

 FLORIDA ATLANTIC UNIVERSITY	COURSE CHANGE REQUEST Undergraduate Programs	UUPC Approval <u>3-28-22</u> UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department Electrical Engineering and Comp Science College Engineering and Computer Science	
Current Course Prefix and Number CDA 4240C	Current Course Title Design of Digital Systems and Lab	
Syllabus must be attached for ANY changes to current course details. See Checklist . Please consult and list departments that may be affected by the changes; attach documentation.		
Change title to: Change prefix From: _____ To: _____ Change course number From: _____ To: _____ Change credits* From: _____ To: _____ Change grading From: _____ To: _____ Change WAC/Gordon Rule status** Add <input type="checkbox"/> Remove <input type="checkbox"/> Change General Education Requirements*** Add <input type="checkbox"/> Remove <input type="checkbox"/> <small>*Review Provost Memorandum</small> <small>**WAC/Gordon Rule criteria must be indicated in syllabus and approval attached to this form. See WAC Guidelines.</small> <small>***General Education criteria must be indicated in syllabus and approval attached to this form. See GE Guidelines.</small>	Change description to: Change prerequisites/minimum grades to: CDA 3203 with minimum grade of "C" Change corequisites to: Change registration controls to: Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade (default is D-).	
Effective Term/Year for Changes: Fall 2022	Terminate course? Effective Term/Year for Termination:	
Faculty Contact/Email/Phone Hanqi Zhuang, zhuang@fau.edu, 561-297-3413		
Approved by Department Chair _____ College Curriculum Chair <u>Hongbo Su</u> College Dean _____ UUPC Chair <u>Ethlyn Williams</u> Undergraduate Studies Dean <u>Dan Meeroff</u> UFS President _____ Provost _____	Date 2/18/22 <u>3/17/22</u> 3-28-22 3-28-22 _____ _____	

Email this form and syllabus to mjenning@fau.edu seven business days before the UUPC meeting.

CDA4240C-001 CRN 21048, 002 CRN 20970, COT6930-007 CRN 21049
008 CRN 20971

Design of Digital Systems and Lab

W 4-6pm (Tutorial) 6-8pm (Lab)
3 credits

Spring, 2022

Prof. Reza Azarderakhsh
Office: EE 313

Office hours: W 3-4pm or by appointment

Classroom: General Classroom South Boca **Room: 11**

Labs: EE 213 and/or Online

Telephone: 561-297-XXXX

Email: razarderakhsh@fau.edu



TA name	TBD
Office	xxxxxxxxx
Office hours	W 6:00pm – 8:00pm
Telephone	561-297-xxxx
Email	TBD

Course Description

In this course, students will learn to use a hardware description language (mainly VHDL) in the digital design process. Emphasis will be on system level concepts and high-level design representations. Students will also have the opportunity to use a commercial synthesis tool to automatically map high-level descriptions to Field Programmable Gate Arrays (FPGAs). The lab-intensive hands-on aspect of this course presents different approaches to the digital system modeling and design with the use of HDLs.

Instructional Method

This class is designated as “Video Stream: Attendance Optional.” Class sessions will be recorded live, and a limited number of students may attend in person as long as social distancing protocols can be maintained. Other students will view class sessions remotely in Canvas. Labs will be in person or online.

1. **Office hours may be scheduled online. For those classes with on-line office hours only, in-person office visits will be accommodated on request for the Fall 2021**

COVID-19 Statement

Due to the surge in COVID-19 cases and the delta variant, all students regardless of vaccination status are expected to wear masks while indoors in any FAU facilities, including classrooms and laboratories. Students experiencing flu-like symptoms (fever, cough, shortness of breath), or students who have come in contact with confirmed positive cases of COVID-19, should immediately contact FAU Student Health Services (561-297-3512). Symptomatic students will be asked to leave the classroom to support the safety and protection of the university community. For additional information visit <https://www.fau.edu/coronavirus/> In classes with face-to-face components, quarantined or isolated students should notify me immediately as you will not be able to attend class. I will not be able to offer an online version of the class but will make reasonable efforts to assist students in making up the work. Vaccinated students have much lower chances of needing to quarantine and a much lower chance of missing class time.

term per the Provost's guidance: <https://www.fau.edu/provost/covid-19.php>.

2. By registering for this class, the students hereby consents to recording of the class and potential use of the class material for other purposes.

Prerequisites/Corequisites

CDA 3203 with minimum grade of "C"

Course Objectives/Student Learning Outcomes

To learn hardware description language with hands-on experience on FPGA devices. To be skilled of register transfer level (RTL) design and gain knowledge of designing digital systems.

Course Evaluation Method

Exam-I: 25%

Homework: 10%

Labs: 35%

Exam-II: 30%

Exams I and II will not follow university midterm and final dates.

Course Grading Scale

90 and above: "A", 87-89: "A-", 83-86: "B+", 80-82: "B", 77-79 : "B-", 73-76: "C+", 70-72: "C", 67-69: "C-", 63-66: "D+", 60-62: "D", 51-59: "D-", 50 and below: "F."

Policy on Makeup Tests, Late Work, and Incompletes (if applicable)

Penalties for late assignment submission will be 5% per day. Appropriate accommodations will be made for students having a valid medical excuse. Unless there exists an evidence of medical or emergency situation, incomplete grades will not be given.

Plagiarism will not be tolerated. Any copying and pasting without attribution and a reference will be considered plagiarism.

Penalties for late project submission will be 25% per day. The student will get zero after 4 days.

Special Course Requirements (if applicable)

N/A

Classroom Etiquette Policy (if applicable)

University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions.

FAU course management system (Canvas) will be the official communication tool between the instructor and the students, and it is the student's responsibility to regularly check the course shell for updates and announcements. This includes unforeseen changes to assignment/project deadlines. It is the student's responsibility to inform the professor, within the first week of class, of any conflict with important course dates. No accommodation will be made if these conflicts are not brought to our attention within the first week.

Students are strongly encouraged to ask questions during class. You may not use a PDA, PPC, laptop, netbook or other computer, IPOD or similar device in-class or during quizzes or exams. Cellular/PCS telephones, pagers, PDAs, etc. must be turned-off or put in vibrate mode during class. If your device disrupts the lecture, you may be asked to leave immediately. Upon a second offense, you will need to explain your actions to the CEECS Department Chair before being allowed to return. If you require an exception to this policy, please see me before creating a disturbance.

Although you are EXPECTED and ENCOURAGED to utilize a study-group, individual and original efforts are expected for all assignments and projects except when otherwise stated.

Policy on the Recording of Lectures (optional)

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

Attendance Policy

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

Counseling and Psychological Services (CAPS) Center

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS

provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

Disability Policy

In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at www.fau.edu/sas/.

Code of Academic Integrity

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys an unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and places high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. For more information, see [University Regulation 4.001](#).

Required Texts/Readings

The course will not follow a particular textbook.

Supplementary/Recommended Readings (if applicable)

The course will not follow a particular textbook.

Materials will be provided in an ongoing basis. The following references will be optional to follow:

- **Text: *Fundamentals of Digital Logic with VHDL Design (3rd Edition)***, Stephen Brown and Zvonko Vranesic, ISBN 978-0-07-352953-0. (not mandatory course materials will be provides in the class.)

The book is available online. No need to purchase it.

- Pong P. Chu, [RTL Hardware Design Using VHDL: Coding for Efficiency, Portability, and Scalability](#), Wiley-IEEE Press, 2014.

Course Topical Outline

Include a breakdown of topics covered (generally, by class day or by week), deadlines for course assignments/requirements, and dates of exams, quizzes, papers, and completion of readings. The *Provost's Policy and Procedure: Definitions of a Credit Hour* needs to be followed in developing out-of-class assignments.

Weekly Schedule	Topics
Week 01	Review of Electronics Circuits Technology: MOS Transistor, CMOS logic
Week 02	VHDL-1 and Combinational/Sequential Logic Review

Week 3-4	VHDL- Behavioral modeling (Lab-1) Xilinx and Vivado Tools
Week 5-6	VHDL-Structural modeling Timing Analysis and simulation (Lab-2)
Week 7-8	VHDL-Dataflow modeling
Week 9	FPGA technology, Embedded resources, DSPs, memories, Slices, LUTs, FFs (Lab-3)
Week 10	VHDL-Test-benches (Lab-4)
Week 11	FSM/ASM design using VHDL (Lab-5)
Week 12	Testing of Digital Circuits
Week 13	Design for Testability and Self Testing Circuitry Functional (Lab-6)
Week 14	Performance Optimization: area, time, and power
Week 15	Verilog and Comparison with VHDL