

Lecture Instructor

Md Maruf Ahamed

Office: 307 Durham Center

Office Hours: Tuesday and Thursday (11:30AM.-12:30PM), 307 Durham Center (or by appointment)

Phone: (515) 294-6323

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Lectures

Monday, Wednesday, and Friday: 2:10 PM - 3:00 PM, LAGOMAR W0142

Labs

Unless stated otherwise there will be a **3-hour lab every week** other than first week. The instructions for each lab will be available on Canvas. The labs will be graded, and they are an essential component of this class. Each lab is worth 1.5% of your final grade. There are 11 labs, but the first one will not be graded. You are expected to attend ALL labs.

Since the seating capacity in the lab is limited, so please attend **ONLY** the section for which you are registered. Switching sections is not allowed. There are 7 lab sections mentioned below:

Section 1: Tuesday 8:10 AM - 10:50 AM (Coover Hall, Room 2050)

Section 2: Tuesday 5:10 PM - 8:00 PM (Coover Hall, Room 1318)

Section 3: Tuesday 11:00 AM - 1:50 PM (Coover Hall, Room 1318)

Section 4: Wednesday 3:10 PM - 6:00 PM (Coover Hall, Room 1318)

Section 5: Thursday 8:00 AM - 10:50 AM (Coover Hall, Room 1318)

Section 6: Friday 8:00 AM - 10:50 AM (Coover Hall, Room 1318)

Section 19: Friday 11:00 AM - 1:50 PM (Coover Hall, Room 1318)

Teaching Assistants

Kerui Tan <ktan@iastate.edu>

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Chin, Amber A <amberli@iastate.edu>

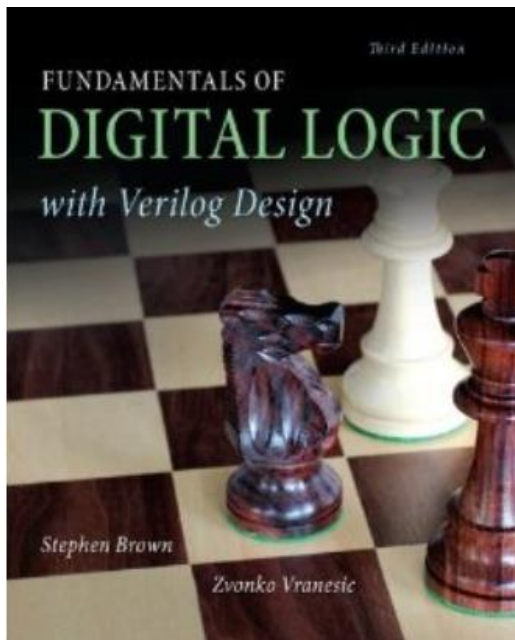
TA Office Hours: Updated office hour will be available on **Canvas**.

Course Catalog Description and Prerequisite

Number systems and representation. Boolean algebra and logic minimization. Combinational and sequential logic design. Arithmetic circuits and finite state machines. Use of programmable logic devices. Introduction to computer-aided schematic capture systems, simulation tools, and hardware description languages. Design of simple digital systems.

Prerequisites: Sophomore Classification

Required Textbooks



Title: **Fundamentals of Digital Logic with Verilog Design [3-rd edition]**

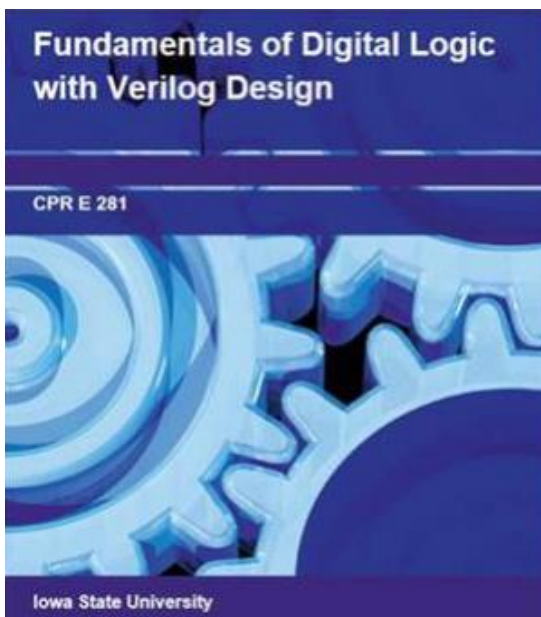
Author: Stephen Brown and Zvonko Vranesic

Edition: Copyright 2013, 3-rd edition

ISBN: 978-0073380544

Publisher: McGraw-Hill

- Note 1: **RedShelf Course Materials: Access on Canvas**
- Note 2: The official textbook is the one listed above. The bookstore also sells an abbreviated version that includes only Chapters 1 to 7 (which are the only chapters covered in this class). This one might be cheaper if you can find it. You can only buy this one from the ISU bookstore. It has a different cover as shown below.



Learning Outcomes

Students who successfully complete CPRE 281 Digital Logic will have:

- Understanding of number systems and codes, and digital representation of data.
- Understanding of the general concepts in digital logic design, including logic elements, and their application in combinatorial and sequential logic circuit design quality.
- Familiarity with computer-aided schematic capture systems, simulation tools and hardware description language.
- Familiarity with programmable logic devices.

Learning Objectives

To introduce number systems and codes, digital representation of data, and to teach the general concepts in digital logic design, including logic elements, and their use in combinatorial and sequential logic circuit design. Students will also be introduced to computer-aided schematic capture systems, simulation tools and hardware description languages, and will use programmable logic devices.

Tentative Class Schedule: Updated schedule will be available on Canvas

Week	Day/Date	Topic	Readings	Homework	Lab
1	Monday 8/26	Introduction	1.1, 1.2, 1.3, 1.4		No Lab
	Wednesday 8/28	Binary Numbers	1.5, 1.6		
	Friday 8/30	Truth Tables & Logic Gates	2.1, 2.2, 2.3, 2.4		
2	Monday 9/2	NO CLASS: University Holiday			Lab 1
	Wednesday 9/4	Boolean Algebra	2.5	HW 1 due	
	Friday 9/6	AND, OR, NOT	2.6		
3	Monday 9/9	NAND, NOR	2.7	HW 2 due	Lab 2
	Wednesday 9/11	Design Examples	2.8		
	Friday 9/13	Intro to Verilog	2.9, 2.10		
4	Monday 9/16	Karnaugh Maps	2.11	HW 3 due	Lab 3
	Wednesday 9/18	Minimization	2.12, 2.13		
	Friday 9/20	Functions and Circuits	2.14, 2.15, 2.16		
5	Monday 9/23	Examples	2.17	HW 4 due	Lab 4
	Wednesday 9/25	Midterm Review Session			
	Friday 9/27	Midterm #1			
6	Monday 9/30	Addition of Unsigned Numbers	3.1, 3.2	HW 5 due	Lab 5
	Wednesday 10/2	Signed Numbers	3.3		
	Friday 10/4	Fast Adders	3.4, 3.5		
7	Monday 10/7	Multiplication	3.6		Mini Project
	Wednesday 10/9	Floating Point Numbers	3.7		
	Friday 10/11	Multiplexers	4.1		
8	Monday 10/14	Decoders & Encoders	4.2, 4.3	HW 6 due	Lab 6
	Wednesday 10/16	Code Converters	4.4, 4.5		
	Friday 10/18	Latches	5.1, 5.2, 5.3		
	Friday 10/18	* Midterm Grade Reports Due *			

9	Monday	10/21	D Flip-Flops	5.4	HW 7 due	Lab 7
	Wednesday	10/23	T Flip-Flops & JK Flip-Flops	5.5, 5.6, 5.7		
	Friday	10/25	Registers & Register Files	5.8		
10	Monday	10/28	Counters	5.9, 5.10	HW 8 due	Lab 8
	Wednesday	10/30	Midterm Review Session			
	Friday	11/1	Midterm # 2			
	Friday	11/1	***DROP DEADLINE***			
11	Monday	11/4	Examples with Counters	5.11, 5.14, 5.17	HW 9 due	Lab 9
	Wednesday	11/6	Basic Design Steps	6.1		
	Friday	11/8	State-Assignment Problem	6.2		
12	Monday	11/11	Moore & Mealy Machines	6.3, 6.4	HW 10 due	Lab 10
	Wednesday	11/13	Serial Adder & Arbiter Circuit	6.5, 6.8		
	Friday	11/15	State Minimization	6.6		
	Friday	11/15	PROPOSE FINAL PROJECT			
13	Monday	11/18	Designing a Counter	6.7	HW 11 due	Lab 11
	Wednesday	11/20	Analysis of Syn. Seq. Circuits	6.9		
	Friday	11/22	ASM charts & Examples	6.10 – 6.13		
14	Monday	11/25	NO CLASS: Thanksgiving Break			No Lab
	Wednesday	11/27	NO CLASS: Thanksgiving Break			
	Friday	11/29	NO CLASS: Thanksgiving Break			
15	Monday	12/2	Register Machines		HW 12 due	Work on Final Project
	Wednesday	12/4	Arithmetic Logic Unit (ALU)			
	Friday	12/6	TBD			
16	Monday	12/9	TBD			Final Project Demo
	Wednesday	12/11	TBD			
	Friday	12/13	Final Review Session			
17	Finals Week	12/19	FINAL EXAM @ TBD	everything		No Lab

Homework Assignments

There will be a total of 12 homework assignments. Each homework is worth 2% of your final grade. You will have more than a week to complete each one of them. These assignments will be used to emphasize and clarify important concepts discussed in the lectures. **The first homework must be submitted but it would not be graded.**

All homework's must be submitted to the instructor **BEFORE the start of the lecture period** on the day on which they are due. Please write clearly and **staple all of your pages** before you submit your homework.

Also, please write the following three on the first page: **1) your full name; 2) your student ID number; and 3) your lab section number.** If any of these three are missing, then you will **lose 10% of your grade** for that homework. All graded homework's will be returned during the labs, which is why we need that lab section number.

IMPORTANT: Due to the large size of this class we cannot and WILL NOT accept late homework's. Period.

Exams

Midterm Exams:

- There will be two midterm exams for this class. The midterms are scheduled for:
 - Midterm 1:** Friday Sep 27th from 2:10-3:00pm (during the lecture period)
 - Midterm 2:** Friday Nov 1st from 2:10-3:00pm (during the lecture period)
- There will be a review session during the Wednesday's lecture prior to each exam (i.e., Sep. 25 and Oct 30).
- **Note:** You can bring up to 3 letter-sized sheets of paper, typed or hand-written.

*** Bring a picture ID or your midterm exam will not be graded! ****

Final Exam:

- There will be a final exam during finals week and the date will be announced on class and on Canvas.
- You can bring up to 5 letter-sized sheets of paper, typed or hand-written.

*** Bring a picture ID or your final exam will not be graded! ****

Class Attendance Policy

You are expected to attend ALL lectures and ALL labs. If you have a valid reason to miss a class (e.g., because you are ill) then it is your responsibility to find out what we have talked about in class, including any announcements that were made during class.

Policy on Collaboration

You are encouraged to form study groups and discuss the reading materials assigned for this class. You are allowed to discuss the homework assignments with your colleagues. However, each student will be expected to write his/her own solutions/code. Sharing of code is not allowed. No collaboration will be allowed during the exams.

IMPORTANT: Cheating, plagiarism, and other academic misconducts will not be tolerated and will be handled according to the [ISU's academic dishonesty procedures](#).

Grading Policy

Grading Scale:

95 - 100	= A
90 - 94	= A-
87 - 89	= B+
83 - 86	= B
80 - 82	= B-
77 - 79	= C+
73 - 76	= C
70 - 72	= C-
67 - 69	= D+
63 - 66	= D
60 - 62	= D-
0 - 59	= F

Grading Percentages:

Homeworks:(11 x 2.0%)	22%
Labs: (10 x 1.5%)	15%
Mini Project:	3%
Final Project:	7%
Midterm Exam 1:	15%
Midterm Exam 2:	15%
Final Exam:	25%
=====	
TOTAL:	102%

Note: If you submit all homeworks and they are correct you get a 2% bonus. Try to take advantage of that as you may lose points on the exams.

Appealing a Grade:

You will have a two-week window of appeal after each homework/exam is graded and returned. The grade challenge must be in writing and must clearly state the specific problem on the homework/exam in question and the reason for your challenge. The written statement and the original exam must be submitted to the instructor during the two-week window. After two weeks the grade cannot be changed.

Lab Safety

This class has a substantial hands-on laboratory section. Students will be using expensive, sensitive, and potentially hazardous equipment. Safety in the lab is a number one priority for students and instructors and to ensure a safe laboratory experience, a brief safety presentation will be given during the first lab session. It is mandatory that all students attend this presentation. Moreover, it is expected that students follow any and all posted safety guidelines. All students must sign the [lab safety form](#).

For reference, a copy of the University Laboratory Safety Manual can be found at:
www.ehs.iastate.edu/sites/default/files/uploads/publications/manuals/labsm.pdf

See also the [safety page of the ECpE Department](#).

Religious Accommodation

If an academic or work requirement conflicts with your religious practices and/or observances, you may request reasonable accommodations. Your request must be in writing, and your instructor or supervisor will review the request. You or your instructor may also seek assistance from the [Dean of Students Office](#) or the [Office of Equal Opportunity](#).

Students with Disabilities

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in [Student Accessibility Services office \(SAS\)](#) to establish eligibility. SAS will then provide electronic access to Notification Letters through that system. Both student and instructor will receive an email with a link to access the NL within Accommodate. Student are suggested to meet with the instructors in person or contact via email, to discuss the implementation of the indicated accommodations and each should digitally sign the NL (vs. sign a paper copy). Students are encouraged to contact SAS as early in the semester as possible. SAS, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr. Contact SAS by e-mail at accessibility@iastate.edu or by phone at 515-294-7220 for additional information.

Harassment and Discrimination

Iowa State University strives to maintain our campus as a place of work and study for faculty, staff, and students that is free of all forms of prohibited discrimination and harassment based upon race, ethnicity, sex (including sexual assault), pregnancy, color, religion, national origin, physical or mental disability, age, marital status, sexual orientation, gender identity, genetic information, or status as a U.S. veteran. Any student who has concerns about such behavior should contact his/her instructor, [Student Assistance](#) at 515-294-1020 or email dso-sas@iastate.edu, or the [Office of Equal Opportunity](#) at 515-294-7612.

How to Access Course Materials?

1. Follow the link below and log on to Canvas with your NetID
<https://canvas.iastate.edu/>
2. Select the course (e.g., CPRE 281 from the Dashboard)

Class Rating

This class is rated PG-13 for some exposure to novel ideas, difficult problems, long and frustrating hours behind the keyboard, 800-page textbook, Muppet violence, the Quartus II environment, and some HDL language. Parental involvement is not required and is strongly discouraged.

Small Print

The instructor reserves the right to change any and all aspects of this class for whatever reason or no reason at all (a.k.a., academic freedom).