EE 4364 - Systems and Controls

2000-02 Catalog Data:  Analysis and design of discrete and continuous time linear systems. Relationships between frequency and time domain design. Analysis of system stability and performance using root locus, lead lag compensation, and other techniques. Applications to electromechanical systems. Prerequisite: EE 3353 with a grade of "C" or better.

Prerequisite by Topic:
1. Laplace transform
2. Linear system theory

Textbook:  
Automatic control systems, 7th Ed.  

Course Outcomes:
Students completing EE 4364 will be able to:
1. Apply various mathematical principles (from calculus and linear algebra) to the solution of control system analysis and design problems (C).
2. Mathematically model dynamic systems in different ways (C).
3. Analytically determine a dynamic system’s stability and performance characteristics from its model (C).
4. Design appropriate control systems to achieve given closed-loop stability and performance specifications (C).
5. Understand and use proper control systems terminology (C).
6. Use Matlab software for the analysis and design of control systems (I).

Topics Covered:
1. Background review (3 hrs.)
2. Modeling of dynamic systems (9 hrs.)
3. State-variable analysis (6 hrs.)
4. Modeling and simulation using MATLAB software (1 hrs.)
5. Stability analysis of linear dynamic systems (5 hrs.)
6. Time domain analysis of linear dynamic systems (6 hrs.)
7. Frequency domain analysis of linear dynamic systems (3 hrs.)
8. Relative stability (2 hrs.)
9. Design of PD, PI and PID controllers (4 hrs.)
10. Design of phase-lead, phase-lag and lead-lag controllers (2 hrs.)
11. Design of pole-placement state-feedback controllers (1 hrs.)

Class Schedule: Three hours lecture per week.

Contribution to Professional Component:
EE 4364 is a senior elective course which builds on topics covered primarily in junior required courses. It is one of a group of courses normally taken by students seeking a specialization in communications and control. It may also be taken as an elective by students seeking additional breadth in their curriculum.

Relationship to Program Outcomes:
1. Have an ability to apply knowledge of mathematics, science and engineering.

   Student's use concepts from calculus and linear systems theory in the analysis and design of control systems. (Course Outcomes 1, 2, 3, 5 and 6).

3. Have an ability to design a system or component to meet desired needs.

   Students solve homework problems that incorporate design issues. (Course Outcomes 1, 2, 3, 4, 5 and 6).

5. Have an ability to identify, formulate and solve engineering problems.

   Students are able to hone these skills while working homework problems and performing design calculations (Course Outcomes 1, 2, 3, 5 and 6).

11. Have an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

   Students work on assignments using Matlab and Simulink for control systems analysis, design and simulation (Course Outcome 6).

   Course Outcomes do not relate to Program Outcomes 2, 4, 6, 7 –10, 12. They do correlate strongly with Educational Objective 1 (60%), Educational Objective 2 (30%) and Educational Objective 3 (10%).

Computer Usage: Students will use Matlab to complete some problem assignments.

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