Concept
    b. Root Locus Procedure
    c. Root Locus Examples
    d. PID, Lead, Lag Controllers
9. Frequency Domain Analysis and Design of Feedback Systems
    a. Bode Design
10. Advanced Feedback Design Techniques
    a. Linear Quadratic Regulator

Bellman's Principle of Optimality: An optimal policy has the property that whatever the initial state and the initial decisions are, the remaining decisions must constitute an optimal policy with regard to the state resulting from the first decision.

“If you don't do the best with what you have happened to have got, you will never do the best with what you should have had.”