THE UNIVERSITY OF TEXAS AT AUSTIN

ASE 170p – Controls Laboratory
Spring 2004

SYLLABUS

UNIQUE NUMBER: 11780

INSTRUCTOR: **Eduardo Gildin**
WRW 405 , 471-8836,
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TIME: Thursdays 6:30 – 9:30 pm

PLACE: WRW 113/ WRW 405

TEACHING ASSTS.: TBD

WEB PAGE: www.ae.utexas.edu/courses/ase170p
Lectures, due dates, additional info will be posted on web page, so check it regularly

OBJECTIVES:
The main objective is to introduce the student to the fundamentals of control systems theory with emphasis on design and implementation, integrated with key ethics and leadership cases, in order to understand the role of aerospace technology in a global context. Technical aspects of the implementation issues of classical control theory in the frequency domain and modern control theory in the state-space are studied to provide the student with a modern view of systems theory.

PREREQUISITES:
Credit for ASE 370

KNOWLEDGE, SKILLS, AND ABILITIES STUDENTS SHOULD HAVE BEFORE ENTERING THIS COURSE:
Students should have a working knowledge of Classical and Modern Control systems, and should have significant experience developing mathematical models, such as mass-spring-damper and inverted pendulum systems. Students should have the basic knowledge of programming in MATLAB and LabVIEW, and basic report writing skills.

KNOWLEDGE, SKILLS, AND ABILITIES STUDENTS GAIN FROM THIS COURSE:
Students will understand the fundamentals of the implementation issues related to classical and modern control systems, based on the design and analysis for single-input, single-output systems.

Students will be able to design, analyze and implement control systems using root locus methods, frequency response methods, and full-state feedback pole placement methods in the state-space (LQR design), using industrial-type Real-Time Hardware and Software.

IMPACT ON SUBSEQUENT COURSES IN CURRICULUM:
The material in this course is essential in the design courses that follow and that require the understanding of modeling, design and implementation of feedback control systems, as the problems studied are presented in subsequent courses as frameworks or a more general and realistic applications.

ABET CRITERIA 2000 OUTCOMES ACHIEVED:
This course contributes to the following EC2000 Criterion 3 outcomes and those specific to the EAC accredited program.

Outcome	√	Outcome	√
a. An ability to apply knowledge of mathematics, science, and engineering	x	g. An ability to communicate effectively	x
b. An ability to design and conduct experiments, as well as to analyze and interpret data	x	h. The broad education necessary to understand the impact of engineering solutions in a global/societal context	x
c. An ability to design a system, component, or process to meet desired needs	x	i. A recognition of the need for and an ability to engage in life-long learning	x
d. An ability to function on multi-disciplinary teams		j. A knowledge of contemporary issues	x
e. An ability to identify, formulate, and solve engineering problems	x	k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	x
f. An understanding of professional and ethical responsibility	x	l. Begin list of any other outcomes unique to the program.	

ABET PROGRAM CRITERIA OUTCOMES ACHIEVED:
Program criteria outcomes are unique to each degree program and are to be compiled from the program criteria given for each degree program and listed in bullet format below. The faculty should check which of the program criteria are achieved in the course.

Criterion	√	Criterion	√	Criterion	√
A. Aerodynamics	**x**	G. Orbital Mechanics		M. Preliminary/Conceptual Design	**x**
B. Aerospace Materials		H. Space Environment		N. Other Design Content	**x**
C. Structures		I Attitude Determination and Control	**x**	O. Professionalism	**x**
D. Propulsion		J. Telecommunications		P. Computer Usage	**x**
E. Flight Mechanics		K. Space Structures			
F. Stability and Control	x	L. Rocket Propulsion			

PROFESSIONALISM TOPICS:
Technical lectures are complemented with discussion of ethics, teamwork and leadership based on outside invited guests with experience in industry. Current events that bring into the class stimulated discussions on the implications of aerospace technology in a global context are at the beginning of each lecture with special attention to the impact of design success and failures on society.

TOPICS / SCHEDULE: (subject to change)

01/22 Course Introduction + Review of Classical and Modern Control Systems
01/29 Introduction to LabVIEW I
02/05 Ethics in Engineering Design Lecture + LabVIEW II
02/12 Introduction to Digital Control Systems
02/19 Plant Identification using the Rectilinear Control System
02/26 Rigid Body PD & PID Control using the Rectilinear Control System
03/04 Collocated PD Control with 2 DOF – Rectilinear Control System
03/11 Plant Identification - Torsional Disks
03/18 Spring Break – no class
03/25 Torsional Control System - Design of a PID control
04/01 Torsional Control System - Design of Phase Lead- Lag Compensator
04/08 Inverted Pendulum Control System – Rectilinear Plant
04/15 Self-Erecting Inverted Pendulum Control System – Rectilinear Plant
04/22 Self-Erecting Inverted Pendulum Control System – Torsional Plant
04/29 Leadership in Aerospace Lecture + Review + Evaluation
05/06 Final Quiz

DESIGN ASSIGNMENTS

Nine design projects are part of the laboratory's assignment.

LABORATORY ASSIGNMENTS:

The class includes nine laboratory assignments, which have to be prepared as pre-lab reports to be performed in the lab session.

COMPUTER:

Several assignments will consist of writing MATLAB and LabVIEW routines. PC's, Mac'c, and workstations are available in the LRC (WRW 205).

TEXT:

Class notes are available in the Sigma-Gamma-Tau.

CLASS FORMAT:

The class consists mostly of theoretical lectures together to the hands-on experiments, which introduces the topic that will be covered during the lab session, and one session per week.

CLASS SCHEDULE:

See topics

CLASS OUTLINE:

See topics.

GRADING:
9 Lab Reports.……..……..80%
Quiz.……...…..……...…….20%

HOMEWORK POLICY:

1. There will be one homework assignment per week. Teaming is allowed on homework assignments, according to your team's lab session. However, each report in an individual work and is due one week after the implementation session.
2. **Reports will be assessed a 10% penalty per day late. Any reports/projects turned in over 9 days late will receive a zero, but ALL must nevertheless be turned in to pass the class.**

EXAMINATIONS:
See topics and grading

ATTENDANCE:
Regular attendance is expected

OFFICE HOURS:
Tuesdays 2:00 - 3:00 pm;
Thursday during the Lab classes;
By appointment, or send e-mail.
(a) Feb. 4 - Last day to drop a course for a possible refund
(b) Feb. 16 - Last day to drop a course without possible academic penalty
(c) Mar. 29 - Last day to drop a course (with dean's approval)

IMPORTANT DATES:

12th. class day	February 4th.
Last day to drop a course for a possible refund	February 4th.
Last day to drop a course w/o possible academic penalty	February 16th.
Last day to drop a course (with dean's approval)	March 29th.
Final quiz	May 6th.
Last day of classes	May 7th.

SPECIAL NOTES:
The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4641 TDD or the College of Engineering Director of Students with Disabilities at 471-4321.

EVALUATION:
Measurement and Evaluation Center forms for the College of Engineering will be used during the last week of class to evaluate the course and the instructor.