EE-210: Digital Circuits, Section 2

COURSE SYLLABUS: FALL 2025 (8/24/2025)

INSTRUCTOR INFORMATION

Instructor:	Dr. Sharif, Sheikh
Office Location:	AG/ET #219
Office Hours:	Tuesday and Thursday, 10:30-11:30 AM, or by appointment
Office Phone:	903-886-5960
Office Fax:	903-886-5960
University Email Address:	Sharif.Sheikh@etamu.edu
Preferred Form of Communication:	Email
Communication Response Time:	within 48 hours (weekdays)

COURSE INFORMATION

Class Meeting Schedule:	From 8/25/2025 to 12/13/2025. See course outline
Class and Lab Meeting Dates:	Tuesday, Lecture: 2:00 – 4:30 PM, Lab: 4:45 – 7:17 PM
Classroom:	Lecture: AG/ET #211, Lab: AG/ET 214
Course Format:	This 3-credit course meets for 5 hours/week on campus
Textbook Required:	Fundamentals of Logic Design, 7th Edition, Charles H. Roth Jr. and Larry L. Kinney, Cengage Learning, Boston, 2014.
Laboratory Manual:	A lab manual prepared for this course will be available to students
Optional References	Fundamentals of Digital Logic with Verilog Design, 3rd Edition, McGraw-Hill Inc., New York, 2014.
Software Required	MS Office, LTspice (free), Quartus Prime Lite(free) ….
Optional Texts and/or Materials	Multisim software (available on school computers)

Course Description

This course introduces the theory and design of digital logic circuits, including number systems, Boolean algebra, logic gates, combinational and sequential circuit design and analysis, Karnaugh maps, truth

tables, logic optimization, arithmetic circuits, flip-flops, counters, memory and storage, synchronous and asynchronous state machines, and an introduction to programmable logic. The course has an associated Laboratory experiments set, which will require the use of simulation software (e.g., Multisim and Spice) and hardware equipment

Prerequisites: PHYS 2426 with a minimum grade of C or concurrent enrollment or COSC 1436 with a minimum grade of C.

Student Learning Outcomes:
- Perform conversions and numerical calculations in different number systems (including decimal, binary, gray code, & hexadecimal) and be able to perform 2's complement calculations in binary
- Recognize the function of logic gates and how they connect and operate together as a system
- Design digital logic circuits using Boolean algebra
- Apply the Karnaugh Maps technique to simplify, analyze, and optimize digital logic circuits
- Design and implement combinational logic circuits using basic logic gates and medium-scale integration (MSI) technology, such as Adders, Subtractors, comparators, Multiplexers, Decoders, etc
- Design and implement sequential logic circuits using flip-flops, registers, counters, etc.
- Design and program basic synchronous and asynchronous state machines
- Use software tools such as Quartus/Ltspice.. to design and simulate digital logic circuits
- Perform experiments/course project independently as well as in a group
- Conduct experiments using discrete components, breadboard, logic analyzer, clock generator, function generator, seven-segment display, etc.
- Write a technical lab report

COURSE REQUIREMENTS

Minimal Technical Skills Needed

Working knowledge and basic skills in using Microsoft Office products Word, Excel, and PowerPoint. Working knowledge and understanding of basic algebra laws and electrical circuits fundamentals (Ohms Law) per high school physics.

Instructional Methods

The instructional methods will include lectures (modules), class discussions, course projects, assignments, problem-solving exercises, Lab reports, and simulations using software. Instructions will be based on the course textbook and on the Lab manual. Course materials, announcements, and lecture notes will be posted on the course website (D2L).

Tips for Success in the Course

Students must attend classes, participate in classwork and discussions, and complete the required course assessments that support the anticipated learning objectives. Students are expected to regularly log into the course website (D2L) to download course material, submit their coursework as instructed, and follow up on new announcements. This course covers more advanced content that requires at least 6 hours of extensive study per week.

Lab Safety Training

Students registered for this course must complete the required Lab safety training before entering the Lab and undertaking any activities. There are no exceptions to this University policy. Failure to

complete the required training will preclude participation in Lab activities and assessments.

Assignment solutions:

Assignment solutions must be submitted by the specified due date mentioned on the D2L platform. Each homework assignment requires a separate solution report. Unless prior arrangements are made with the instructor, no late submission of assignment solutions will be permitted. Some homework assignments may require the submission of simulation files created using software. Any file that is flagged as infected with malware or viruses will not receive a grade.

Exams and Quizzes

The exams (midterm and final) will be closed-book & closed-notes. Relevant scientific formulas will be provided in the supplementary sheet. The student will need to bring a scientific calculator for the exam. The use of a personal phone (or any other smart device) is strictly prohibited during exams. A makeup exam may be offered, but an official permit for absence that fulfills University procedures should be available on time.

Make-up Assessments:

Make-up assessments (Assignments, lab reports, quizzes, exams) are generally not offered without valid, documented justification. When approved, make-up work should be completed within one week of the missed assessment (if possible). Early communication is essential, and approval is not guaranteed.

Academic Integrity:

The first incident of academic misconduct will result in a zero for the assessment; further violations may lead to a failing grade in the course. All incidents will be reported to the department chair. If you are unsure whether something constitutes academic dishonesty, consult the instructor before submission. Refer to the TAMUC Academic Integrity section (included on page 8) for additional details.

Attendance

Attendance will be taken at the beginning of the class. Make-up for a missed In-class assignment may be given only if you contact the instructor before the end of the class and there is a valid reason for the absence.

No. of unexcused absences	< 4	= 4	= 5	= 6	= 7	<7
Grade penalty	0%	5%	10%	20%	30%	F

Because this course includes laboratory work, appropriate attire is required to reduce the risk of injury. Bluetooth earbuds or similar devices are not permitted while in the lab. For more information about the ETAMU attendance policy, please view the Attendance Webpage and the Class Attendance Policy

Lab Work

Students will perform simulations and experiments to study the characteristics and practical applications of digital gates and circuits. The lab experiments will be supported by software simulation using Quartus and/or LTspice and/or Multisim. Students will work in teams and must submit their reports in the specified format within one week.

Additional guidelines for Lab work:

- Proposed laboratory experiments are listed in the course outline below.
- Divide the class into groups to do Lab work, with 3-4 students/group.

- In Pre-Lab, you will be asked to design a circuit to perform a specific function (if applicable).
- Each group will need to submit a full report for each experiment.

Lab report should be constructed as follows:

1. **Cover page**: Your Lab report cover page should include the following information:

   - Course name and title
   - Experiment number and title
   - Names of team members and their IDs
   - Instructor's name.
   - Date of the experiment

2. **Objectives**: State clearly the objectives of the experiment.

3. **Equipment required**: List all the equipment and components used in the experiments.

4. **Introduction:** Provide a brief background to the problem that you are trying to solve in the Lab and the approach to solving it.

5. **Procedure:** Each part of the Lab experiment should explain the following**:**

   - Basic measurements and calculations
   - Brief explanation of the derived solution
   - Schematics were developed that demonstrate the solution

6. **Results and Analysis**: Each part of the Lab experiment should have the following:

   - Include measurement results. Also include a copy of the simulated schematic diagram and results (if applicable).
   - Include a picture (taken using a mobile phone) of the circuit you built in the Lab.
   - Analyze the measured data and produce necessary plots using Excel and/or MATLAB.
   - State the observations made while performing the Lab and an explanation of your results.

7. **Conclusions:**

   - Describe what you did and learned from the Lab.
   - Explain to what degree the objectives of the Lab were achieved.
   - Describe possible real-time applications from the work done in the Lab.

A Formal Lab report should enable someone else to duplicate your work and obtain the same results without reference to any other documents. Reference URL of data sheets. Graphics in your Lab reports may not be hand-drawn and prepared using a graphics program.

Lab reports are due before Lab time, one week after the Lab was performed. 10% per day will be deducted from the final Lab grade.

GRADING

Final Grade

Final grades in this course will be based on the following scale:

A = 90% - 100%

B = 80% - 89%

C = 70% - 79%

D = 60% - 69%

F = 59% or Below

Assessments

The following assessments will be used in this course to evaluate individual progress:

Assessment	Weight
Attendance	10%
Assignments	15%
Class Quizzes	10%
Midterm Exam	20%
Final Exam	20%
Lab Work + Project	20 + 5%

COURSE OUTLINE

The instructor reserves the right to adjust the schedule to serve the needs of the class/lab, and any changes will be communicated promptly.

Week	Lecture Topics	Descriptions	Laboratory Sessions
1: 26th Aug.	Introduction, Number Systems / Arithmetic operation	Number systems (binary, octal, hexadecimal), conversions, arithmetic (addition, subtraction, 2's complement), arithmetic (multiplication, division), floating-point…	Class lecture and L1: Overview of Lab Policies, Hardware and Software
2: 2th Sep.			L2: Digital Circuits Simulation using Quartus software
3: 9th Sep.	Logic gates and Boolean expressions	Truth tables and basic gates. Max-terms and Min-terms.	L3: Testing the Quartus Simulated Digital Circuit on the D10-Lite FPGA Boards. Verilog codes
4: 16th Sep.	Simplification of Boolean expression	Boolean Algebra and Karnaugh maps…	L4: Testing of Logic IC's, Gates and Digital Circuits
5: 23rd Sep.			L5: Simplification of Logic Circuit: Simulation and Testing using Digital Logic Trainer
6: 30th Oct.			L6: Minimum-cost Circuit Design: Test using breadboard and using DE10-Lite FPGA board
7: 7th Oct.	MSI Devices	Multiplexers, decoders, encoders, etc.	Midterm exam
8: 14th Oct.	MSI Devices	Combinational logic design word problems	L7: Adder-Subtractor Circuits: Simulation and Testing
9: 21st Oct.	Combinational Logic Circuits	Introduction to sequential logic and flip-flops	L8: Project Work
10: 28th Oct.	Sequential Logic Design Basics of Sequential Logic	Sequential logic design word problems	L9: Project Work
11: 4th Nov.			
12: 11th Nov.	Counter Design	Counters	L10: Project work
13: 18th Nov.	Introduction to PLC	Programming logic controllers	L11: Project work

Week	Topics	Descriptions	Laboratory Sessions
14: 25th Nov.	Applications and Review		L12: Testing the Project work
15: 2nd Dec.	Project Presentation		
	Final exam		

TECHNOLOGY REQUIREMENTS

LMS

All course sections offered by East Texas A&M University have a corresponding course shell in the myLeo Online Learning Management System (LMS: D2l's Brightspace). Below are the technical requirements

LMS Requirements:
https://community.brightspace.com/s/article/Brightspace-Platform-Requirements

LMS Browser Support:
https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm

Zoom Video Conferencing Tool
https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom_Account.aspx?source=universalmenu

Communication and Support

If you have any questions or are having difficulties with the course material, please contact your Instructor.

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:
https://community.brightspace.com/support/s/contactsupport

STUDENT RESPONSIBILITIES FOR THE COURSE

CWID and Password

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or helpdesk@etamu.edu during the office hours.

Technology-Related Issues

Personal computer and internet connection problems do not excuse the requirement to complete all coursework in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, an ETAMU campus open computer lab, etc.

TECHNOLOGY REQUIREMENTS AND SUPPORT

Minimal Technical Skills Needed

Students will need a reliable computer and internet access for this course. Students must be able to effectively use myLeo email, myLeo Online D2L (Brightspace), and Microsoft Office.

Learning Management System (LMS) – D2L's Brightspace

All course sections offered by East Texas A&M University have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are the technical requirements:

- View the Learning Management System Requirements Webpage.

- Learn more on the LMS Browser Support Webpage.

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found on the Brightspace Support Webpage.

COMMUNICATION AND SUPPORT

Interaction with Instructor Statement

If you have any questions or are having difficulties with the course material, please contact your instructor. Correspondence will always be through university email (your "myLeo" mail) and announcements in myLeo online (D2L). You will not RECEIVE email through D2L, so be sure to check your ETAMU email for communication. Students are encouraged to check their university email daily.

Include the Following in Emails with the Instructor:
- Course name and subject in the subject line
- Salutation (Good afternoon, Dr. Jackson)
- Proper email etiquette (no "text" emails – use proper grammar and punctuation)
- Student name and CWID after the body of the email

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced.

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The Code of Student Conduct is described in detail online in the Student Guidebook.
Students should also consult the Rules of Netiquette Webpage for more information regarding how to interact with students in an online forum.

Academic Integrity

Students at East Texas A&M University are expected to maintain high standards of integrity and honesty in all their scholastic work. For more details and the definition of academic dishonesty, see the following procedures:

Undergraduate Academic Dishonesty University Procedure 13.99.99.R0.03

Undergraduate Student Academic Dishonesty Form

Graduate Student Academic Dishonesty University Procedure 13.99.99.R0.10

Graduate Student Academic Dishonesty Form

Use of Artificial Intelligence

East Texas A&M University acknowledges that there are legitimate uses of Artificial Intelligence, Chatbots, or other software that have the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided, the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources.

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact: **Office of Student Disability Resources and Services**

East Texas A&M University

Velma K. Waters Library Rm 162

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

Email: studentdisabilityservices@etamu.edu

Website: Office of Student Disability Services

Nondiscrimination Notice

East Texas A&M University will comply in the classroom and in online courses with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information, or veteran status. Further, an environment free from discrimination based on sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in East Texas A&M University buildings only by persons who have been issued and have a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and ETAMU Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the Carrying Concealed Handguns On Campus document and/or consult your event organizer.

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all East Texas A&M University campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

East Texas A&M Supports Students' Mental Health – Counseling Services

The Counseling Center at East Texas A&M University, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connections to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit www.tamuc.edu/counsel

Mental Health and Well-Being

The university aims to provide students with essential knowledge and tools to understand and support mental health. As part of our commitment to your well-being, we offer access to TELUS Health, a service available 24/7/365 via chat, phone, or webinar. Scan the QR code to download the app and explore the resources available to you for guidance and support whenever you need it.

As an Institutional Member of the National Association of Schools of Music, East Texas State A&M University supports the Association's commitment to student health and wellness. The following web address provides links to information for resources related to physical and mental well-being, as well as assists in offering preventative measures that students can take to avoid serious and/or chronic conditions: Musician Health and Safety - East Texas A&M University

Department and Accrediting Agency Statements:

School of Music Mission Statement:

The School of Music at East Texas A&M University promotes excellence in music through the rigorous study of music history, literature, theory, composition, pedagogy, and the preparation of music performance in applied study and ensembles to meet the highest standards of aesthetic expression.

ABET Accreditation:

This course will assess the achievement of ABET student outcomes #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. 2.1) and #6 (An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.)