



EAST TEXAS A&M
College of Science and Engineering

Digital Circuits

Fall 2026

Course Number: E210 (Mon., Wed., Tue.)

Instructor Name: Dr. Ike Agbor

Office Telephone: 903.886.5474

Office Location: AG/ET #22R

Email: Ike.Agbor@etamu.edu

Classroom #: AG/ET #214

Office hours: **Tuesday and Thursday 10:30-11:30 AM**

Lab Location: AG/ET #211

Lecture Schedule: Tuesday, 2:00-4:30 PM

Lab Schedule: Tuesday, 4:45-7:15 PM

COURSE DESCRIPTION:

This course introduces 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 introduction to programmable logic. The course has an associated Laboratory experiments set, which will require the use of simulation software (e.g. Multisim and PSpice) and hardware equipment.

COURSE PREREQUISITES/COREQUISITES:

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

REFERENCE BOOK(S):

Stephen Brown and Zvonko Vranesic. 2013. Fundamentals of Digital Logic with Verilog Design (3 ed.). McGraw-Hill, Inc., New York, USA.

Charles H. Roth JR and Larry L. Kinney, 2014, Fundamentals of Logic Design, (7 ed.), Cengage Learning. Boston, USA.

REFERENCE LAB MANUAL:

Thomas L. Floyd and David B, 2014, Lab Manual for Digital Fundamentals, (11 ed.), Pearson Edu. , UK

RECOMMENDED LEARNING MATERIALS:

Other Digital Logic books and online material, ie. <https://digitalcommons.njit.edu/oat/1/>

COURSE LEARNING OUTCOMES:

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

- 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 Karnaugh Maps technique to simplify, analyze, optimize digital logic circuits
- Design and implement combinational logic circuits using basic logic gates and medium scale integration (MSI) technology such as Adders, Subtractors, Comparator, 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 LTSpice/Quartus/Pspice.. 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

LAB SAFETY:

Student Laboratory Safety Training is included in LMS system (D2L) in collaboration with Banner for the automatic assignment, tracking, communication and record of completion of all students enrolled in an identified lab and/or corequisite course. Students registered on this course **must complete all required lab safety training** prior to the 1st lab. Once completed, Lab Safety Training is valid for the remainder of the same academic year (i.e., through the following August) and must be completed anew in subsequent years. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in any lab activities, including those for which a grade is assigned. For further information, contact the office of Environmental Health and Safety at EHS@etamu.edu

GRADING POLICY:

Midterm-Exam + Final Exam	(15+20)%
Quizzes	10%
Assignments/HW/Class-Exercises	15%
Attendance and Participation	10%
Lab: Reports/Quizzes/HW	15%
Project	15%
Total	100%

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

Note: this grading policy may be modified during the course by the instructor at any time.

SYLLABUS OUTLINE:

Week	Lecture Topics	Descriptions	Laboratory Sessions
1	Introduction, Number Systems / Arithmetic operation	Number systems (binary, octal, hexadecimal), conversions, arithmetic (addition, subtraction, 2's complement), arithmetic (multiplication, division), floating-point.	L1: Lab safety training and Introduction to lab software and equipment's
2			L2: Digital Circuits Simulation using Quartus software
3	Logic gates and Boolean expressions	Truth tables and basic gates. Max-terms and Min-terms. Introduction to Verilog/VHDL.	L3: Logic gates and circuits using Digital Logic Trainer
4	Simplification of Boolean expression	Boolean Algebra and Karnaugh maps	L4: Logic Circuits: Simulation and Testing using DE10-Lite FPGA board
5			L5: Simplification of Logic Circuit: Simulation and Testing using Digital Logic Trainer
6			L6: Minimum-cost Circuit Design: Simulation and Test using DE10-Lite FPGA board
7	MSI Devices	Multiplexers, decoders, encoders, etc.	No Lab
Midterm exam in Week 7			
8	MSI Devices	Combinational logic design word problems	L7: Adder-Subtractor Circuits: Simulation and Testing using DE10-Lite FPGA board
9	Combinational Logic Circuits	Introduction to sequential logic and flip-flops	Project selection
10	Sequential Logic Design Basics of Sequential Logic	Sequential logic design word problems	L8: Basic Counter Circuits: Simulation and Testing Using and DE10-Lite FPGA board
11			
12	Counter Design	Counters	Project work
13	Introduction to PLC	Programming logic controllers	Project work
14	Applications and Review		Project work
15	Project Presentation		
	Final exam		

Note: the instructor may modify, add, or delete any topics anytime during the course. The instructor reserves the right to modify the syllabus during the semester at any time.

INSTRUCTIONAL METHODOLOGIES:

Individual Submissions: All submissions (labs, homework, quizzes, etc.) are to be done individually unless otherwise stated explicitly in the instructions. You may *discuss* a problem with your classmates or complete lab work in a group.

Late Submissions: Submissions are due by the due date posted on Brightspace or announced in class. You will lose 10% if the submission is a day late, 20% if it is 2 days late, and a grade of 0 if turned in 3 or more days after the due date.

Participation and Assistance: Participation is strongly encouraged. Please ask questions in the class, email, or stop by my office if you need help. I have posted Office Hours, however, if these times do not work for you can set up an appointment. Feel free to stop by my office to see if I am there to ask questions at any time; if I am available at that time, I will help you.

Exams: The exams will be closed book & closed notes unless otherwise specified. Students may bring a scientific calculator. The use of a personal phone, smart watch/glass and earpieces are prohibited during exams. A makeup exam may be offered but an official permit for absence that fulfills University procedures may be required by the instructor.

Make-up Assessments: Generally, make-up assessments (labs, quizzes, and exams) are not given without a valid documented excuse. Make-up assessments should be done within a week of the missed assessment (if possible), contact me as early as possible to set up a date/time. Make-up assessments are not guaranteed to be given.

Academic Honesty and Accountability: the first incident of academic misconduct will result in a 0 in the assessment; any further offenses may result in a unexpected grade. Incidents will be reported to the department chair. Academic dishonesty includes but is not limited to cheating, prohibited collaboration, coercion, inventing false information or citations, plagiarism, tampering with computers, destroying other people's coursework or lab or studio property, theft of course materials, posting coursework/course materials to websites, or other academic misconduct. If you have any questions, contact your professor before submitting an assignment for evaluation.

Use of Artificial Intelligence (AI) Tools: Any use of AI-tools, Chat-Bots, etc. must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

ATTENDANCE POLICY AND DRESS CODE

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%	50%

Shoes & Attire: This course requires laboratory work, and thus suitable attire will be required to minimize the risk of injury. Hoodies should not be worn over the head during the lab, nor should blue tooth and similar devices be worn in the ears during the lab.

ADD/DROP:

Students should check the academic calendar to confirm the add/drop deadline. Dropping and/or adding courses are done online. Courses dropped in this period are removed from the student's record. If a student has registered for a course and subsequently withdraws or receives a failing grade in its prerequisite, **then the student must drop that course**. In some cases, the student will be dropped from that course by the Registrar. However, it is the student's responsibility to make sure that he or she meets the course prerequisites and to drop a course if the student has not completed the prerequisite. The student must see his or her academic advisor or academic department chair for schedule revision and to discuss the impact of the failed or withdrawn course on the student's degree status.

ACADEMIC SUPPORT:

Please visit: <https://www.etamu.edu/trio-programs/student-support-services/>

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). Below are 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

ACCESS to LMS AND NAVIGATION:

Students require a 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 tel 903.468.6000 or helpdesk@tamuc.edu.

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner.

TECHNICAL SUPPORT:

Students with technical difficulty with any part of Brightspace LMS, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

ETAMU POLICIES FOR STUDENT CONDUCT, ACADEMIC INTEGRITY

The Code of Student Conduct is described in detail in the Student Guidebook.

<http://www.tamuc.edu/Admissions/oneStopShop/undergraduateAdmissions/studentGuidebook.aspx>

For more information about the ETAMU attendance policy please visit:

- <http://www.tamuc.edu/admissions/registrar/generalInformation/attendance.aspx>
- <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/academic/13.99.99.R0.01.pdf>

ETAMU definition of academic dishonesty:

- <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/documents/13.99.99.R0.03UndergraduateStudentAcademicDishonestyForm.pdf>
- <http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/13students/undergraduates/13.99.99.R0.03UndergraduateAcademicDishonesty.pdf>

ETAMU ADA STATEMENTS (students with disabilities)

Office of Student Disability Resources and Services

Texas A&M University-Commerce

Velma K. Waters Library Rm 162

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

Fax (903) 468-8148

Email: studentdisabilityservices@tamuc.edu

Website: Office of Student Disability Resources and Services

<http://www.tamuc.edu/campusLife/campusServices/studentDisabilityResourcesAndServices/>

ETAMU CONCEALED CARRY STATEMENTS)

Please refer to the Carrying Concealed Handguns on ETAMU Campus document and/or consult your event organizer.

<http://www.tamuc.edu/aboutUs/policiesProceduresStandardsStatements/rulesProcedures/34SafetyOfEmployeesAndStudents/34.06.02.R1.pdf>