

EEL4712C - Digital Design

[Edit](#)

Last update: 8/17/2022 -subject to change throughout the semester

Instructor:

Dr. David Cheney, NEB 227

Office Hours:

Monday & Wednesday 9th period (after class)
By appt.

Meeting Times & Location:

MWF 8th Period (3:00-3:50) in NEB 202

Course Description:

Advanced modular logic, design languages, finite state machines and binary logic. This course will review basic concepts in digital logic (muxes, decoders, encoders, etc.) and will build upon these concepts to form complex digital circuits consisting of finite state machines, controllers, and datapaths. The course will be lab intensive and will provide realistic case studies to apply concepts learned during lecture. All concepts discussed in lecture will be implemented in VHDL.

Course Pre-Requisites:

EEL 3701

Course Objectives:

Students will gain fundamental knowledge and understanding of principles and practice in digital design through class lectures, reading assignments, and lab experiments using VHDL and field-programmable gate arrays.

Lab Sections & Undergraduate Peer Instructors (TBA):

Section 11836: [NEB 213B \(Links to an external site.\)](#) M | Period E2 - E3 (8:20 PM - 10:10 PM)

Section 13132: [NEB 213B \(Links to an external site.\)](#) T | Period 9 - 10 (4:05 PM - 6:00 PM)

Section 11835: [NEB 213B \(Links to an external site.\)](#) T | Period 11 - E1 (6:15 PM - 8:10 PM)

Section 11833: [NEB 213B \(Links to an external site.\)](#) T | Period E2 - E3 (8:20 PM - 10:10 PM)

Section 11837: [NEB 213B \(Links to an external site.\)](#) W | Period 9 - 10 (4:05 PM - 6:00 PM)

Section 11830: [NEB 213B \(Links to an external site.\)](#) R | Period 11 - E1 (6:15 PM - 8:10 PM)

Section 11831: [NEB 213B \(Links to an external site.\)](#) R | Period E2 - E3 (8:20 PM - 10:10 PM)

Material & Supply Fees: \$28.36

An FPGA-based laboratory board (will be provided to you)
Digilent Analog Discovery (must be purchased): <http://www.digilentinc.com/Products/Detail.cfm?Prod=ANALOG-DISCOVERY> (Links to an external site.)

Relation to Program Outcomes (ABET):

Outcome	Coverage*
1. An ability to identify, formulate, and solve engineering problems by applying principles of engineering, science, and mathematics.	High
2. An ability to apply both analysis and synthesis in the engineering design process, resulting in designs that meet desired needs.	High
3. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.	Medium
4. An ability to communicate effectively with a range of audiences	Low
5. 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.	
6. An ability to recognize the ongoing need for additional knowledge and locate, evaluate, integrate, and apply this knowledge appropriately.	
7. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty	

Coverage is given as high, medium, or low. An empty box indicates that this outcome is not covered or assessed in the course.

Textbook & Hardware/Software(Required Item):

- Instructor-provided references, linked from class website
- (Recommended book - not required)
Fundamentals of Digital Logic with VHDL Design
Brown, S. D. and Vranesic, Z. G
Second or third edition

Course Schedule

Week	
1	VHDL Intro, Combinational Logic
2	Arithmetic operations, Lab 1
3	Synthesis Coding Guidelines, Testbenches
4	Carry-lookahead Adders, For-generate, Lab 3, Misc VHDL
5	Sequential Logic, Finite State Machines
6	Finite State Machines w/ Datapaths, Exam1
7	Finite State Machines w/ Datapaths, Cont., VGA
8	2-process FSM, Interfacing protocols, Misc VHDL
9	FPGA Architectures
10-11	MIPS architecture, Exam 2
11	Intro to AC
12	Metastability, Tri-state Buffers, Buses
13	Design-Space Exploration, Architecture Tradeoffs
14-15	Digital Design Research

Attendance Policy and Class Expectations:

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies. Click here to read the university attendance policies: <https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/>

Evaluation of Grades:

Assignment	Total Points	Percentage of Final Grade
Labs (6)	100 each	30%

Exams (3)	100 each	60% (20% each)
Final Project	250	10%
Total		100%

Exams (60%):

Exams are held live in-class, on the dates indicated in the Canvas calendar. There are three exams in the course, each exam is 50 minutes long. Exams will total 60% of your grade, with each exam weighted equally at 20% of your grade.

Labs (30%) :

- - Late penalties for labs are 20% for the first day and 10% for each additional day.
 - In case of misgrade, you have one week from the date the individual assignment grade is posted to discuss that assignment grade with your faculty member.

Final Project (10%) :

- - Three deliverables
 - Week 1 35pts
 - Week 2 50pts
 - Week 3 165pts
 - Late penalty are 20% for the first day and 10% for each additional day.
 - In case of misgrade, you have one week from the date the individual assignment grade is posted to discuss that assignment grade with your faculty member.

Extra Credit :

- - There may be opportunities for extra credit throughout the semester
 - First opportunity: 1% added to your final grade if, by the last day of class, I (the instructor) remember your name when seeing your face. **Come to office hours!!!!**

Grading Scale:

Percent	Grade	Grade Points
90 – 100	A	4.00
87 – 89.9	A-	3.67
84 – 86.9	B+	3.33
80 – 83.9	B	3.00

77 – 79.9	B-	2.67
74 – 76.9	C+	2.33
70 – 73.9	C	2.00
67 – 69.9	C-	1.67
65 – 66.9	D+	1.33
62 – 64.9	D	1.00
60 – 61.9	D-	0.67
<60	E	0.00

More information on UF grading policy may be found at: <https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx> (Links to an external site.)

Students Requiring Accommodations:

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <https://www.dso.ufl.edu/drc>) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Course Evaluation:

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <https://evaluations.ufl.edu/evals>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <https://evaluations.ufl.edu/results/>.

In-Class Recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A “class lecture” is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To “publish” means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.

University Honesty Policy:

UF students are bound by The Honor Pledge which states, “We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: “On my honor, I have neither given nor received unauthorized aid in doing this assignment.” The Honor Code (<https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/>) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or undergraduate peer instructors in this class.

Commitment to a safe and inclusive learning environment:

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination. It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- - Your academic advisor or Graduate Program Coordinator
 - Jennifer Nappo, Director of Human Resources, 352-392-0904, jpennacc@ufl.edu
 - Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
 - Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

Software Use:

All faculty, staff, and students of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Student Privacy:

There are federal laws protecting your privacy with regards to grades earned in courses and on individual assignments. For more information, please see: <http://registrar.ufl.edu/catalog0910/policies/regulationferpa.html>

Other Campus Resources:

Health and Wellness

Covid-19 Protocols:

- - - You are expected to wear approved face coverings at all times during class and within buildings even if you are vaccinated.
 - If you are sick, stay home and self-quarantine. Please visit the UF Health Screen, Test & Protect website about next steps, retake the questionnaire and schedule your test for no sooner than 24 hours after your symptoms began. Please call your primary care provider if you are ill and need immediate care or the UF

Student Health Care Center at 352-392-1161 (or email covid@shcc.ufl.edu) to be evaluated for testing and to receive further instructions about returning to campus.

- If you are withheld from campus by the Department of Health through Screen, Test & Protect, you are not permitted to use any on campus facilities. Students attempting to attend campus activities when withheld from campus will be referred to the Dean of Students Office.
- UF Health Screen, Test & Protect offers guidance when you are sick, have been exposed to someone who has tested positive or have tested positive yourself. Visit the UF Health Screen, Test & Protect website for more information.
- Please continue to follow healthy habits, including best practices like frequent hand washing. Following these practices is our responsibility as Gators

U Matter, We Care:

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

Counseling and Wellness Center: <http://www.counseling.ufl.edu/cwc>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS) : Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or <http://www.police.ufl.edu/>

Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. <https://lss.at.ufl.edu/help.shtml>

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. <https://www.crc.ufl.edu/>

Library Support, <http://cms.uflib.ufl.edu/ask>. Various ways to receive assistance with respect to using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <https://teachingcenter.ufl.edu/> (Links to an external site.)[Links to an external site.](#)

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. <https://writing.ufl.edu/writing-studio/> (Links to an external site.).

Student Complaints Campus: <https://sccr.dso.ufl.edu/policies/student-honor-code-student-conduct-code/> (Links to an external site.); <https://care.dso.ufl.edu> (Links to an external site.).

On-Line Students Complaints: <http://www.distance.ufl.edu/student-complaint-process> (Links to an external site.).