

# EGR 2131-100: ENGINEERING DIGITAL DESIGN

Sinclair Community College, Spring Semester 2019  
Monday & Wednesday 1:00 – 3:40 PM, Room 1-230

**INSTRUCTOR:** Nick Reeder, Office Room 1-118, Phone 937-512-2303, [nick.reeder@sinclair.edu](mailto:nick.reeder@sinclair.edu)

**Office Hours:** Mon. 12:00–1:00, Tues. 12:00–1:00, Wed. 12:00–1:00, Thurs. 12:00–1:00, Fri. 12:00–1:00.

**COURSE DESCRIPTION:** Binary systems, Boolean algebra, combinational and sequential circuits, digital design using computer-aided design (CAD) tools with hardware description language. Laboratory exercises include simulation using CAD tools and implementation of designs on breadboards and on field-programmable-gate-array boards. This course is designed for Engineering University Transfer students.

**Credit hours:** 4 credit hours (= 3 classroom hours and 3 lab hours per week)

**Prerequisite:** MAT 1470.

**TEXTS & SUPPLIES:**

- S. Brown & Z. Vranesic, *Fundamentals of Digital Logic with VHDL Design*, 3<sup>rd</sup> edition or custom edition available from Sinclair's bookstore.
- Scientific calculator.
- Flash drive

## TENTATIVE SCHEDULE (Revised January 29, 2019):

Dates	Unit	Class Topics	Reading	Lab
January 7, 9	1	Design Concepts and Binary Codes	Chapter 1 and Section 5.8	Lab #1
January 14, 16	2	Logic Gates and Boolean Algebra	Sections 2.1 to 2.5	Lab #2
January 21		<b>No class; Martin Luther King Day</b>		
January 23, 28	3	Synthesis	Sections 2.6 to 2.8	Lab #3
Jan. 30		<b>No class; Sinclair Closed</b>		
February 4, 6	4	CAD Tools and VHDL	Sections 2.9 to 2.12 and A.1 to A.4	Lab #4
February 11, 13, 18	5	Optimized Implementations of Logic Functions	Chapter 4	Lab #5
February 20, 25, March 11	6	Number Representation and Arithmetic Circuits	Chapter 5 and Sections A.5 and A.6	Lab #6
February 27		<b>Midterm Exam</b>		
March 4, 6		<b>No class; Spring Break</b>		
March 13, 18	7	Multiplexers and Decoders	Sections 6.1, 6.2, 6.8	Lab #7
March 20, 25	8	Encoders, Code Converters, and Comparators	Sections 6.3 to 6.5	Lab #8
March 27, April 1	9	VHDL for Combinational Circuits	Sections 6.6 to 6.8 and Sections A.7 to A.9	Lab #9
April 3, 8	10	Latches and Flip-Flops	Sections 7.1 to 7.7, and 7.12; also, A.10.1 to A.10.5	Lab #10
April 10, 15, 17	11	Registers and Counters	Sections 7.8 to 7.13 and A.10.6 to A.10.9	Lab #11
April 22, 24	12	Synchronous Sequential Circuits	Sections 8.1 to 8.4, 8.9, A.10.10, A.10.11	Lab #12
April 29, May 1		<b>Final Exam</b>		

**HOW TO SUCCEED IN THIS COURSE:**

- \* Attend all scheduled hours of class.
- \* Read the scheduled textbook sections and labs before class.
- \* If you are struggling with the course, come to my office hours, or contact me by phone or e-mail. If you get sick or have personal problems, contact me as soon as possible so that we can plan a strategy to keep you from falling too far behind.

**GRADING COMPONENTS:**

Homework: 15%  
 Labs: 20%  
 Quizzes: 10% (lowest quiz grade dropped)  
 Midterm Exam: 25%  
 Final exam: 30%

<b>GRADING SCALE:</b>	A	90% – 100%
	B	80% – 89.9%
	C	70% – 79.9%
	D	60% – 69.9%
	F	less than 60%

**CLASS POLICIES:**

- \* I expect you to attend all class meetings, and I will take attendance. While attendance is not a direct part of your grade, missing class may cause your grade to drop, as described below.
- \* Homework assignments and lab write-ups are due at the beginning of class on the due date. **I will deduct 25 percent from the grade on any late homework or lab work that is handed in within one week of the due date. I will not give any credit for homework or lab work handed in more than one week late.**
- \* If you miss a quiz for any reason, you'll receive a grade of 0 for that quiz; **I don't give make-ups for missed quizzes.**
- \* If you miss an exam, contact me (either in person, by phone, or by e-mail) as soon as possible to arrange a make-up. **If you take an exam late, I will deduct 25 percent from your grade for that exam.**
- \* Make sure that assignments are complete when you hand them in. If you skip part of an assignment, I will take off points for the missing part, and I won't let you hand the assignment in a second time to regain the lost points.
- \* Turn off cell phones, and do not use them during class. Do not use the computers for non-academic work.
- \* No food or soft drinks in the classroom. Stow water bottles at floor level, never on the computer desk or lab bench.
- \* You may complete lab work in pairs or individually, but you must hand in your own lab write-up.
- \* If you miss class or do not get finished with a lab during the class period, I expect you to finish the lab during an Open-Lab session in Room 1-242-H.
- \* While you may discuss assignments with other students, anything that you turn in must be your own work, not work that you have copied from another student. Cheating includes copying someone else's work, obtaining or distributing an advance copy of a quiz or exam, and allowing someone else to copy your work. Depending on the severity of the incident, the penalty for cheating ranges from a zero on that assignment to an 'F' in the course. See Sinclair's Academic Integrity Policy (below) for more on this topic.

**COLLEGE POLICIES:**

**Sinclair Academic Policies.** To view policies on topics such as dropping a course, late registrations, administrative withdrawal, grades, student behavior guidelines, safety and security, academic and other counseling, go to

<https://www.sinclair.edu/services/basics/registration-and-student-records/policies/>.

**Sinclair Academic Integrity Policy.** Conduct yourself in accordance with Sinclair's honor code and academic integrity policy at <https://www.sinclair.edu/services/conduct-safety/student-judicial-affairs/academic-integrity-policy/>.

Understanding these policies is your responsibility.

**USEFUL CONTACT INFORMATION:**

Engineering University Transfer Coordinator: Eric Dunn, Room 6–112, Phone (937) 512-2918, [eric.dunn@sinclair.edu](mailto:eric.dunn@sinclair.edu)

EGR Dept. Chair: John Pax, Room 3–134, Phone (937) 512–2570, [john.pax@sinclair.edu](mailto:john.pax@sinclair.edu)

Co–op Coordinator: Chad Bridgman, Room 3-134, (937) 512–2508, [chad.bridgman@sinclair.edu](mailto:chad.bridgman@sinclair.edu)

## QUALITY STANDARDS FOR HOMEWORK ASSIGNMENTS

1. Use lined white paper, letter-size (roughly 8 by 10 inches), with no ragged edges.
2. Write on only one side of each sheet, with roughly one-inch margins all around.
3. Use pencil.
4. Include this information at the top of the first page:
  - a. your first and last name
  - b. course number and section number
  - c. assignment type and number (for example, "Homework 1")
  - d. the due date
5. Organize your work:
  - Write horizontally from the top of the page to the bottom. No zigzagging across the page. No tiny equations running up and down the edge of the page.
  - Use a single column. If a short answer, leave any remaining space to the right empty. Do not try to fill in every empty area of the sheet.
  - Leave at least one blank line between problems.
6. Answer all assigned parts of all assigned problems.
7. Start each solution by listing the problem number. For multi-part problems, include the correct a, b, c, etc. designator.
8. You don't need to copy the problem wording to your homework paper. But if the question involves an electrical schematic or other diagram, neatly copy the diagram to the homework paper with all the given quantities and labels. Use a straightedge if neat straight lines do not come naturally to you.
9. Show ALL calculations, steps, and explanations needed to arrive at an answer. If an equation is solved, show that equation in symbolic form (*example:  $V = IR$* ) and the numbers you substituted in (*example:  $V = 2A \times 470 \text{ ohms}$* ). If a decision needs to be made, explain how you chose the result you did (*example: "The second bulb is burned out because DMM#2 reads 0 volts."*) For operations on your calculator, show the equations you use and the numbers you entered into your calculator, and write "by calculator" next to the result.
10. Make your work neat and readable. No coffee stains, pizza sauce, etc.
11. To make corrections, either use a good eraser OR cross out the error with a single horizontal line. Do not use X's to cross out the mistake, and do not black out the mistake with a solid "blob."
12. Use proper electrical units. Carry units all the way through the problem; units should not appear magically at the end of a problem.
13. Draw a box around final answers on problems that require manual solution steps.
14. For multi-page assignments, staple pages using **one staple** in the upper left corner.
15. Submit each assignment separately. Do not staple homeworks to lab reports.

## QUALITY STANDARDS FOR LAB WORK AND LAB REPORTS

1. Use pencil to record your data on the lab handouts. To make corrections, either use a good eraser OR cross out the error with a single horizontal line. Do not use X's to cross out the mistake, and do not black out the mistake with a solid "blob."
2. Tidy up your lab bench before leaving. For each lab, complete the end-of-lab checklist provided on the course website. This checklist covers points such as turning off equipment, returning components to their drawers, and so on. Neglect may cost you up to 10% of your grade on that lab.
3. Assemble your lab reports in the following order:
  - a. The lab handout with all recorded data and instructor check-offs.
  - b. Any additional required pages, such as Quartus printouts, oscilloscope printouts, graphs, etc.
  - c. Computer-printed answers to questions, technical conclusion, or other summary material as directed in the lab handout.
4. Staple all sheets together, using **one staple** in the upper left corner.
5. Submit each assignment separately. Do not staple lab reports to homeworks.