CSU Course Syllabus: Fall 2016
ECE611 - Nonlinear Control Systems
TR 11:00-12:15, Weber 202

Instructor: Dr. Peter M. Young, Engr B114, Ext. 1-5406,
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Office Hours: TR 12:30-1:30, Engr B114

Course Book: Nonlinear Systems
Khalil

Recommended Additional Reference Books:
Nonlinear Control Systems
Isidori

Robust Adaptive Control
Ioannou and Sun

System Identification
Ljung

Prerequisites: ECE412

Grading and Exams: Midterm Exam 30%
Final Exam 40%
Computer & Lab Projects 20%
Homework Assignments 10%

Course Schedule: Homework problems will usually be assigned every other week (due
two weeks later). In addition there will be a number of special computer projects, reading
assignments, and if time permits, laboratory experiments. You are expected to work on all
these problems yourself (or within your team), but reasonable collaboration is allowed.
No collaboration is allowed for the Midterm and Final Exams. Both exams will be take-home,
open-book and open-notes.

Course Objective: The students will learn how to analyze the stability and perfor-
mance properties of nonlinear systems, and also how to design nonlinear feedback controllers.
The skills developed will be based on both extensions of linear tools as well as the latest
direct nonlinear methods.
This course will be lecture-based, with both homework assignments and exams. In addition a number of computer projects will be assigned. If time permits, we will also undertake laboratory projects utilizing the Systems and Controls Laboratory.

**Introduction and Background**
Introduction to nonlinear and time-varying systems. Mathematical background, including vector spaces and norms. $\ell_p$ norms for signals, induced norms for systems, and the Lebesgue $\ell_p$ spaces. Existence and uniqueness of solutions to nonlinear differential equations.

**Stability Analysis**

**Design Techniques**
Overview of design for nonlinear systems. Jacobian linearization and gain scheduling. Introduction to feedback linearization and extensions of optimal control techniques. Direct design methods.