
Digital Logic Design I

CPE100 Fall 23

<http://www.ee.unlv.edu/~b1morris/cpe100>

Website Webcampus

Professor: Brendan Morris	Class: TuTh 16:00-17:15, SEB 1242
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Textbook

Digital Design and Computer Architecture, Harris and Harris, ISBN: 978-0123944245
2nd Edition

Recommended Text

Fundamentals of Logic Design, Roth and Kinney, 7th Edition ISBN: 978-1133628477

Grading

Final:	25%	Tu. 12/13 18:00-20:00
Midterms:	40%	Th. 10/05, Tu. 11/21
Homework:	25%	Weekly
Participation:	10%	“In Class”

- This course which will utilize a “flipped” classroom. Lectures (video and slides) will be provided online for asynchronous viewing while the “lecture” time will be used as extended office hours and problem solving session.
- Students are expected to come to lecture prepared. We will not do a traditional lecture but instead answer questions and work on problems. You should come with your problems ready to ask. Additionally, lecture reading assignments should be completed before lecture in order to be successful.
- **Class attendance during the “lecture” time is still required.** It will be difficult to be successful if you are not engaged. Make sure you are reading the book and watching recorded lectures.
- Homework will be assigned weekly. There will be a “hands-on” component to the homework where students will use logic design software to build and test digital circuits.
- Students may study together in groups but all assignments must be completed individually. Copying homework is unacceptable and will result in a fail in the class with an F grade.
- Homework will be due via Webcampus (Canvas) on the designated date. No late homeworks will be accepted unless prior notification and arrangements are made.
- Class participation will be recorded through online questions. (Webcampus classXX quizzes).
- Exams are cumulative but will emphasize new material. All exams will be closed book and closed notes. Calculators will NOT be allowed. Questions can be answered with basic mathematics.
- Exams should be i) completed by you alone ii) without the use of any books or reference material iii) without access to internet outside of Webcampus and iv) should not be discussed with any other student until after the exam is closed.
- NOTE: Homework and exams will be submitted online via Webcampus. You must obtain tools to scan or make pdf images of your work.
- It is expected that you will spend 6 hours per week outside of lecture.
- Course grades can be tracked using Webcampus.

Catalog Description

Number systems, including unsigned binary and two's complement numbers. Logic gates. Boolean algebra. Combinational circuits. Introduction to sequential circuits.

Prerequisites: Prerequisites: MATH 127 or MATH 128 or MATH 181 or higher; or SAT math score of 630 or higher or ACT math score of 28 or higher. MATH 127 or MATH 128 must be completed with a grade of C or better.

Prerequisite by Topic: Pre-calculus

Topics

- Number Systems, Coding, and Conversion
- Boolean Functions, Simplification Methods (K-maps, Tabulation Method)
- Combinational Network Design
- LSI, MSI circuits including Adders, Decoders, Multiplexers
- Flip Flops and Introduction to Sequential Circuit Design

Additional course material not present in the textbook will be distributed to the class when needed. Extra problems can be found in the recommended text.

Course Outcomes (ABET) [UULO]

Upon completion of this course, students will be able to:

- Convert numbers to different bases, understand coding and conversion (1) [1, 2]
- Form a Boolean equation and simplify it using different methods (1, 2) [1, 2]
- Derive a truth table and design combinational circuits (1, 2) [1, 2]
- Understand and use decoders, multiplexers, and PLDs (1, 2) [1, 2]
- Understand the function of flip flops and timing issues (1, 2) [1, 2]
- Possess basic knowledge of sequential circuits (1, 2) [1, 2]

Course Policies

- Questions are best addressed during office hours. You may send an email and expect a response by the following business day.
- There will be no make-up exams or late homework without prior arrangements.
- Extensions will only be granted for medical emergencies or due to the observance of a religious holiday. The instructor must be notified of the absence prior to the last day of late registration.
- As a university student it is your responsibility to conduct yourself ethically and with integrity as described in the Academic Misconduct Policy. Cheating and plagiarism will not be tolerated. Any student caught cheating will be given an F grade.
(<https://www.unlv.edu/studentconduct/student-conduct>)

Resources

- Engineering Tutoring Lab - will have tutors available for CPE100 most days of the week
- Scanning Apps: It is recommended that you use an App on your phone for ease of use with on-device camera for creating electronic submissions. Select an App that is able to convert an image into a pdf. It is beneficial to have functionality to detect the edges, correct the orientation, and remove/cleanup background. Good Apps include: Genius Scan, CamScanner, or Office Lens [Android][Apple]

Tips for University Success

- **Participate:** Attend virtual class and take part in discussion.
- **Practice:** Spend ample time on homework. These give you the practice required for the exams. Do not wait until the last moment to complete an assignment. Starting early will give you time to get answers to your questions before they are due and will ultimately prepare you better for exams.
- **Question:** Do not be afraid to ask questions. Others will have the same question. Faculty are here to help you succeed but cannot do so unless we know where you are having issues.
- **Network:** Find people taking the same courses as you and build study groups. Support your friends and colleagues so everybody wins. It's dangerous to go alone!
- **Review:** Don't just do what is asked in class. Take time to review material between lectures. Look up lecture notes and videos online. Do extra problems from reference books.
- **Be RESPONSIBLE:** You are an adult and must be responsible for your academic career. Only you can ensure success by putting in the time and effort required. It won't be easy, but will be worth it.

Academic Policies for Students

<https://www.unlv.edu/policies/students>

Schedule (Tentative)

Week	Date	Lecture Topic	Reading	Assignment
1	08/29 Tu 08/31 Th	Digital Design Principles Number Systems	Ch 1.1-1.4	HW01 Due Su. 9/10
2	09/05 Tu 09/07 Th	Logic Gates & Truth Tables Logic Levels	Ch 1.5-1.6 A.1-A.2, A.6	HW02 Due Su. 9/17
3	09/12 Tu 09/14 Th	Transistor Design Boolean Equations	Ch 1.7-1.9 Ch 2.1-2.3.2	HW03 Due Su. 9/24
4	09/19 Tu 09/21 Th	Boolean Algebra Boolean Simplification	Ch 2.3.3-2.3.5	HW04 Due Su. 10/01
5	09/26 Tu 09/28 Th	Bubble Pushing Two-Level Logic	Ch 2.4-2.6	
6	10/03 Tu 10/05 Th	Midterm Review Midterm01		
7	10/10 Tu 10/12 Th	Karnaugh Maps K-Maps	Ch 2.7	HW05 Due Su. 10/22
8	10/17 Tu 10/19 Th	K-maps Multiplexers, Decoders	Ch 2.8	HW06 Due Su. 10/29
9	10/24 Tu 10/26 Th	Timing: Delay & Hazards Sequential Logic	Ch 2.9-2.10 Ch 3.1-3.2	HW07 Due Su. 11/05
10	10/31 Tu 11/02 Th	Registers Finite State Machines	Ch 3.4	
11	11/07 Tu 11/09 Th	FSM FSM Examples		HW08 Due Su. 11/12
12	11/14 Tu 11/16 Th	Midterm Review Midterm02	Ch 3.5	
13	11/21 Tu 11/23 Th	Timing Sequential Circuits Thanksgiving	Ch 3.6	HW09 Due Su. 11/26
14	11/28 Tu 11/30 Th	Parallelism Adder Design		HW10 Due Su. 12/03
15	12/05 Tu 12/07 Th	Building Block Final review	Ch 5.1-5.2.3, Ch 5.4	
16	12/12 Tu 12/14 Th	Final -		

Computer Engineering Program Objectives

The Program Educational Objective of the Computer Engineering program is to create, apply, and disseminate knowledge so that within a few years after graduation the graduate:

1. can successfully practice and mature intellectually in the field of Computer Engineering or a related field.
2. can be admitted to and successfully progress through a post graduate program in Computer Engineering or related program.

Computer Engineering Program Goals

To achieve these objectives, the Computer Engineering program's goals are for the graduate to possess:

1. Appropriate technical knowledge and skills
2. Appropriate interpersonal skills
3. The knowledge and skills to be a responsible citizen

Computer Engineering ABET Student Outcomes

To achieve these objectives and goals, each graduate of the Computer Engineering Major will attain the following outcomes before graduation:

- (1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- (2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- (3) An ability to communicate effectively with a range of audiences
- (4) 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
- (5) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- (6) An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- (7) An ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

University Undergraduate Learning Outcomes [UULO]

The five University Undergraduate Learning Outcomes (UULOs) define what all UNLV students should know and be able to do when they graduate. Because students engage with the UULOs in both their general education and academic majors, the UULOs help make the undergraduate experience intentional and coherent.

Full context online (<https://www.unlv.edu/provost/gen-ed/uulo>)

- [1] Intellectual Breadth and Lifelong Learning
- [2] Inquiry and Critical Thinking
- [3] Communication
- [4] Global/Multicultural Knowledge and Awareness
- [5] Citizenship and Ethics