The University of Texas at Tyler
Department of Electrical Engineering

Course: EENG 4332/5335 – FPGA Design

Syllabus

Catalog Description:

Digital Systems design with Field Programmable Gate Arrays (FPGAs); Design and synthesis of reconfigurable logic with High-level Hardware Description Language; Logic Design using FPGAs; Architectural and System Design issues; Reconfigurable computing with FPGAs. Three hours of lecture each week.

Prerequisites: EENG 3307 Microprocessors and EENG 4309 Electronic Circuits II or Consent of Instructor

Credits: (**3** hours lecture, **0** hours laboratory per week)

Text(s): Stephen Brown and Zvonko Vranesic, Fundamentals of Digital Logic with Verilog Design. 3rd Edition. Mc Graw Hill, 2014. ISBN 9780073380544

Additional Material(s): Peter J. Ashenden, The Student's Guide to VHDL. 2nd edition. Morgan Kaufmann, 2008.

Class Notes; Journal Articles

Course Coordinator: Kazi Rashed, Electrical Engineering

Topics Covered:
(Paragraph of topics separated by semicolons)

VLSI CAD Tools; Fabrication of Integrated Circuits; Modeling Submicron Transistors; Static and Dynamic Logic Gate Design; Datapath design; Subsystem design; Delay, Power Characterization; Clock Distribution; Physical Design; Interconnect Modelling; Testing and Verification Issues.

Evaluation Methods (Only items in dark print apply):

1. Examinations/ Quizzes
2. Homework
3. Report
4. Computer Programming
5. Project
6. Presentation
7. Course Participation
8. Peer Review

Course Objectives[1]: By the end of this course students will be able to:

1. Explain how FPGAs are used in digital system design. [1,2]
2. Design digital logic circuits using VHDL. [1,2]
3. Use CAD tools in the design, simulation, and implementation of FPGA designs. [4,5]

4. Analyze the implementation of reconfigurable logics in a VLSI process [1]
5. Design and implement Combinational and sequential logic circuits with FPGAs. [1,2,7]
6. Optimize the device sizing for a complex logic circuit using the concept of logical effort. [1,2]
7. Determine the delay in CMOS circuits. [1]
8. Characterize a CMOS logic gate utilizing SPICE simulation data. [4,5]
9. Implement transistor-level schematic of compound CMOS logic gates. [2]
10. Assess the design challenges of implementing dynamic logic circuits in submicron technologies. [1]
11. Analyze different memory architectures in the transistor-level. [1,2]
12. Identify the issues with testing complex logic circuits. [1,2]
13. Understand the issues with designing devices and circuits using nanotechnology. [1]
14. Explore the real-time advance applications of FPGA boards. [3,6]
15. Explore the current research trend in VLSI Design. [6]

[1] Numbers in brackets refer to method(s) to evaluate the course objective

Relationship to Program Outcomes (only items in dark print apply)[2]. This course supports the following

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics [1,2,9,10]
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 [4,6,11,12]
3. an ability to communicate effectively with a range of audiences [15]
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 [14]
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 [3,8]
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies [13]

Electrical Engineering Program Outcomes, which state that our students will:

[2] Numbers in brackets refer to course objective(s) that address the Program Outcome.

Contribution to Meeting Professional Component: (in semester hours)

Mathematics and Basic Sciences:	0	hours
Engineering Sciences and Design:	3	hours
General Education Component:	0	hours

Prepared By: Prabha Sundaravadivel
Revised by Kazi Rashed

Date: 22-Aug-2018
08-Jan-2020