

ECE2372 – Modern Digital System Design

Fall 2022

Department of Electrical and Computer Engineering, Texas Tech University

Instructor: Dr. Kai Wu
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Class Meeting Time: TR 2:00 PM ~ 3:20 PM

Classroom: Indus. Manufac. and Sys. Engr, Room: 00117

Office Hours: TR 3:30 ~ 4:30 pm, or by appointment

Class Website: *Blackboard*

Grader: Akhil Bandi abandi@ttu.edu

Tutor: Charlie Scheel, Charlie.Scheel@ttu.edu, office hour Monday 6pm-8pm, Wednesday 6pm-8pm, Thursday 3:30pm-5:30pm at the Student Lounge (ECE 04)

Required Textbooks:

- M.M. Mano and C.R. Kime, *Logic and Computer Design Fundamentals*, 4th or 5th Edition, Pearson - Prentice Hall.

Expected Learning Outcomes

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

- Analyze and design combinational digital logic circuits.
- Analyze and design sequential digital logic circuits.
- Use hardware description language.

ABET Student Learning Outcomes Addressed

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 acquire and apply new knowledge as needed, using appropriate learning strategies

Methods of Assessment of Learning Outcomes

The learning outcome will be evaluated based on students' performance in homework and exams (fundamental knowledge) and design projects (practical skills).

Grading:

- Homework/Quizzes: 16%
- In-class exams (two exams counted at 24% each): 48%
- Final exam: 20%
- Projects: 16%

Approximate Final Grade Evaluation:

- A+: ≥ 97
- A: 96 - 90
- B: 89 - 80
- C: 79 - 70
- D: 69 - 60
- F: < 60

In-Class Exam Policy:

Three in-class exams (80 minutes each) will be offered. The two with the highest scores will be automatically counted into a student's grade. Student can skip the last in-class exam (makeup exam) if he/she is satisfied with the previous two. Refer to 'Preliminary Course Schedule' for tentative exam dates. (Note: final exam is mandatory for every student)

Preliminary Course Outline (subject to changes)

- 1 Number systems
- 2 Boolean algebra, Karnaugh maps, simplifications
- 3 Logic circuits, gates, basic logic implementation
- 4 Combinational logic design and implementation
- 5 Hardware description languages
- 6 Basic cell, flip-flop design, timing consideration
- 7 Sequential circuit analysis and design (state assignment, next state and output decoders), counter design
- 8 Hardware description language for sequential design
- 9 Registers and counters
- 10 Memory and programmable devices.

Subject Matter for Each Lecture

(Note: the schedule is subject to changes and will be updated throughout the semester)

August	
Tuesday	Thursday
	8/25: Introduction, number system
8/30: Arithmetic operations, base conversion	
September	
Tuesday	Thursday
	9/1: Codes, finish chapter 1, review
9/6: Gates and Boolean equations	9/8: Standard forms, optimization, K-map
9/13: K-map continue, additional gates	9/15: Finish chapter 2, review
9/20: Combinational logic design procedure	9/22: Combinational logic
9/27: EDA tutorial	9/29: Exam #1
October	
Tuesday	Thursday
10/4: Finish chapter 3	10/6: Binary adder, binary subtraction
10/11: Binary adder-subtractors	10/13: Other arithmetic functions
10/18: Finish chapter 4, review	10/20: Hardware tutorial
10/25: Project discussion	10/27: Exam #2
November	
Tuesday	Thursday
11/1: Storage elements	11/3: Sequential circuit analysis
11/8: Project discussion	11/10: Sequential circuit design
11/15: State machine design	11/17: Finish chapter 5, review
11/22: CMOS, delay, programmable devices	11/24: Thanksgiving no class
11/29: Exam #3 (makeup exam)	
December	
Tuesday	Thursday
	12/1: Project discussion
12/6: Final review	
Final Exam: Saturday, December 10, 1:30 pm to 4:00 pm	

Academic Honesty

Academic integrity is taking responsibility for one's own class and/or course work, being individually accountable, and demonstrating intellectual honesty and ethical behavior. Academic integrity is a personal choice to abide by the standards of intellectual honesty and responsibility. Because education is a shared effort to achieve learning through the exchange of ideas, students, faculty, and staff have the collective responsibility to build mutual trust and respect. Ethical behavior and independent thought are essential for the highest level of academic achievement, which then must be measured. Academic achievement includes scholarship, teaching, and

learning, all of which are shared endeavors. Grades are a device used to quantify the successful accumulation of knowledge through learning. Adhering to the standards of academic integrity ensures grades are earned honestly. Academic integrity is the foundation upon which students, faculty, and staff build their educational and professional careers. [Texas Tech University ("University") Quality Enhancement Plan, Academic Integrity Task Force, 2010.

Accommodations for Students with Disabilities

Any student who, because of a disability, may require special arrangements in order to meet the course requirements should contact the instructor as soon as possible to make any necessary arrangements. Students should present appropriate verification from Student Disability Services during the instructor's office hours. Please note: instructors are not allowed to provide classroom accommodations to a student until appropriate verification from Student Disability Services has been provided. For additional information, please contact Student Disability Services in West Hall or call 806-742-2405.

Religious Holiday

"Religious holy day" means a holy day observed by a religion whose places of worship are exempt from property taxation under Texas Tax Code §11.20. A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. A student who is absent from classes for the observance of a religious holy day shall be allowed to take an examination or complete an assignment scheduled for that day within a reasonable time after the absence. A student who is excused under section 2 may not be penalized for the absence; however, the instructor may respond appropriately if the student fails to complete the assignment satisfactorily.