ECE 3027: Electronics Laboratory

Course Description

Electronic amplification, signal processing, timing, and power regulation circuits. Experiments with electronics evaluation modules and use of an analog system lab kit for electronics testing.

Prior Course Number: 327
Transcript Abbreviation: Electronics Lab
Grading Plan: Letter Grade
Course Deliveries: Classroom
Course Levels: Undergrad
Student Ranks: Junior, Senior
Course Offerings: Autumn, Spring
Flex Scheduled Course: Never
Course Frequency: Every Year
Course Length: 14 Week
Credits: 1.0
Repeatable: No
Time Distribution: 3.0 hr Lab
Expected out-of-class hours per week: 0.0
Graded Component: Laboratory
Credit by Examination: No
Admission Condition: No
Off Campus: Never
Campus Locations: Columbus
Prerequisites and Co-requisites: Prereq: 2020 or 2100; or 2027 and 2021; or 2027 and 2106; and 3020; and ECE or EngPhysics major.
Exclusions:
Cross-Listings:

Course Rationale: Existing lab course, increased from session to full semester. Part of a program change proposal, to become required for major rather than elective.

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

This electronics lab course uses educational kits as being developed in the ongoing growth of the maker movement. Students are assigned in groups of two and have an overall lab kit assigned to them for the entire semester. In the course topics below, student groups are able to pick up where they left off from the previous lab with their specific kit, allowing for flexibility in the depth into which they can explore the topics. The lab manual and added material contains more content than can be explored in one semester.

Course Goals

Use knowledge of circuits and electronics to design electronic circuits, and to measure and document performance of electronic circuits
Provide the student the experience of designing, constructing, testing, and debugging electronic circuits

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Overview of the TI Analog System Lab Kit Pro and lab procedures. Op Amp Circuits - verify correct operation by reducing offset voltage with unity gain configuration, and use this to estimate open loop gain.			3.0					
Op Amp Circuits: Inverting and non-inverting configurations.			3.0					
Op amp based Schmitt trigger, oscillators, and monostable multivibrator. Dual supply vs. single supply designs. Oscillator driving light emitting diode circuits.			3.0					
Op amp integrators and differentiators - dual vs. single supply. Slew rate effects, settling time, and ringing behaviors.			3.0					
Transistor amplifiers and inverters - single supply vs dual supply designs. N type vs P type transistor amplifier configurations.			3.0					
Op amps combined with transistor buffer amplifiers for driving higher current loads such as light emission, sound, and other power considerations, such as regulation.			3.0					
Measurements of TI Analog System Lab Kit's built-in low dropout regulator and DC-DC switching regulator.			3.0					
Discrete low dropout regulator design and measurement. Op Amp selection with respect to stability and settling time.			3.0					
Discrete form of switching regulator - LCR plus transistor switch.			3.0					
Analog multipliers vs. multiplying Digital to Analog Converters (DAC). Programmable oscillator with analog multiplier vs. DAC.			3.0					
Programmable filter with analog multiplier vs DAC. Controlling DAC with TI Launchpad Microcontroller.			3.0					
Analog to Digital Converter in TI Launchpad Microcontroller.			3.0					

Representative Assignments

Laboratory Reports
Quizzes

Grades

Aspect	Percent
Laboratory Reports	70%
Quizzes	30%

Representative Textbooks and Other Course Materials

Title	Author
Laboratory Notes	Elec. and Comp. Engr. Dept.

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.

CpE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
*	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
*	3	an ability to communicate effectively with a range of audiences
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
**	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
**	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
**	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

EE ABET-EAC Criterion 9 Program Criteria Outcomes

Course Contribution		Program Outcome
*	1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
	2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
*	3	an ability to communicate effectively with a range of audiences

Course Contribution		Program Outcome
	4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
**	5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
**	6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
**	7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Additional Notes or Comments

converted prereq and exclusions to standard form.
Added "or 292 or 294 (Spring 2011) " to prereqs 4/11/12
Increased to full semester 1 credit hour for ECE program change 10/10/2014

added 2020 or (2021 and 2027) to prereqs. 10/7/15 BLA

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