ENGR 4210/6210 Linear Systems

Biological & Agricultural Engineering Department

Fall Semester 2008

Professor
Dr. E. W. Tollner
Office: Driftmier Engineering Center, Room 115
Phone: 706-542-3047
Email address: btollner@engr.uga.edu

Office hours:

8 am – 5 pm or whenever you can catch me

Academic Honesty

All students are responsible for maintaining the highest standards of honesty and integrity in every phase of their academic careers. The penalties for academic dishonesty are server and ignorance is not an acceptable defense. The document for academic honesty may be found at the web site for The University of Georgia Office of Senior Vice President for Academic Affairs and Provost.

Departmental Grading Policy Regarding Communication Skills

Thirty percent of the grade on all written assignments (lab reports and papers) and oral presentation will be based on quality of communication. Spelling, grammar, punctuation and clarity of writing are evidence of written communication quality. Enunciation, voice projection, clarity and logical order of the presentation and effective use of visual aids are evidence of oral communication quality.

Engineering Professionalism Policy

The engineering profession is governed by a code of ethics that have developed alongside the rigors of the practice and its many contributions to society. Engineering students at UGA are responsible for maintaining the highest standards of professionalism and professional practice. Engineering faculty at UGA expect students to act in a professional manner at all times. This includes removal of hats in the room.

Attendance

Students are expected to attend class. The instructor reserves the right to drop students missing more than 4 consecutive classes.

Cell phones

Cellular phones and related equipment should be in the off position during the class.

UGA Bulletin Course Description

Time and frequency domain analysis of linear systems, convolution, Fourier series, and Fourier transforms with applications.

Offered	Credits	Level	Weekly Class Meeting Pattern
Fall	03	Senior	3 hours lecture

Course Prerequisites

ENGR 2170

Course Pre- or Co-requisites

None

Courses that require this course as a pre-requisite

ENGR 4220/6220

Text

Continuous Signals and Systems with MATLAB, 2nd Editioin
Taan Elali ad M.A. Karim

References

Contemporary Linear Systems Using Matlab
Robert Strum, Donald Kirk

Signals, Systems and Transforms
Charles Phillips, John Parr, Eve Riskin

Linear Dynamic Systems and Signals
Zoran Gajic

Fundamentals of Linear State Space Systems
John S. Bay

Topics and (Number and 1 hour classes)

Track A (about 30)	Track B (15 total)
1. Introduction to the topic of signals, sequences and systems	Matlab
Signal types (2)	
8. Properties of continuous systems (2)	
4. Review of the matrix operations (1)	
8. The Fourier series and transform (6)	Linear Algebra
7. Laplace Transform and transfer function representation (8)	
Properties	Matrices
System transfer function	
Poles and zeros	Differential equation modes of systems
System impulse response	Characteristics roots
System forced and initial condition response using Laplace Transform	Initial condition solution
8. Linear Systems	Systems in the time domain

Systems Analyses

Note: Students for ENGR 6210 will meet the following additional requirements

1. Prepare a literature review of systems analyses approaches used in a selected research area
2. Do an additional analyses project that may relate to thesis or dissertation research which would likely include a detailed comparison and contrast of linearized and and nonlinear approaches to solving sets of differential equations.
3. Prepare lectures and labs designed to teach MATLAB solution techniques to undergraduates

Laboratory Exercises

All laboratory exercises are to be performed using the software program **Matlab.**

1. Matlab tutorial: Part I (1)
2. Complex numbers (1)
3. Matlab tutorial: Part II (.5)
4. Plotting signals and sequences (.5)
5. Matlab tutorial: Part III (.5)
6. Matrices and linear algebra (.5)
7. Matlab tutorial: Part IV (.5)
8. Differential equation solvers, including Laplace Transforms (.5)
9. Project

Course Learning Objectives Matrix

Course Learning Objectives	Course Assessment Methods*	Extent of Coverage of Program Outcomes* (ABET Criterion 3)
Upon successful completion of this course, the student will be able to:		
Analyze system in the time domain	A,B,C,D,E	a, d, e, f, g, i, k xxx c, h, j, xx
Analyze a system in the frequency domain	A,B,C,D,E	a, d, e, f, g, i, k xxx c, h, j xx
Use the software program Matlab for system simulation and analysis	A,B,C,D,E	a, d, e, f, g, i, k xxx c, h, j xx
Use a state-space model to simulate a system	A,B,C,D,E	a, d, e, f, g, i, k xxx c, h, j xx
Understand the transition from the time domain to the frequency domain	A,B,C,D,E	a, d, e, f, g, i, k xxx c, h, j xx
Analyze a signal in the frequency domain	A,B,C,D,E	a, d, e, f, g, i, k xxx c, h, j xx

*****Course Assessment Methods: A – homework; B – hourly exams; C – final exam; D – computer based project; E – student evaluation

**Extent of Coverage: x – some, xx – moderate, xxx – extensive

ABET EC-2000 Criterion 3 Program Outcomes

a) An ability to apply knowledge of mathematics, science, and engineering.
b) An ability to design and conduct experiments, as well as to analyze and interpret date.
c) An ability to design a system, component, or process to meet desired needs.

d) An ability to function on multi-disciplinary teams.
e) An ability to identify, formulate, and solve engineering problems.
f) An understanding of professional and ethical responsibility.
g) An ability to communicate effectively.
h) The broad educational necessary to understand the impact of engineering solutions in a global and societal context.
i) A recognition of the need for, and an ability to engage in life-long learning.
j) A knowledge of contemporary issues.
k) An ability to use techniques, skills, and modern engineering tools necessary for engineering practice.

Overall Course Contribution to Program Outcomes

a, d, e, f, g, i, k Extensive	c, h, j Moderate

Method of Grading

Test 1	15%
Test 2	15%
Test 3	15%
Final Exam	30%
Homework and computer projects	25%

Revision
08/16/03 – Fall semester, 2004
07/11/07 – Fall semester, 2007