Department of Electrical and Computer Engineering

EEL 3657 - CONTROL SYSTEMS I
(Required)

Catalog Description:
Analysis of linear time-invariant feedback control system. System modeling, time- and frequency-domain responses, stability and accuracy. Analysis by use of Root-locus, Bode plots, Nyquist diagram methods. (3 Credits)

Prerequisites:
EEL 3110 or EEL 3112, and EEL 3135

Textbook:
Control Systems Engineering, by Norman Nise, 4th ed., Wiley & Sons

Learning Outcomes:
1. Understand linear approximation of physical systems, Laplace transform, transfer functions of linear systems, block diagram models, signal-flow graph models
2. Understand open and closed-loop system, sensitivity of control system to parameter variations, transient response of control systems, disturbance signals in feedback control system
3. Understand and analyze of test input signals, of performance of second-order system, effect of a third pole and zero on the second-order system response, the s-plane root location and the transient response, The steady state error of feedback control system and of non-unity feedback systems
4. Understand the concept of stability, relative stability of feedback control system
5. Understand the root locus concept and procedures, parameter design by the root locus method
6. Calculate and measure the frequency responses, analyze the performance specification in the frequency domain
7. Understand mapping contours in the s-plane, Nyquist criterion, relative stability, time-domain performance

Topics Covered:
1. Introduction to control System
2. Mathematical models of systems
3. Feedback control system characteristics
4. Performance of feedback control system
5. Stability of linear feedback systems
6. Root locus method
7. Frequency response methods
8. Stability in the frequency domain

Class Schedule:
Twice a week, 75 minutes each session

Contribution of course to meeting the professional component:
Engineering Science
Engineering Design

Relationship of course to program outcomes:
In the course EEL 3657 the student will have to show

(a) an ability to apply knowledge of mathematics, science and engineering
(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health
and safety, manufacturability, and sustainability
(e) an ability to identify, formulates, and solves engineering problems (homework)
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice (MATLAB Simulation)
(m) an ability to apply knowledge of advanced math (D.E., Linear Algebra, Complex Variables, Discrete Math)

Person(s) who prepared this description and date of preparation:
Amaury Caballero, Lecturer; Kang Kang, Professor - April 7, 2007