



Department of Computer Science

CPTG 345
Digital Logic Design (4 units)
Spring Quarter, 2026

Time and Location

Lecture: 3/30/2026 – 6/11/2026, MTRF 9:00 a.m. – 9:50 a.m.

Textbook (Required)

Enoch Hwang, *Digital Logic & Microprocessor Design with Interfacing*, Cengage, 2018, 2nd Ed, ISBN: 978-1-305-85945-6.

Instructor

Dr. Hwang. Office PSC 255. E-mail: ehwang@lasierra.edu. Office hours: email to set up time for appointment.

Course Description

Bulletin Course Description: Design of digital systems. Topics include Boolean algebra, combinational and sequential logic design, design and use of arithmetic-logic units, carry-lookahead adders, multiplexers, decoders, comparators, multipliers, flip-flops, registers, and simple memories. Laboratories involve use of hardware description languages, synthesis tools, programmable logic, and hardware prototyping. Three class periods, one three-hour laboratory per week.

Prerequisite: CPTG 245.

Student Learning Outcomes

The computer science curriculum at La Sierra University provides opportunities to reach various goals under the broad mission statement: “To Seek, To Know, To Serve.” This course introduces digital circuits for microprocessors.

Achievement at this level will be specifically demonstrated through the following:

- Students will develop logical thinking skills by learning how to design digital circuits; (SLO 1)
- Students will communicate and work effectively in a team environment. (SLO 2)

- Students will understand the concept and design of computer architecture components such as multiplexer, adder, arithmetic-logic unit, register, memory, control unit, datapath, and microprocessors. (SLO 3)

Topics (Numbers in parenthesis are chapter/section numbers in the textbook.)

1. Designing Microprocessor (1). HDL (1.4).
2. Digital Circuits (2): Boolean Algebra (2.7 – 2.9).
3. Combinational Circuits (3): Minimization of Combinational Circuits (3.3).
4. Standard Combinational Components (4): Arithmetic Logic Unit (4.6), Tri-state buffer (4.8), Comparator (4.9), Shifter (4.10), Multiplier (4.11).
5. Sequential Circuits (5): Description of a Flip-Flop (5.11), HDL (5.7), Register File (5.13), Memories (5.14), Counters (5.16).
6. Finite-State Machines (6): State Diagrams (6.2), Analysis (6.3) and Synthesis (6.4).
7. Dedicated Microprocessors (7).
8. General-Purpose Microprocessors (8).
9. Microprocessor Interfacing (Keyboard, mouse, LCD, VGA, Serial, Audio, SD, etc.) if time permits.

Requirements and Evaluation

Tests: 2 Midterms: Monday April 20 and Tuesday May 12. Final: Monday June 8, 2026, 8:00 a.m. – 10:00 a.m.

Quizzes: There will be pop quizzes on materials that have just been covered in class.

Homework assignments: There will be approximately one homework assignment with one or more computer programming problems each week. These assignments must be turned in at the beginning of the class period on the given due date. Late assignments are not accepted unless you have a medical or emergency excuse. Unless otherwise noted, all programming assignments must be executable on the computer.

Labs: Weekly lab exercises to be done during the lab period.

Final Project: A final project due on the last day of class.

Attendance and Class Participation

This course will include much computer programming and discussion on topics covered. Students are expected to be on-time for class and ready to actively engage the material. Proper class preparation, active participation in class, and thoughtful conversation on the topic being discussed are expected. Since so much of what we learn takes place in dialogue with each other, the presence of each student is valued and necessary at every class period. To be excused from a class, you must provide an official note documenting the reason(s) for your absence. It is still your responsibility to catch up on any material that you have missed.

Grading

Homeworks 10%, Labs 15%, Quizzes 5%, Class participation 5%, Final Project 15%, Midterms 2 @ 15% each, Final 20%.

Grading Scale

After the grades for the above requirements and their percentages have been calculated for each student, the final grades will be based on the following scale:

95 – 100%	A
90 – 94.9%	A-
87 – 89.9%	B+
83 – 86.9%	B
80 – 82.9%	B-
77 – 79.9%	C+
73 – 76.9%	C
70 – 72.9%	C-
67 – 69.9%	D+
60 – 66.9%	D
0 – 59.9%	F

“Incomplete” grades are given only in extremely unusual circumstances. See *La Sierra University Undergraduate Bulletin* for the University’s policy concerning required procedures and course completion.

La Sierra University’s Policy on Academic Integrity and Honesty

“Academic honesty is the cornerstone of institutional integrity. Academic dishonesty, on the other hand, is a treat to the intellectual fabric of an academic community and is, perhaps, the most serious violation of trust that can occur in a community of scholars and educators.... Students who commit any offense against academic integrity and honesty may receive from an instructor a failing grade in an assignment or a failing grade in a course, without possibility of withdrawal. The nature of the offense may dictate probation, suspension, dismissal, or permanent expulsion as determined by the dean and the Administrative Committee of the student’s school of enrollment” (*La Sierra University Undergraduate Bulletin*).

Faculty members are expected to report all incidents of academic dishonesty. The instructor for this course will follow the established protocol for faculty members, which includes a report to the Provost’s office should such an incident occur.

To be sure that you have no misunderstandings about the definitions of academic honesty or academic dishonesty, refer to your *La Sierra University Student Handbook*. The University has significant penalties for academic dishonesty, so please take this suggestion seriously.

La Sierra University’s Policy on Assistance for Physically and Learning Challenged Students

La Sierra University complies with the Americans with Disabilities Act and Section 504 of the Rehabilitation Act of 1973. The Office of Disability Services located in the Learning Support and Testing Center coordinates all student requests for accommodation relating to

special needs (physical, learning, or psychological). A student with such needs should contact the Office of Disability Services the first week of the quarter by calling 785-2450. After proper documentation is established, instructor will meet with the student privately to discuss specific needs.

La Sierra University's Policy on Sexual Misconduct (Title IX)

La Sierra University is committed to fostering an environment in which all members of our campus community are safe, secure, and free from sexual misconduct in any form. When learning of conduct or behavior that may not meet the standards outlined in the University's Sexual Misconduct policy, all faculty and staff are expected take an active role in upholding this policy and promoting the inherent dignity of all individuals. If members of our campus community, including students, have questions related to sexual misconduct or wish to report sexual misconduct in any form, please contact the Title IX Coordinator at (951) 785-2849 or titleix@lasierra.edu. La Sierra University's Sexual Misconduct Policy can be located online at <https://lasierra.edu/fileadmin/documents/sexual-misconduct/title-IX-policy.pdf>

Important Dates

4/10 (Last day to withdraw with no record on transcript), 5/22 (Last day to withdraw with a "W"), 5/25 (Memorial Day holiday).

Resource Links

- [VHDL syntax summary](#).
- DE0 board [pinouts](#)
- DE1 board [pinouts](#)
- DE2 board [pinouts](#)
- [ASCII Table](#)
- Quartus schematic entry and DE1 [tutorial](#)
- [Binary to Decimal converter](#)