

Reconfigurable Logic

CSCE 3730, Section 001

Fall 2023

Class Timings: Monday and Wednesday 5:30 PM – 6:50 PM, Discovery Park B140

Instructor: Robin Pottathuparambil, Email: rpottath@unt.edu, Office: Discovery Park F263, Student hours: Tuesday and Thursday 1:00 PM – 3:00 PM or by appointment

Teaching Assistants:

- Anand Kumar Bapatla, Email: anandkumarbapatla@my.unt.edu, Student hours: Discovery Park F243, Monday 2:30 PM – 3:30 PM and 4:30 PM – 5:30 PM and Wednesday 2:30 PM – 4:30 PM (Homework and Lab Grading)
- Venkata Bathalapalli, Email: venkatakarthikvishnuvardbathalapalli@my.unt.edu, Student hours: Discovery Park E247 (Cubicle F), Monday and Wednesday 1:00 PM – 2:00 PM (Quiz and Class Activity Grading)

Course Webpage: All the course related material will be posted on the course webpage which is available through Canvas (<https://unt.instructure.com>).

Course Outcomes:

- Understand the concept of reconfigurable logic.
- Know how FPGA (most popular reconfigurable device) is designed.
- Have an overall view of Computer Aided Design (CAD) for FPGA.
- Understand specific algorithms utilized in technology - mapping, placement and routing.
- Learn how to use the hardware description language - VHDL to simulate and synthesis digital circuit system.
- Capable of using commercial CAD tools to design and simulate digital circuits.

Program Outcome Mapping:

- An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Text: (a) *FPGA-Based System Design* by Wayne Wolf, Prentice Hall, 2004. ISBN: 0-13-142461-0, (b) *The Designer's Guide to VHDL* (3rd Ed.) by Peter Ashenden, Morgan Kaufmann, 2008. ISBN-13: 978-0-12-088785-9 (c) *VHDL: A Starter's Guide* (2nd Ed.) by Sudhakar Yalamanchili, Prentice Hall, 2005. ISBN-13: 978-0131457355. (d) *Digital Design by Frank Vahid* by Wiley, 2nd Edition, ISBN: 978-0-470-53108-2

Catalog Description: Prerequisite: CSCE 2610. Advanced concepts in Boolean algebra, use of hardware description languages as a practical means to implement hybrid sequential and combinational designs, digital logic simulation, rapid prototyping techniques, and design for testability concepts. Focuses on the actual design and implementation of sizeable digital design problems using representative Computer Aided Design (CAD) tools.

Topics:

- Fundamentals of digital logic & IC design

- FPGA overview
- Combinational logic design - fundamentals and modeling using VHDL
- Sequential logic design - fundamentals and modeling using VHDL
- Platform FPGA

Grading:

Class Activity	5%
Quizzes	12%
Homework	12%
Lab assignments	20%
Midterm Exam (10/09/2023)	21%
Comprehensive Final Exam (12/11/2023)	30%

Class Activity: There will be five to six class activity that will reinforce the concepts that we learned in the class. These class activities will be scheduled during the class timing.

Quizzes: There will be six to seven pop quizzes given throughout the semester. The pop quizzes can be given any time during the class. These will be to reward students who consistently show up to class but will be more than just attendance points.

Homework: Homework will be in the form of problem sets with a due date **one week** after it is assigned. Homework will be assigned on Mondays as per the schedule. **No late homework will be accepted.** Homework must be done individually (you will learn the most from this). Any evidence of group participation or direct copying from sources like previous year's solutions, textbook, solutions, Wikipedia, websites, and other sources will be interpreted as academic dishonesty. Using AI (Artificial Intelligence) assisted websites to generate or auto generate solutions will also be interpreted as academic dishonesty. There will be five to six homework assignments. There will be five to six homework assignments.

Lab Assignments: Lab assignments are an integral part of the course and are intended to provide hands-on experience in the application of the design techniques discussed in lecture. Lab assignments will be assigned on Wednesdays as per the schedule and with a due date of **two weeks** after it is assigned. There will be five to six lab assignments assigned. Each of the lab assignment will be used to build the next lab. The last lab will be a overall project with most of the pieces completed in the previous labs. Lab assignments must be done individually and can be done in Discovery Park, F243. Any evidence of group participation will be interpreted as academic dishonesty. Using AI (Artificial Intelligence) assisted websites to generate or auto generate solutions will also be interpreted as academic dishonesty.

Recitations: There will be recitations on Mondays. The TA will be available at that time to help you with the labs. There will be demonstrations on how to setup and use software tools during the recitation.

Exams: There will be a midterm exam and a final exam. The exams are closed books and closed internet. Mobiles phones are not permitted and browsing the internet is not allowed. Exams will include material from the modules, the readings, homework, and programming assignments and should be taken individually and not as a team. Final exam will be comprehensive.

- **Midterm Exam:** Monday, October 9th, 2023, 5:30 PM – 6:50 PM, Discovery Park B140
- **Final Exam:** Monday, December 11th, 2023, 4:00 PM – 6:00 PM, Discovery Park B140

Missing Classes/Assignments/Exams: Attendance at all exams is mandatory. Throughout the semester, a student may miss classes, assignments, quizzes, or exams due to many reasons. Most of the reasons will not be accepted as an "excused" absence. Assignments, quizzes, or exams can be made-up only under

extraordinary circumstances and only when notification is given to me before the quiz or exam is administered. A no-show for a quiz or exam without prior notification and a verifiable excuse (appropriate official documentation) results in a grade of zero for that quiz or exam.

COVID-19 Impact on Attendance: Students are expected to attend class meetings regularly and to abide by the attendance policy established for the course. It is important that you communicate with the professor and the instructional team prior to being absent, so you, the professor, and the instructional team can discuss and mitigate the impact of the absence on your attainment of course learning goals. Please inform the professor and instructional team if you are unable to attend class meetings because you are ill, in mindfulness of the health and safety of everyone in our community.

If you are experiencing any [symptoms of COVID-19](#) please seek medical attention from the Student Health and Wellness Center (940-565-2333 or askSHWC@unt.edu) or your health care provider PRIOR to coming to campus. UNT also requires you to contact the UNT COVID Team at COVID@unt.edu for guidance on actions to take due to symptoms, pending or positive test results, or potential exposure.

Statement on Face Covering: UNT encourages everyone to wear a face covering when indoors, regardless of vaccination status, to protect yourself and others from COVID infection, as recommended by current CDC guidelines. Face covering guidelines could change based on community health conditions.

Disputing Grades: If you have a dispute with how an assignment, quiz, or exam is graded, you should get the solution to the lab assignment, quiz, or exam off the class web site and examine it. If you really believe that your answer is correct (matches the answer given in the solution), contact the grader and discuss it with him. The grader will listen to your concern, and act on it, at their discretion. In any case, they will regrade the assignment and will communicate with you. The lab assignments will not have solutions posted, so contact the grader for disputing the grade if you have met all the requirements of the lab assignment and you have lost points. Note that instructor or grader addition errors should follow the above procedure. Assignment, quiz, exam, and homework grades are disputable for **one week** from the day the grades were assigned on Canvas.

Class Policies: Please note that portable phones, pagers, and late arrivals are disruptive to the instructor and to your peers. The use of cell phones, beepers, or communication devices is disruptive and is therefore absolutely prohibited during class. Turn off your cell phone while in class. If I catch you using these devices, your final grade will be reduced by 10 points for each and every transgression and you will be asked to leave the class. Except in emergencies, students using such devices must leave the classroom for the remainder of the class period. I know that some of you may wish to take notes directly on your computer and I have no problem with that. If, however, you choose to access your email, use headphones, search the web, play solitaire or other games, or instant messenger your friends during class, you will have 10 points deducted from your final grade for each and every transgression. This penalty will be at the sole discretion of the instructor. If I am late arriving to class, it will be because of circumstances beyond my control. You are expected to remain for 20 minutes past the scheduled class start time while I attempt to communicate my situation and relay instructions.

Syllabus Revisions: This syllabus may be modified as the course progresses. Notice of such changes will be by email or announcement in class.

Course Policies: You are expected to spend at least 10 hours per week for this course. Keep all your graded assignments, quizzes, and tests for study and review. You should track your own progress on Canvas and be aware of current grades throughout the term. I will make all the effort to return the graded assignments, but it's your responsibility to collect back the graded assignments from the grader or the instructor if it is not given back to you. Final grading will be done as follows. **A:** $\geq 90\%$, **B:** $\geq 80\%$ and

< 90%, **C:** $\geq 70\%$ and < 80%, **D:** $\geq 60\%$ and < 70% and **F:** < 60%. Grades will be curved if necessary. Grades cannot be changed after they have been electronically entered into the university's system except for instructor error. Any extenuating circumstances that may adversely affect your grade must be brought to my attention before the final course grades are recorded. To be considered, such circumstances must be unusual, unavoidable, and verifiable.

Disability Services/Special Needs: UNT complies with all federal and state laws and regulations regarding discrimination including the Americans with Disability Act of 1990 (ADA). If you have a disability and need a reasonable accommodation for equal access to education or services, please contact the Office of Disability Accommodation. Please initiate this process and inform me during the first two weeks of class.

Academic Dishonesty: All the provisions of the University code of academic integrity apply to this course. In addition, it is my understanding and expectation that your signature on any test or assignment means that you neither gave nor received unauthorized aid. For homework and lab assignments, while discussion is allowed, direct copying is not, and students must turn in individual submissions. Using AI (Artificial Intelligence) assisted websites to generate or auto generate solutions will also be interpreted as academic dishonesty. All students are required to know, observe and help enforce the UNT Code of Student Academic Integrity. Cheating will result in disciplinary action according to UNT Policy 18.1.16. The penalty for a first offense can range from a formal warning to an 'F' for the course. Regardless of the penalty imposed, a record of the offense will be kept in the Office of the Dean of Students.

Student Perceptions of Teaching (SPOT): Student feedback is important and an essential part of participation in this course. The student evaluation of instruction is a requirement for all organized classes at UNT. The short SPOT survey will be made available **November 20 – December 7** to provide you with an opportunity to evaluate how this course is taught.

ABET Survey: Towards the end of the course, the students will be asked to ABET exit survey which will help instructors to quantitatively measure whether the students met the course outcomes stated in the course syllabus. This survey will be administered during the last week of classes.

Tentative Course Schedule:

Week	Lecture	Assignments Due
08/21 – 08/25	Fundamentals of digital logic & IC design	
08/28 – 09/01	Fundamentals of digital logic & IC design	
09/04 – 09/08	FPGA overview	Homework 1
09/11 – 09/15	Combinational logic design	Lab 1
09/18 – 09/22	Combinational logic design	Homework 2
09/25 – 09/29	Combinational logic design	Lab 2
10/02 – 10/06	Combinational logic design/Review	Homework 3
10/09 – 10/13	Sequential logic design	Midterm Exam
10/16 – 10/20	Sequential logic design	
10/23 – 10/27	Sequential logic design	Lab 3
10/30 – 11/03	Sequential logic design	Homework 4
11/06 – 11/10	Platform FPGA	Lab 4
11/13 – 11/17	Platform FPGA	Homework 5
11/20 – 11/24	Thanksgiving Break	No Classes
11/27 – 12/01	Platform FPGA	Lab 5
12/04 – 12/08	Platform FPGA/Review	Homework 6
12/11 – 12/15	No Lecture	Comprehensive Final Exam