

ECE 3561: Advanced Digital Design

Course Description

Design and analysis of sequential circuits; digital circuit design using building blocks, programmable logic devices; design of basic computer components such as arithmetic logic units.

Prior Course Number: 561, 667

Transcript Abbreviation: Adv Digital Dsgn

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: 3.0

Repeatable: No

Time Distribution: 3.0 hr Lec

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

Prerequisites and Co-requisites: Prereq: 2000, 2060, 2061, 2010, 2000.02, 290, 294 (Autumn 2010) or 206 and 261. Prereq or concur: 3020 (323), and enrollment in ECE, EngPhys, or CSE majors; or prereq or concur 2010 and permission of department.

Exclusions: Not open to students with credit for 561.

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: 14.0902

Subsidy Level: Baccalaureate Course

Programs

Abbreviation	Description
CpE	Computer Engineering
EE	Electrical Engineering

Course Goals

Learn digital design principles and practice and learn to design using building blocks such as counters, shift registers, and adders and programmable logic devices such as FPGAs and CPLD
Learn methods to design clocked sequential circuits using state diagrams and tables, state reduction and state assignment methods
Learn to perform timing analysis at each step of the design

VHDL is introduced
Design and simulate digital circuits using a state-of-the-art CAD package. Both schematic and VHDL-based design is supported

Course Topics

Topic	Lec	Rec	Lab	Cli	IS	Sem	FE	Wor
Clocked synchronous state-machine analysis and timing	8.0							
Clocked synchronous state-machine design	13.0							
Design with counters, shift registers, multiplexers, comparators, decoders, and adders	8.0							
Design with asynchronous inputs and for glitch-free outputs	1.0							
VHDL for combinational logic and state machine design	4.0							
Logic implementation with PLDs, FPGAs, and ROMs	6.0							

Representative Assignments

Textbook problems
Computer simulations

Grades

Aspect	Percent
Quizzes	15%
Computer Projects & Homework	30%
Midterm Exams	25%
Final Exam	30%

Representative Textbooks and Other Course Materials

Title	Author
<i>Fundamentals of Logic Design Roth and Kinney</i>	Roth 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.

Course Contribution		College Outcome
***	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
*	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

deleted "ECE" from exclusion of 567- BLA 2/22/12

Add "; or prereq or concurrent 2010 and permission of department." to prereq 10/20/13

Make consistent with university version 2/13/14

Add a star to ABET outcome "b" per ABET review 4/21/14 BLA

Add 2060, 2061 to prereqs 9/8/2015 BLA

Change textbook August 11. 2018 BLA

Change text back to Roth and Kinney 11/15/18 BLA

Newoutcomes 6/5/ 2019 BLA

Prepared by: Betty Lise Anderson