

**ECE 470: Feedback Systems (3 – 0)**  
**Elective Course**

**2006-2007 Catalog Description:**

Design principles of linear and non-linear feedback systems in both the frequency and time domain. Credit: 3 hours Prerequisite: ECE 3710

**Textbook(s) and Required Material:**

*Modern Control Systems* by Richard C. Dorf and Robert H. Bishop, 9th edition, 2001  
Mat Lab, Version 6.0, Release 12 or 13, Student Edition

Mat Lab Control Systems Toolbox. This will NOT be available at the bookstore.

You may purchase it over the web at [www.mathworks.com/store](http://www.mathworks.com/store). You will then need to follow the directions on the screen. When you get to question 2 (How will you use the software) you should choose Student use on student's own computer (student versions).

**Recommended Materials:**

*Modern Control Systems Analysis & Design* by Robert H. Bishop, 1997

**Course Coordinator:** Dr. Ralph Tanner, Professor, ECE

**Instructor (Spring 2007):** Johnson Asumadu, Associate Professor, ECE

**Prerequisites by Topic:**

1. an ability to analyze, design, simulate, and experimentally validate linear control systems while taking into account practical limitations of operations;
2. an ability to utilize circuit simulation and/or mathematical software tools for control system design and analysis;
3. an understanding of negative and positive feedback systems and their application to circuit analysis and design;
4. an understanding of frequency compensation and its application to control system design; and
5. a basic understanding of control system noise analysis.

**Course Objectives: (ABET Learning Outcomes)**

*ABET learning outcome assigned to this course by ECE Assessment Plan: c and k.*

1. an ability to analyze, design, simulate, and experimentally validate linear and non-linear control systems while taking into account practical limitations of operations (a, b, c, e, k);
2. an ability to utilize circuit simulation and/or mathematical software tools for linear and non-linear control system design and analysis (k);
3. an understanding of negative and positive feedback systems and their application to circuit analysis and control system design (a, c);
4. an understanding of frequency compensation and its application to linear and non-linear control system design (a, c);

5. a of compensation for noise in control systems (a, c); and
6. an ability to prepare effective written technical communications for engineering analysis and design work (g).

**Topics:**

1. Review of System Analysis
  - a. Root Locus
  - b. Nyquist & Bode
  - c. State Variables
2. The Design of Feedback Control Systems
  - a. PID Control
  - b. Root Locus Design
  - c. Frequency Response Design
  - d. State Space Design
  - e. Analytic Design
3. Digital Control Systems

**Course/Laboratory Schedule:** 3 one hour lectures

**Evaluation:**

- |                                   |     |
|-----------------------------------|-----|
| 1. Examinations                   | 70% |
| 2. Homework & class participation | 10% |
| 3. Term Project                   | 20% |

**Computer Usage:**

Students extensively use control system simulation software in homework and examinations.

**Contribution to Professional Component:**

ABET professional component content as estimated by faculty member who prepared this course description:

Engineering Design: 2 credit or 66.7%  
Engineering Science 1 credits or 33.3%

**Relation of Course to Program Outcomes:**

This course provides significant support for:

EE and CE program objectives - depth, breath, and professionalism  
ECE expected learning outcomes: c and k.

**Person who prepared this description and date of preparation:**

Prepared by: Johnson Asumadu

Date: May 23, 2007