

ECE 2000: Electrical and Computer Engineering I

Course Description

Introduction to the theory and practice of combinational and clocked sequential networks, sampling, discrete linear time invariant systems and discrete finite impulse response filters.

Transcript Abbreviation: ECE 1

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: Math 1152 (152) or 1161.01 or 1161.02 or 1172 or 1181H or 161, and Physics 1250 or 1260 or 131, and CSE 222 or 2221 or 202 or 205 or 221 or EnGraph 167 or Engr 1281.01H or 1281.02H or 1222 or Engineer 192.01H or 192.02H; and Engr 1182.01 or 1182.02 or 1182.03 or 1282.01H or 1282.02H or 1282.03H or Engineer 183 or 193H, or Engr 1186 (Engineer 186) and 1187 (187) and concur: 1188 (185) concurrent, or 1187 and 1188 and concur: 1186, or major in CIS or CIS-PRE; and CPHR 2.00 or above.

Exclusions: Not open to students with credit for 2000.02, 2000.03, 2000.07, 2000.08, 2001, 2004, 2017, 261, 270, 290, 291, 294.01, 294.02, 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 the number representations used in today's digital systems and their arithmetic properties and conversion techniques

Learn to analyze and synthesize networks of combinatorial, digital logic elements
Learn to analyze, design and synthesize digital clocked sequential circuits
Learn sampling, analog to digital and digital to analog conversion
Learn the fundamentals of Discrete Linear Time Invariant Systems
Learn Z transforms techniques to handle discrete systems
Learn how to use modern computer tools for digital design, verification and simulation
Learn how to implement their design schematics to hardware using modern FPGAs
Learn how to work in teams for lab experiments
Explore digital circuit design methods
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
Number systems and conversion	3.0							
Boolean algebra	2.0							
Karnaugh maps	2.0							
Multi-level gate circuits	2.0							
Multiplexers, decoders and PLDs	3.0							
Latches and flip-flops	3.0							
Registers and counters	3.0							
Timing (delays, timing diagrams)	2.0							
Analysis of clocked sequential circuits (general models for sequential circuits, timing charts, state tables, graphs)	4.0							
Design of clocked sequential circuits	3.0							
Introduction to complex numbers	1.0							
Sinusoidal signals, periodic signals, Fourier series, time-frequency spectrum	3.0							
Sampling, aliasing, sampling theorem	2.0							
Discrete linear time invariant (LTI) systems	3.0							
Impulse response and convolution for discrete systems	1.0							
z-Transforms, properties, convolution and the inverse z-transform	3.0							
Bootstrapping: intro to iPad, signal generator, and oscilloscope			2.0					
Intro to building hardware on the FPGA chip: DE2 board, HPGA chip, Quartus II projects, Quartus II simulation, hierarchy			2.0					
Building and debugging hardware on FPGA board using features of Quartus II			2.0					
Sampling, using the ADC and DAC of the CODEC, line in and line out on the DE2 board			2.0					
Building a synthesizer using ROM and counter; dividing and multiplying frequencies using bit shifting, intro to using the Ipm_ROM and Ipm_Counter, building a fully functional synthesizer			2.0					

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Building a signal generator using the synthesizer, CODEC and multiplexers from previous labs, producing various frequencies and waveforms			2.0					
Build an electronic keyboard to play music: decode keystrokes, use components developed in earlier labs			2.0					
Adding playback capabilities to electronic keyboard using MATLAB to code keystrokes, duration of key presses, add hardware to electronic keyboard developed earlier to read the MATLAB file into ROM and play back the music encoded in the file.			2.0					
Digital signals and sending and receiving digital signals from the FPGA chip: GPIO (General Purpose Input Output) Headers. Intro to the digital part of the oscilloscope, using digital probes; tri-state buffers.			2.0					
Measuring the spectrum of a signal using FFT in the lab: FFT on oscilloscope, generating AM signals and observing spectral content, spectrum of sinusoidal, square and triangular waves, spectral analysis of music from mp3 player.			2.0					
MATLAB for digital signal processing: generate periodic signals in MATLAB, use FFT in MATLAB, reconstructing signals from FFT data			2.0					
SIMULINK to simulate difference equations			2.0					
Realizing difference equations in hardware on the FPGA chip			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
<i>Fundamentals of Logic Design, 7th ed, 978-1133-62847-7, Cengage Learning</i>	Roth, Jr. and Kinney
<i>Signal Processing First, 2003, 0-13-09099-8, Pearson (new edition coming Jan. 2014)</i>	McClellan, Schafer and Yoder

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.

Course Contribution		College Outcome
	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

Updated prereqs and exclusion 1/22/12

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

Clarified programming preqs to CSE 2221, 1222, 202, 221, EnGraph 167, Engineer 192.01H, 192.02H 1281.01H, 1281.02H or 1222 May 7, 2012

Added CSe 205 and Math 161, 1161.01. 1161/02 and 1181H to prereqs 5/19/12 and CIS-PRE

Added "or all thre of ENGR 1186 and 1187 and 1188" for transfer students 10/15/12

ADd Marion campus 11/13/12

revised prereqs for transfer students, require 1187 pre with at least one 1186 and 1188, and the other at least concur. Add exclusions for 2001, 2004, and 2017. 12/11/12

Updated text info, 4/4/13, CED

Revised grading scheme 4/24/13

Changed graded component to lecture, 6/26/13, CED

Add Lima Campus 3/7/14

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