

ECE 2060: Introduction to Digital Logic

Course Description

Introduction to the theory and practice of combinational and clocked sequential networks.

Transcript Abbreviation: Int Digital Logic

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 1222, 2221, Engr 1222, 1281.01H, or 1281.02H; and Math 1152, 1161.01, 1161.02, 1172, or 1181H; and Physics 1250, or 1260; and Engr 1182.01, 1182.02, 1182.03, 1282.01H, 1282.02H, 1282.03H, 1282.04H, or 1186, 1187, and 1188 concurrent, or 1187, 1188, and 1186 concurrent, or major in CIS or CIS-PRE; and CPHR 2.00 or above.

Exclusions: Not open to students with credit for 2000, 2000.02, 2000.07, 2001, 2010, or 2017.

Cross-Listings:

Course Rationale: Restructuring of Sophomore sequence. Splitting ECE2000 and ECE2100 into 3 courses.

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

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

Course Goals

Master the number representations used in today's digital systems and their arithmetic properties and conversion techniques
Master analyzing, synthesizing, and designing networks of combinatorial, digital logic elements
Be competent to analyze, design and synthesize digital clocked sequential circuits
Be familiar with modern computer tools for digital design, verification and simulation
Be familiar with how to implement their design schematics to hardware using modern FPGAs
Be competent in working in teams for lab experiments
Be familiar with digital circuit design methods
Be competent in reporting standards
Be competent in using laboratory instruments and laboratory methodology
Exposure to methodology for critical troubleshooting skills

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	4.0							
Finite state machines, flow diagrams, mapping to flip-flop circuits with logic gates.	4.0							
Introduction to lab Equipment: Signal Generator and Oscilloscope, how to measure digital signals using the oscilloscope and the motivation for using digital signals			3.0					
Introduction to Quartus and the DE2 Board: HDL files, basic RTL components for simulation. Quartus on-chip debugging tools, Signal Tap II and the In-System Memory Content Editor.			6.0					
Using the CODEC: Students are shown how to use the DE2s audio CODEC chip to perform conversions between analog and digital signals.			3.0					
Introduction to the Synthesizer: build a synthesizer, Students also learn how to use Matlab to create memory contents for ROM look-up tables. Finally students are introduced to bit shifting as a means of scaling signed and unsigned numbers.			3.0					
Electronic Keyboard: Students build a circuit that takes signals from PS2 keyboard and converts them into musical tones by applying the concepts and skills they have learned in the previous 5 labs.			3.0					
Demo Player Feature for an Electronic Keyboard: Students add an auto play feature to the electronic keyboard that automatically plays a short tune. Emphasizes the use of sequential components, testing of large Quartus project.			3.0					

Representative Assignments

Homework
Midterm Exams
Final Exam
Lab Reports

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</i>	Roth, Jr. and Kinney

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

Course Contribution		Program Outcome
**	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
	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

Initial Design: 9/10/14 Khan

Updated from 2.5 to 3 hr course 10/9/14

Synch prereqs and exclusions to match university. 10/12/2015 BLA

Add recitations. Hours don't add up, but the in-person section takes the lecture with no recitations and the on-line section has a recitation but no lecture. We need to have recitations here or Carol can't schedule them. 10/12/2015

Edited text info 5/9/17, CED

Added ENGR 1282.04H to prereqs

Added contributions to the new ABET student outcomes. 5/22/2019 GJV

Prepared by: George Valco