ECE 2100: Electrical and Computer Engineering II

Course Description

Introduction to the theory and practice of discrete systems using difference equations and z-transforms, and analog systems using differential equations and Laplace transforms.

Transcript Abbreviation: ECE 2
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: 4.0
Repeatable: No
Time Distribution: 2.0 hr Lec, 1.0 hr Rec, 3.0 hr Lab
Expected out-of-class hours per week: 6.0
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 2000.03, or 2004 and 2017.
Exclusions: Not open to students with credit for 2100.01, 2100.02, 2100.04, 2100.06, 2100.07, 2100.08, 2104, 2105, 2106, 2117, 2127, 2300, 205, 209, 291, 292, 294.02, 294.03, 301, or 351.
Cross-Listings:

Course Rationale: Existing course.

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: Yes

Subject/CIP Code: 14.1001
Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Learn how to analyze, design and implement simple IIR filters based on difference equations
Learn circuit concepts such as voltage, current, charge, inductors, capacitors etc.
Learn how to analyze, design and implement circuits using Ohm?s Law, Kirchhoff?s law and superposition
Learn Phasor Domain techniques
Learn to analyze, design and implement steady state and transient behavior of RC, RL, RLC circuits

Learn to analyze, design and synthesize elementary FIR (Finite Impulse Response) discrete filters.
Learn Laplace and Fourier Transform techniques
Learn to analyze, design and implement simple active filters based on ideal Op amps
Learn how to use modern computer tools for digital design, verification and simulation
Learn how to implement design schematics to hardware using modern FPGAs
Learn methodology for critical troubleshooting skills
Learn reporting standards
Learn how to use laboratory instruments and laboratory methodology

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Frequency Response, Magnitude and Phase Response of Discrete Systems	2.0							
Lowpass, highpass and bandpass discrete filters	2.0							
FIR filters, implementation of FIR filters	3.0							
IIR filters, difference equations	3.0							
Charge, current, voltage, power, circuit elements	1.0							
Ohms law, Kirchoffs laws KCL, KVL	1.0							
Nodal, mesh, Thevenin, Norton, superposition, maximum power transfer	4.0							
RC and RL first-order circuits, natural and total response	2.0							
General solution of second-order circuits	3.0							
Phasor domain analysis, impedance transformations, average and complex power	3.0							
RC, RL, RLC frequency response vs transient response	2.0							
Bode Plots	2.0							
Ideal op amp, active filters, cascaded active filters	2.0							
Laplace transforms, properties, pole zero diagrams and inverse Laplace transform	3.0							
Scaling properties, initial and final value theorems	1.0							
System transfer function impulse response, step response, sinusoidal response	2.0							
Convolution integral	1.0							
Fourier fransform, Fourier transform pairs	3.0							
Implementing an FIR nulling digital filter, comparing to MATLAB			2.0					
Designing and implementing a single pole slow pass filter and imoproving the design by adding a zero.			2.0					
Building a DC-coupled digital-to-analog converter based on pulse wave modulation			2.0					
Controlling the speed of a DC motor			2.0					
Brushless DC motors and quadrature signals			2.0					
Multisim simulation of analog circuits			2.0					
Building circuits based on resistors and capacitors			2.0					
Active circuits based on op amps			2.0					
Building more advanced active circuits based on op amps			2.0					

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Building active filters using op amps on a breadboard; high-pass and low-pass, second order Bessel filters, observe the effects of these filter on sound from an electronic music source			2.0					

Grades

Aspect	Percent
Homework	15%
Midterm Exam 1	20%
Midterm Exam 2	20%
Final Exam	25%
Lab Reports	20%

Representative Textbooks and Other Course Materials

Title	Author
Signal Processing First, 2003, 0-13-09099-8, Pearson (new edition Jan 2014)	McCellan, Schafer and Yoder
Circuits, 2nd ed, 978-1-934891-19-3, NTS Press	Ulaby and Maharbiz

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

Changed grading weights; changed "Homework" to "Quizzes and Homework;" changed "Lab evaluations" to "Lab reports." Delete "their" from course goal. Change "Eeements" to "elements, "Ppots" to "plots, "filter" to "filters" in course topics.
Updated text info, 4/4/13, CED

Add recitation and make it graded component 2/14/12

Changed "Prereqs" to "Prereq" per request of registrar 2/24/12

Updated text (Circuits) to the latest edition. CD. 10/4/12

Add Marion Campus 11/13/12

Update prereqs and exclusions to include transfer student courses 12/12/12

revise grading scheme 4/24/13
Changed graded component to lecture, 6/26/13, CED

Added Lima campus 3/7/14 BLA

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