AME 451 Linear Control Systems I

Spring 2011

Department of Mechanical Engineering
University of Southern California

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Meeting: Monday and Wednesday, 11:00 am -12:20 pm, OHE 100C

Instructor: Professor Ben Yang
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Office Hours: Monday and Wednesday, 9 -11 am

TA: Mr. Thanapat Wanichanon
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Office Hours: Tuesday and Thursday: 1.30-3.30PM

Grading:

Two midterm exams (@20% each)	40%
Homework	20%
MATLAB project	10%
Final Exam	30%

Total	100%

Homework: Weekly homework (about 12 sets) assigned, and due the following week.
Late homework receives **NO** credits.

Text Book: K. Ogata, "Modern Control Engineering", 5th Edition, Prentice Hall, 2009

Website: Log in at http://www.uscden.net/

Go to the AME451 web page, and check the following directories:
Course Information:
syllabus
class schedule
Course Documents:
ppt files for lecture，MATLAB related
Assignments:
homework and solutions, project description

For Remote Students:

Feel free to call the TA and instructor during their office hours, or to send email to them.

Course Description:

1. Background Materials (5 weeks)
Introduction to control systems
Laplace transforms
Differential equations, transfer functions, poles and zeros
Mathematical models of dynamic systems
Block diagrams, feedback systems
Simulation via MATLAB

2. Basic Concepts of Feedback Control (5 weeks)
Open-loop and closed-loop systems
Basic control actions: P-, I- and D- controllers
Control system characteristics and performance
   - Sensitivity to parameter variations
   - Transient response
   - Disturbance rejection
   - Stability, Routh's criterion
   - Steady-state error
Simulation via MATLAB

3. Design of Control Systems (5 weeks)
The root locus techniques
Frequency response, Bode diagrams
Polar plots, Nyquist stability criterion
Relative stability, phase and gain margins, bandwidth
PID controllers in the Frequency Domain
Lag and lead compensation
Time delays
Simulation via MATLAB

Design Example: Disk Drive Read System

Handouts uploaded on the AME 451 website