ECE 2020 (Proposed): Introduction to Analog Systems and Circuits

Course Description

Circuit theory and applications of passive components and Op amps. Introduction to analog systems using differential equations and Laplace transforms.

Prior Course Number: 2100
Transcript Abbreviation: Anlg Sys & Circuit
Grading Plan: Letter Grade
Course Deliveries: Classroom, Greater or equal to 50% at a distance
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, 1.0 hr Rec, 1.5 hr Lab
Expected out-of-class hours per week: 4.0
Graded Component: Lecture
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus, Lima, Marion
Prerequisites and Co-requisites: Prereq: CSE 205, 1222 (202), 2221 (221), Engr 1222 (EnGraph 167.01), 1281.01H (192.01H), or 1281.02H (192.02H); and Engr 1182.01, 1182.02, 1182.03 (183), 1282.01H (193H), 1282.02H, 1282.03H, or 1186 (186), 1187 (187) and 1188 (185) concurrent, or 1187, 1188, and 1186 concurrent; and Math 1152 (152), 1161.01 (161), 1161.02, 1172, or 1181H; and Physics 1250 (131), or 1260; and CPHR 2.00 or above.
Exclusions: Not open to students with credit for 2100, 2100.02, 2100.06, 2100.07, 2100.08, 2105, 2106, 2110, 2127, 2137, or 2300.
Cross-Listings:

Course Rationale: Restructuring of Sophomore Sequence.

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

General Information

Course contains seven 3 hour labs Course will meet 3x / week for 45 minutes a session.

Course Goals

Master circuit concepts such as voltage, current, charge, resistors, inductors, capacitors, etc.
Master how to analyze, design and implement circuits using Ohm's Law, Kirchhoff's laws and superposition
Be competent in Phasor Domain sinusoidal techniques
Be competent in analyzing, designing and implementing steady state and transient behavior of RC, RL, RLC circuits
Be competent in Laplace Transform techniques
Be competent in analyzing, designing and implementing simple active filters based on ideal Op amps
Be familiar with how to use modern computer tools for analog simulation
Be competent in how to use laboratory instruments and laboratory methodology
Be competent with methodology for critical troubleshooting skills

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Fundamentals of electric circuits: Charge, Voltage, Kirchhoff's Laws, power and sign conventions, Ohm's law, practical circuit elements	2.5							
Circuit Analysis Techniques: Node Voltage / Mesh analysis, superposition, Thevenin and Norton equivalents	4.0							
Ideal op amp, feedback, active filters, cascaded active filters	2.5		3.0					
RC and RL first-order circuits, natural and total response, RC Op amp circuits	2.5		3.0					
Initial and Final Conditions, Series and Parallel RLC, General solution of second-order circuits	2.5		3.0					
Laplace transforms, properties, pole zero diagrams and inverse Laplace transform	3.0							
System transfer function scaling, impulse response, step response, sinusoidal response, s-Domain circuit analysis	2.0							
Sinusoidal signals, Phasor domain analysis, impedance transformations	4.0							
RC, RL, RLC frequency response vs transient response	2.0		3.0					
Bode Plots, Passive and Active Filters	4.0		3.0					
Periodic Waveforms, Average and Complex Power, Maximum power Transfer	2.5							
Multisim circuit analysis			3.0					
Introduction to Lab Equipment, troubleshooting skills			3.0					

Representative Assignments

Homework, laboratories, midterms, final exam

Grades

Aspect	Percent
Homework	15%
Midterm Exam 1	20%

Aspect	Percent
Midterm Exam 2	20%
Final Exam	25%
Lab Results	20%

Representative Textbooks and Other Course Materials

Title	Author
Circuits	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

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Initial Design 8/29/14

Added recitation 10/13/15 BLA

change lab reports to labs, add midterms and final to representative assignments, delete
standards from course goals  9/14/116 BLA

Edited text info 5/9/17, CED
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Prepared by: Carol Duhigg