

Walla Walla University ENGR 435 - Digital DesignII
Spring 2021, 4 credits

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Textbook: RTL Hardware Design Using VHDL by Pong Chu
Digital Design II, ENGR-435 by Sedra/Smith. Custom book, Oxford press

References: Fundamentals of Digital Logic with VHDL Design, 3rd ed by Brown & Vranes
Digital Design: Principles and Practices, 4th ed by John Wakerly
FPGA Prototyping by VHDL Examples, 2cd ed by Pong Chu

General

Description: Design of digital circuits and systems including review of CMOS technology used for most modern chips, electrical details of digital circuits, and logic level design using a hardware description language (VHDL). Register Transfer level (RTL) design methodology will be emphasized. Circuit designs will be implemented and tested using a field programmable gate array (FPGA).

Big Goal 1: To efficiently design digital systems using methodologies that result in sound and reliable systems.

Knowledge domains: The following knowledge domains will be addressed:
Sequential logic design using a hardware description language (VHDL)
Programmable logic (FPGAs)
Electrical and timing details of logic circuits
Design using a hardware description language
Design verification using both simulation and actual circuit testing.

Objectives: 1) Understand transistor level details of CMOS digital circuits and related electrical and timing concerns.
2) Thoroughly understand synchronous state machines
3) Design digital systems using a hardware description language (VHDL).
4) Understand programmable logic
5) Understand RTL abstraction and design methodology
6) Understand how signals propagate through logic circuits and interconnect
7) Develop the ability to handle large problems systematically and efficiently
8) Design and implement a significant digital circuit or system.

Handouts: Occasionally there will be “handouts” that extend or clarify material covered in the textbook. Unless stated otherwise, **you are responsible for the content of these handouts.**

Assignments: **Reading assignments** will be given and **you are expected to read** them prior to the class period they are listed for. **Read!!!** I expect it. Written assignments are due at the start of class.

Late work: Not accepted unless one of the following conditions is met (but do inform me if you are getting behind or have questions) :

- a) A valid medical reason exists
- b) You confer in advance with the instructor and receive an ok.

Cheating: Will be rewarded. With scores of zero. And a possible F for the quarter. I expect anything you turn in for grading to be your work and represent your understanding of the material,

Grading:	Homework (& quizzes)	20%
	Labs	35%
	Exam I	22%
	Exam II	23%

The instructor reserves the right to shift this distribution to best serve the needs of the class. Scoring generally follows 90,80,70,60% for A,B,C,D but scores may be curved when needed.

Missed exams will receive a score of zero and cannot be made up.

Exams: There will be two exams but no final. Show and tell at final exam time.

Homework: To promote good problem solving and facilitate grading, I require that the following guidelines be followed for hardcopy papers:

- Solutions are to be neatly written on engineering paper, sheets folded together lengthwise, and stapled. The following must be on the outside of the folded papers:
 - ENGR 433
 - your name
 - assignment number
 - due date
- The problem number must be clearly stated for each problem.
- Each problem solution must begin with a statement of the problem.
- Work must be neat and readable.
- Templates must be used for drawing logic diagrams
- Work you submit must be your own. Consultation with friends regarding concepts is expected when doing homework but solutions to assigned problems are to be your own work. This is also true for lab assignments when individual submissions are specified. There may be team submissions for some labs. Read lab assignment statements carefully.

See the Engineering Department Professionalism handout.

Labwork: Lab on Thursdays 2 to 5pm in the Digital Lab

Disability: If you have a physical and/or learning disability and require accommodations, please contact the Disabilities Support Services office at 527-2366 and also inform the instructor.

Walla Walla University (WWU) is a Seventh Day Adventist institution of higher education

Bulletin description of this class:

System oriented digital design using programmable logic with an emphasis on hardware description language (VHDL) methods; simulation; test benches; inter circuit communications; signal integrity; integrated circuit technology considerations. Laboratory work required.

WWU Integrity policy:

www.wallawalla.edu/academics/academic-administration/academic-policies/academic-integrity-policy/

WWU Emergency information

WWU is committed to having a safe campus. Emergency information is at:
www.wallawalla.edu/campus-life/student-life/campus-security

WWU Disability accommodations

In addition to the phone number listed above, see:
www.wallawalla.edu/?id=4318

WWU Title IX sex discrimination and sexual misconduct policy

WWU prohibits all forms of sex discrimination and sexual misconduct including, but not limited to, sex-based intimidation and harassment, sexual harassment, domestic violence, dating violence, stalking and sexual violence. If you have been subjected to, or are aware of, an instance of sex discrimination or sexual misconduct, you are highly encouraged to report it to the Title IX coordinator, through the Title IX webpage, or by calling (509) 527-2141. The University has resources to help.

Title IX coordinator email address: Erika.Sanderson@wallawalla.edu

Title IX web page: www.wallawalla.edu/resources/human-resources-payroll/titleix/

Relationship of this class to the WWU core themes

Excellence in Thought

This class helps students develop ability to perform design that requires excellence in thought.

Generosity in Service

Course content does not directly address generosity in service although as an engineering professional there are opportunities to contribute professional service to the community.

Beauty in Expression

There is beauty in carefully crafted designs and documentation that is clear, concise, and complete. Such is required in this class.

Faith in God

A life with inner peace comes through faith in God.