ECE 2050: Introduction to Discrete Time Signals & Systems

Course Description
Introduction to sampled time signals and linear time invariant sampled time systems.

Prior Course Number: 2000, 2100, 292
Transcript Abbreviation: Intr Disc Sig&Sys
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Sophomore
Course Offerings: Autumn, Spring
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 3.0
Repeatable: No
Time Distribution: 2.5 hr Lec, 1.5 hr Lab
Expected out-of-class hours per week: 5.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus, Lima, Marion
Prerequisites and Co-requisites: Prereq: 2000, or 2060, or 2061 and 2067. Prereq or concur: Math 2568.
Exclusions: Not open to students with credit for 2100, 2100.01, 2100.04, 2104, or 2110.
Cross-Listings:

Course Rationale: Part of splitting of ECE 2000 and ECE 2100 into 3 courses to better represent topics taught.

The course is required for this unit's degrees, majors, and/or minors: Yes
The course is a GEC: No
The course is an elective (for this or other units) or is a service course for other units: No

Subject/CIP Code: 14.1001
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

General Information

There are actually seven 3 hour labs instead of fourteen 1.5 hour labs.
Lectures will meet three times per week for 45 minutes a session.

Course Goals

Be competent with the fundamentals of discrete time linear time invariant (LTI) systems

Be competent in using laboratory instruments, methodology and reporting standards
Be competent in working in teams for laboratory experiments
Be competent is performing z-transforms and inverse z-transforms
Be competent in analyzing, designing and sythesizing discrete time LTI systems, including finite impulse response (FIR) and infinite impulse response (IIR) filters
Be familiar with sampling, analog to digital and digital to analog conversions
Be familiar with how to implement designs in hardware using modern techniques such as FPGAs and microcontrollers
Be exposed to troubleshooting and debugging practices

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Introduction to continuous & discrete signals, sampling & aliasing, quantization	2.0							
Review of complex numbers	1.0							
Discrete time signals and special functions	1.0							
Discrete time systems descriptions & properties: LTI systems, impulse response, FIR/IIR conditions, convolution, difference equations, zero-state and zero-input, flow diagrams	6.0							
Z-transform techniques: two-sided vs one-sided z-transform, region of convergence (ROC), rational z-transforms, LTI systems in z-domain, power series and partial fraction expansion, transient and steady-state, stability	7.0							
Steady-state frequency response of discrete time LTI systems: spectrum, Fourier series, discrete time Fourier transform & relationship to z-transform, frequency response from poles & zeros in transfer function	7.0							
Frequency response of LTI systems and LTI frequency selective filters	7.0							
Instrumentation and CAD tool review: oscilloscope, Matlab, microcontroller and FPGA programming			9.0					
FPGA implementation of discrete time filters (FIR, IIR)			6.0					
Microcontroller implementation of discrete time filters (FIR, IIR)			6.0					

Representative Assignments

Homework
Midterm Exam 1
Midterm Exam 2
Lab Reports
Final Exam

Grades

Aspect	Percent
Homework	15%
Midterm Exam 1	20%
Midterm Exam 2	20%
Lab Reports	20%

Aspect	Percent
Final Exam	25%

Representative Textbooks and Other Course Materials

Title	Author
Digital Signal Processing, any edition (recommended)	John G. Proakis & Dimitris G. Manolakis

ABET-EAC Criterion 3 Outcomes

Course Contribution		College Outcome
***	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 data.
*	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 education 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 the techniques, skills, and modern engineering tools necessary for engineering practice.

Additional Notes or Comments

Created summer and autumn 2014 for UG program revision - sophomore sequence update.

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