



California State University, Fullerton
Department of Electrical and Computer Engineering

EGCP 281-01/02

Designing with VHDL

Fall 2024

Instructor: Rakesh Mahto, Ph.D.
Office location: E-314
Office hours: Monday and Wednesday: 2:00 p.m. to 3:30 p.m.
Or by appointment
Zoom Meeting ID: 894 4126 5483 (Office Hours Only)
Telephone: 657-278-7274
E-mail : ramahto@fullerton.edu
Lecture: Monday from 11:00 a.m. – 11:50 a.m.
Lab: Wednesday from 11:00 a.m. – 12:50 p.m.
Location: CS -301

Catalog Objective:

Introduction to various modeling methods, timings, events, propagation delays and concurrency, the language constructs, data representations and formats, and physical attributes. (1 hour lecture, 2 hours laboratory) (Same as EGEE 281)

Nearly all modern digital circuits are created using a Hardware Description Language, HDL, and then synthesized into standard cells, which are then fabricated into digital chips. In this course, students will learn how to use one of these HDLs, namely VHSIC Hardware Description Language, or VHDL, to create basic digital designs, and to learn some design tradeoffs for different design methods.

Course Communication:

All course announcements and updates will be provided via CSUF email. Therefore, you MUST check your CSUF email on a regular basis for the duration of the course. In addition to regularly scheduled office hours, students may ask questions via email. Generally, responses will be provided within two business days.

Prerequisites:

CPSC 120: Introduction to Programming or
CPSC 121: Programming Concepts
and
EGCP 180: Digital Logic and Computer Structures or
EGEE 245: Computer Logic and Architecture

Textbook (required):

Stephen Brown, Zvonko Vranesic, “Fundamentals of Digital Logic with VHDL Design”, 4th edition, 2023, McGraw Hill, ISBN-13: 9780073380728

Reference:

Real Digital by Clint Cole: https://reference.digilentinc.com/textbooks:real_digital

Free Range VHDL by Bryan Mealy and Fabrizio Tappero: <http://freerangefactory.org/>

Digital Design by M. Morris R. Mano and Michael D. Ciletti

RTL Hardware Design Using VHDL: Coding for Efficiency, Portability, and Scalability, by Pong P. Chu

Student Learning Goals:

1. Understand the top-down digital design approach.
2. Understand different layers of design abstraction.
3. Understand VHDL language construct.
4. Understand timing events and models.
5. Model and design combinational and sequential logic.
6. Write VHDL test benches.

Course Outline:

1. Introduction to VHDL
2. Layers of abstraction and basic language concepts
3. Digital design flow, simulation and synthesis
4. Combinational design, data flow design style and simulation
5. Behavioral design style and simulation
6. Midterm Exam #1
7. Structural design style, simulation, and delays
8. Sequential design
9. Flip-flops and counters
10. Finite state machine design with VHDL
11. Midterm Exam #2
12. Modeling and simulation of finite state machines
13. Structural modeling and simulation using test benches
14. Sub-programs, packages and libraries
15. RTL design
16. Final Exam

Grading Policy:

Category	% of Final Grade
Homework	10%
Laboratory Assignment	25%
Quizzes	15%
Midterm Exams	20%
Final Exam	20%
Final Project	10%

Software For Students:

Did you know you can get FREE and low-cost software for being an active CSUF student? Software downloads and request forms can be found on the CSUF Student Software website.

Letter Grade Assignment Policy:

The letter grade will be ascertained based on the accumulated score calculated in accordance with the grading policy mentioned above. The +/- grading system will be used. The letter grade assignment policy is as follows:

96% or more.....A+	92-95.99%.....A	88-91.99%.....A–
85-87.99 %.....B+	82-84.99%.....B	78-81.99%.....B–
75-77.99 %.....C+	72-74.99%.....C	68-71.99%.....C–
65-67.99 %.....D+	62-64.99%.....D	58-61.99%.....D–
Less than 58%.....F		

Late submission:

After a deadline has passed, a late submission with a 10% penalty will be allowed only under extenuating circumstances such as a personal or family emergency, subject to the following conditions:

- The solutions for the assignment/homework etc. have not been distributed by the instructor, **and**
- The submission is made by the beginning of the class period immediately following the specified deadline

Please **note** that any homework/assignment/report etc. that is due during the last week of instruction or on the day of the final exam **must be submitted on the specified deadline**. There will be **no** relaxed deadline (with 10% penalty) in such cases.

Exams and Quizzes:

Examinations will be hosted in an online format at the class meeting time. All examinations will be proctored via Proctorio. The dates of exams are provided in the course outline at the end of this syllabus. Anyone missing a scheduled examination must notify the instructor in advance except for bona fide emergencies. An absence must be followed by a written letter from a medical doctor or other appropriate official. For excused absences, no make-up examinations will be given and average scores in other examination may be just extended, at the discretion of the instructor. Unexcused absences count as if a zero score has been obtained on the exam. An oral examination may be conducted following any of the exams. If an oral exam is administered, you must pass the oral exam in order to receive credit for that specific exam.

Extra Credit Options:

Extra credit options, if any, will be announced in class during the semester. Such options will be available to all students on an equitable basis.

Assessing Student Learning:

As part of my effort to assess student learning in the classroom, I will be constantly monitoring student performance at the individual and class level. The homework, midterm, and pop quizzes will be used as the data for this assessment. Students are encouraged to periodically check with me for their relative standing in the class.

Academic Integrity Statement:

Students are expected to maintain a high standard of academic integrity. Policies on academic integrity will be strictly enforced. Familiarize yourself with the academic dishonesty policy, which can be found in the current student handbook or on the web at

https://www.fullerton.edu/senate/publications_policies_resolutions/ups/UPS%20300/UPS%20300.0.021.pdf

Academic dishonesty will not be tolerated. Penalty for academic dishonesty will result in a score of “0 (zero)” for the assignment/homework/exam/quiz/project and a possible final letter grade of “F” in the course along with an entry in the student records. You are encouraged to discuss the subject material with your classmates in order to enhance your understanding of the course concepts. However, please note that any work submitted for grading must be done individually or, in the case of a team-based assignment/homework/project, with another team partner (s). Teams must be approved by the instructor before the start of any team-based activity. Collaboration between two or more teams are prohibited for team-based activities unless approved by the instructor. Team composition cannot be changed without the prior approval of the instructor.

Special Needs:

Students with disabilities/special needs should contact the Office of Disability Support Services (DSS), located in UH-101. The contact telephone number of the Disability Support Services (DSS) is 657-278-3117. Also, students with disabilities/special needs should inform the instructor so that arrangements can be made to accommodate the special needs. More information can be obtained at <http://www.fullerton.edu/DSS/>. Confidentiality will be protected.

Emergency preparedness:

It is important for students to have a basic understanding of the emergency response procedures of the University. Please read the Campus Emergency Preparedness information available at <http://prepare.fullerton.edu>

Other course-related policies:

1. Any disruptive classroom behavior that can adversely affect the learning environment will be reported and dealt with seriously.
2. Attendance is mandatory. If a student cannot attend a class for any compelling reason, he/she should notify the instructor as soon as possible (in advance, if applicable) and provide appropriate documentation.
3. Cell-phones, laptops, tablets, and other such devices should be turned off while the class is in session.
4. Although the consumption of solid food is not encouraged while the class is in session, it is OK to do so due to another class or an urgent commitment immediately before or after this class.
5. You must bring your own calculator, pen, pencil eraser, sharpener, ruler etc. for exams and quizzes.