

**University of Texas at El Paso  
Electrical and Computer Engineering  
Digital Systems Design 1  
Spring 2024, version 1  
EE2369-27073, ECE2303-26890**

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Lecture HOURS:	TR 3:00PM – 4:20 PM,
OFFICE HOURS:	T 2:00 – 3:00 PM, W 4:00 PM – 5:00 PM,
TEXT: (Also recommended references)	<ul style="list-style-type: none"> <li>• Digital Design with an introduction to the Verilog HDL, by Morris Mano and Michael Ciletti, Pearson. (current edition is 6<sup>th</sup>, however you can use previous editions)</li> <li>• Supplemental materials in Blacboard</li> <li>• REQUIRED: Zybook for homework assignments (\$58), with animations and exercises. <ol style="list-style-type: none"> <li>1. Sign in or create an account at <a href="http://learn.zybooks.com">learn.zybooks.com</a></li> <li>2. Enter zyBook code: UTEPECE2303EE2369GonzalezWinter2023</li> <li>3. Subscribe</li> </ol> </li> </ul>
Catalog Description	EE2369/ECE2303: Design and synthesis of digital systems using both combinational and sequential circuits. Includes laboratory projects implemented with standard ICs.
Prerequisites/ Co-requisites	Prerequisite: EE 1305/ECE1300 or CS 1301 with a grade of "C" or better. Co-requisite: EE 2169 / ECE2103
Software	LabVIEW, Xilinx-VIVADO available for download through the ETC office, to get your own free license. <a href="https://www.utep.edu/engineering/etc/Software/">https://www.utep.edu/engineering/etc/Software/</a>  Available in in E340 and E319 labs. Also Remote limited access through UTEP VPN, using Remote Desktop.

**Course Outcomes**

1. Apply concepts of number systems to perform binary arithmetic and conversions between bases.
2. Apply Boolean algebra and K-Map to simplification of Boolean expressions, analysis and synthesis of digital circuits

3. Design combinational circuits, such as binary adders, code converters, etc., by using logic gates
4. Design sequential circuits, such as counters, registers, etc., by using flip-flops and logic gates
5. Design and test digital circuits using MSIs, EPROMs and simple CAD tools.

### Tentative Calendar

Note: Dates and topics are subject to change

Week #	Lecture #	Lecture Dates	Sequence of Topics	ZyBook	Mano & Ciletti
1	1	01/16/24	Course Information, Syllabus, Introduction	Chapter 1	Chapter 1
	2	01/18/24	Logic Gates, Basic Boolean Operators and Equations, Introduction to Logic System Design		
2	3	01/23/24	Basic Boolean Algebra, Logic Diagrams (CKT), Function tables, Timing Diagrams, Intro to HDL (Verilog)	Chapter 1, Chapter 7 (Verilog)	Chapter 2
	4	01/25/24			
3	5	01/30/24	Number Systems, Arithmetic operations in binary	Chapter 1	Chapter 1
	6	02/01/24	Two's Complement, overflow, other codes		
4	7	02/06/24	Reduced Equations via Boolean Algebra, SOP, POS	Chapter 1, Chapter 2	Chapter 2, Chapter 3
	8	02/08/24	Canonical Equations		
5	9	02/13/24	Design steps for Combinational Systems, K-Maps & Reduced Equations (2 & 3 Variables , SOP & POS)	Chapter 2	Chapter 3
	10	02/15/24	Kmaps (4 variables), Don't care conditions.		
6	11	02/20/24	<i>Quine-McCluskey method of reduction ,More design considerations</i>	Chapter 2	Chapter 3
	12	02/22/24	<b>*Exam 1 (Date to be confirmed)</b>		
7	13	02/27/24	Other gates: XOR, XNOR, NAND, NOR Binary Adder design and Analysis	Chapter 2, Chapter 3,	Chapter 3, Chapter 4
	14	02/29/24	MSI, Multiplexers and Decoders		
8	15	03/05/24	Sequential Digital Systems Intro // Flip-Flops and timing diagrams. FF Timing Diagram and Registers Design	Chapter 3, Chapter 4	Chapter 4, Chapter 5
	16	03/07/24	Counter Design and Analysis		
9		03/12/24	<b>Spring Break</b>		
		03/14/24			
9	17	03/12/24	Counter Analysis // Sequential Machines.	Chapter 4	Chapter 5, Chapter 6

	18	03/14/24	FMS: Mealy and Moore Machines. Sequential Design & Analysis examples		
10	19	03/19/24	<i>Capturing behavior with FSM</i>	Chapter 4	Chapter 5, Chapter 6
	20	03/21/24	<b>*Exam 2 (Date to be confirmed)</b>		
11	21	03/26/24	FSM continued	Chapter 4	Chapter 6
	22	03/28/24	Algorithmic State Machines (ASM) methodology	Chapter 5	Chapter 8
12	23	04/02/24	Basic ASM Design	Chapter 5	Chapter 8
	24	04/04/24	ASM Design with MSI	Chapter 5	Chapter 8
13	25	04/09/24	Design Examples – Different Hardware versions	Chapter 5	Chapter 8
	26	04/11/24	ASM Design with LSI	Chapter 5	Chapter 8
14	27	04/16/24	RTL	Chapter 5	Chapter 8
	28	04/18/24	RTL	Chapter 5	Chapter 8
15	29	04/23/24	Review		
	30	04/25/24	<b>Exam 3 (Date to be confirmed)</b>		
16	31	May 6-10 *FINAL WEEK*	Comprehensive exam (EXAM #4) ONLINE		
	32				
		<b>05/03/24</b>	<b>Dead Day</b>	<i>Friday Lab Section might need to meet for missing sessions</i>	

\* Exam dates might be adjusted

### General Policies

- Each session consists of regular lecture supported by supplementary materials. They are composed of brief notes, videos and assigned readings.
- Class sessions will be streamed simultaneously and recorded for later view. However, There is a delay in records availability.
- You are expected to dedicate about 2 to 3 hours per session to review the assigned materials, answer problems, submit postings and assignments.
- Students are encouraged to use MS teams to interact in the allocated office hours to talk with the instructor. Face to face time is also available in the professor office. Please make an appointment reservation to guarantee availability.
- The EE2169 is a corequisite to the course. However, the topics and the grading are separate.
- Technology Requirements
  - Course content is delivered via the Internet through the **Blackboard** learning management system (LMS). Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Mozilla Firefox and Google Chrome are the most supported browsers for Blackboard; other browsers may cause

complications with the LMS. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.

- You will need to have or have access to a computer/laptop, scanner, a webcam, and a microphone. You will need to download or update the following software: Microsoft Office, PDF reader tool (Adobe or others), Media players (Flashplayer, Windows Media Player or QuickTime), and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.
- You will need to use LabView and XILIX Vivado to solve assignments for the laboratories. Further instructions will be provided in the lab sections.
- If you encounter technical difficulties beyond your scope of troubleshooting, please contact the Help Desk as they are trained specifically in assisting with technological needs of students.

### GRADING

ITEM	Points / Total
Exams 1, 2, & 3	200 ea / 600 total
Weekly Assignments, progress in Zybook (85% completion)	100 total
Special Homeworks	100 total
Class participation (other discussions, iClicker, etc)	50 total
Final Exam or Project	200 total
TOTAL	1000+50

- Each element will accumulate points
- Exams will become available Fridays and will be due on Mondays via Blackboard. There are 4 exams requiring solving problems or applying concepts.
- **Show always all the procedure** to arrive to the solutions, including brief justifications for multiple choice selections. End results without the right procedure are considered conceptual errors. Procedures for exams will be uploaded separately.
- After the initial grading is done, to earn partial credit, students might need to identify the cause of the errors and provide with an additional correction document stating the proper procedure to obtain a valid answer. (maximum 50 % credit only)
- **Special Homework** Students will need to propose a solution to an open-ended problems and posting the concise proposal in the Blackboard discussion boards before the assigned deadline. Expected length is between one or two paragraphs per problem and attach needed graphics.
  - Afterwards, students are required to inspect at least two proposals from other students and make comments about the solutions. Responses must be posted no later than 48 hrs after the assignment initial submission. The length of the comments should be about one single paragraph.
- Letter scale will be **A:** 90%-100%; **B:** 80%-89.9%; **C:** 70%-79.9%; **D:** 60%-69.9%; **F:** below 60% of the reference grade.
- Some large attachments might require saving the document in a shared OneDrive folder and share the link with the instructor.
- Additional requirements may be stated in specific assignments.

## GENERAL COURSE POLICIES

- For email questions or concerns, please start the email subject line with “ **EE2369: ...** “ .
- Samples of student work will be collected for accreditation purposes. Please notify the professor, in writing, if there is any confidentiality restriction.
- **No late work** will be accepted and special accommodations require the letters with instructions from CASS.
- The Professor will be available only during the assigned office hours or by appointment.
- Each piece of written work must include **EE2369, name, student ID, TEAM** number (when applicable) at the **upper right corner** of the first page; and the **name** in all remaining pages.
- All printed work must have good presentation. Final results must be emphasized (example **red underline** or **highlighted box**)
- Online work must have in the first text line the name of the student and the team number when applicable.
- Detailed instructions for the **assignments** will be **provided later** in separate handouts through **Blackboard**

### Academic Honesty, Accommodations and NETiquette

- It is expected that the students will conduct with integrity in all course areas. Do not attempt to engage in a dishonest activity such as copying, plagiarism, falsifying information, etc. The professor will take measures to prevent such instances and will bring a case to the university authorities. USING CHEGG or other online tools for answering exams is not allowed.
- Information about University wide policies could be found in the Dean of Students Web page at <http://studentaffairs.utep.edu/Default.aspx?alias=studentaffairs.utep.edu/dos>
- NETiquette
  - Always consider audience. Remember that members of the class and the instructor will be reading any postings.
  - Respect and courtesy must be provided to classmates and to instructor at all times. No harassment or inappropriate postings will be tolerated.
  - When reacting to someone else’s message, address the ideas, not the person. Post only what anyone would comfortably state in a F2F situation.
  - Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).
- The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services.

## STUDENT RESOURCES

UTEP provides a variety of student services and support:

- [UTEP Library](#): Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- [Help Desk](#): Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- [University Writing Center \(UWC\)](#): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- [Math Tutoring Center \(MaRCS\)](#): Ask a tutor for help and explore other available math resources.
- [History Tutoring Center \(HTC\)](#): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- [Military Student Success Center](#): UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- [RefWorks](#): A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.