



Instructor:	Mrs. Jane Moorhead Email: jnm15@msstate.edu
Office Hours:	Wednesdays 2:30-3:30pm in Simrall 304 Simrall 304 and WebEx
Lecture Time:	Lecture MWF 8-8:50am (Section 01) or MWF 10:00-10:50am (Section 02)
Lab Time:	Starkville campus - lab time is assigned based on the enrolled lab section in Simrall 308.
Prerequisites:	N/A
Corequisites:	Credit or registration in CSE 1213, CSE 1233, or CSE 1284
Textbook:	Digital Design at learn.zybooks.com (see details in zybook section of syllabus)
Software:	Intel Quartus Prime Lite latest version (23.1.1) (installed in Lab 0) Questa Simulation Software (installed in Lab 0)
Hardware:	Parts distributed in lab for Starkville on campus students; distance students will receive parts list when they register for the course. (will need parts for 1st week of course). Kits include Breadboard, Wiring Kit, Discrete Components Parts Kit, Intel DE10-Lite Development Board, PMOD cables and PMOD headers. Online students will also need an Analog Discovery III (will be used toward middle of semester).
Website:	canvas.msstate.edu

Course Description and Objectives

(Prerequisite: Credit or registration in CSE 1213, CSE 1233, or CSE 1284). Three hours lecture. Three hours laboratory. Binary codes, Boolean algebra, combinational logic design, flip-flops, counters, synchronous sequential logic, finite state machines, RTL system design, programmable logic devices.

After successfully completing this course, the students will be able to:

- i. Explain and apply the concepts of binary and hexadecimal number representations, and conversions between decimal, binary and hexadecimal.
- ii. Explain and apply binary codes for numbers and characters and implement binary and hex arithmetic for signed and unsigned representations.
- iii. Demonstrate proficiency in designing combinational and sequential logic circuits using CAD tools.
- iv. Apply basic skills for building working combinational and sequential logic circuits on breadboards using discrete components, and computer-based digital design techniques to program devices on a development board.
- v. Demonstrate an understanding and usage of finite state machines implemented as controllers, data path components and processors.



LECTURE TOPICS (45 contact hours)

- I. Introduction to Digital and Analog representations (1 hour)
- II. Number Systems (2 hours)
 - a. Binary
 - b. Hexadecimal
 - c. Decimal
 - d. Conversions
 - e. Addition
- III. Codes (4 hours)
 - a. Unsigned Binary
 - b. Signed 2s Complement
 - c. Fixed-Precision Range
 - d. Overflow
 - e. Character Codes (ASCII/Unicode)
 - f. Examples of Audio, Image/Video
 - g. Arrays
 - h. Records
 - i. Compression
 - j. Floating Point
- IV. Basic Electronics (2 hours)
 - a. Ohm's law
 - b. Introduction to CMOS Transistors (2 hours)
 - c. Wiring and Breadboards
 - d. Discrete Integrated Circuits
- V. Boolean Algebra (2 hours)
 - a. Gates
 - b. Theorems
- VI. Representations of Functions (2 hours)
 - a. Truth Tables
 - b. Equations/Simplified Equations
 - c. Circuits
 - d. Timing Diagrams
- VII. Function Representation Conversions, Simplification Methods (2 hours)
 - a. Boolean Algebra, K-maps)
 - b. Implementation using more complex integrated Circuits (Muxes, Decoders, Adders, ALU)
- VIII. Combinational Logic Design Process Implementation on breadboard or FPGA development board) Intel DE0-CV FPGA Development Board (2 hours)
 - a. Introduction to VHDL
 - b. Verilog
- IX. Data Storage Techniques (2 hours)
 - a. Latches/FF
 - b. Registers/Cache



- c. Memory Architectures
- X. Sequential Function Logic Design (2 hours)
 - a. Finite State Machines
 - b. Design
- XI. Controller Design (FSM implementation process) (2 hours)
- XII. Sequential Datapath Components (Registers, Counters, Shift/Multifunction Registers, (S/D)RAM, ROM, Register Files) (2 hours)
- XIII. Register Transfer Logic (RTL)- HLSM Design/Implementation Process Datapath Control, Timing Constraints, Datapath Components (2 hours)
- XIV. Testing and course evaluation (3 hours)

LABORATORY TOPICS (30 contact hours)

1. Binary and hexadecimal number representations, conversions, codes arithmetic. (3 hours)
2. Building blocks of hardware - transistors, basic logic gates (3 hours)
3. Boolean algebra logic, operations, gates, representations of functions (3 hours)
4. Digital logic controllers from finite state machine models (3 hours)
5. Simulation tools, programming, and debugging used for digital design (3 hours)
6. Minimization techniques used for combinational logic design - KMaps (3 hours)
7. Hands-on skill development, prototyping, debugging (3 hours)
8. Basic memory devices and circuits (3 hours)
9. Clocking basics for circuit synchronization, asynchronous inputs (3 hours)
10. Multi-bit component design and data path design (3 hours)



Methods of Evaluation and Standards of Achievement

Your grade will be calculated using the following breakdown of assignments and scale.

Grade Composition		Grading Scale	
Assignment Type	Percentage	Grade	Average
Tests	25%	A	90.0-100
Laboratory	25%	B	80.0-89.9
Final Exam	20%	C	70.0-79.9
Homework, Quizzes	20%	D	60.0-69.9
Attendance	5%	F	<60.0
Project	5%		

Final Exam time and location

The final exam will be administered according to the University exam schedule for Fall 2024.

The final exam for Section 1 will be on Tuesday, 12/7 from 8-11am.

The final exam for Section 2 will be on Wednesday, 12/8 from 12-3pm.

University Policies

The Mississippi State University Syllabus contains all policies and procedures that are applicable to every course on campus and online. The policies in the University Syllabus describes the official policies of the University and will take precedence over those found elsewhere. It is the student's responsibility to read and be familiar with every policy. The University Syllabus may be accessed at any time on the Provost website under Faculty and Student Resources and at <https://www.provost.msstate.edu/faculty-student-resources/university-syllabus>



ECE 3714 COURSE POLICIES

Course Grading Policies

Instructor-provided class materials are the only resources allowed while taking quizzes. **All quizzes, homework, and laboratory assignments, and exams are INDIVIDUAL assignments.** If you share quiz questions, copy another student's work, or allow another student to copy your work, then you are guilty of academic dishonesty.

A programmable calculator is not allowed for test 1. The term "programmable" includes any calculator capable of storing a sequence of keystrokes that can be retrieved after the calculator is turned off or powers itself off. For later tests, calculators will be allowed as directed by the instructor.

You may use a calculator, lecture notes, lecture videos, and other instructor-provided material when taking quizzes. **No other outside resources are allowed.** Resources such as Chegg or any other unauthorized resource used during the completion of a quiz or homework is considered a violation of the Mississippi State University Honor Code.

Preparation, self-regulated learning, and participation are expected and required throughout the semester. These skills are demonstrated through attendance in lecture, consistent log ins to the Canvas site, frequent email reading and responding, viewing course videos, and/or timely submission of assignments.

Due dates matter. The rule in ECE 3714 is that assignments must be turned in on the due date by the time specified. Assignments typically close at the due date and time, and no late assignments will be accepted unless specifically allowed by the instructor.

On occasion and with prior announcement, your instructor may choose to institute a "soft" deadline for an assignment to encourage you to work on an assignment early, but give you more time if needed. In these exception cases, the assignment will be open past the due date, which means Canvas will accept the assignment and mark it as "late". There are late penalties for the lab report assignments.

Except in cases of an excused absence as defined in Academic Operating policy 12.09 or "soft" deadlines described above, assignments will not be accepted after the due date listed in Canvas and will receive no credit. For excused absences, contact the instructor prior to the absence, if possible, or as soon as possible after the absence if the nature of the absence prevents prior notice. For other unusual emergency situations beyond the student's control (e.g., housing disruption, family emergency), deadline extensions may be requested via email and may be granted solely based on the instructor's discretion.

Assignment Submissions



Submit assignments well before the deadline! Engineering is often more about creating an efficient process than the final product, and engineering education is very similar. ECE3714 is a large class with many assignments. To be efficient, ECE3714 uses the Canvas classroom management system for almost all “classroom transactions”: assignments are made via Canvas, homework assignments are submitted to Canvas, quizzes are administered and graded by Canvas, etc. It is impractical or impossible to adjust student submissions or computer-based grading on a student-by-student basis. Therefore, **it is YOUR responsibility to ensure that your submissions are in the right format and have been accepted by the Canvas system before the scheduled deadline.**

Missed quizzes. All quizzes are provided in the online environment and, in most cases, available for multiple days. ***There will be no make-up quizzes offered.*** In cases of true emergency or excused absence, the instructor may temporarily reopen a quiz if the instructor is notified of the emergency within 24 hours of the student’s return to campus, **and** it is reasonably feasible, **and** documentation of the circumstance is produced upon the instructor’s request.

Attendance Policies

Students registered in face-to-face sections are expected to attend all class meetings. Please refer Academic Operating policy 12.09. (<http://www.policies.msstate.edu/policypdfs/1209.pdf>Links to an external site.), regarding attendance expectations and accommodations. Note that official, university-approved and documented absences are not subjected to attendance penalties. It is the student’s responsibility to initiate a request of making up course work in a timely manner. Unless impractical, all communication regarding official, university-approved and documented absences and make-up work should take place prior to the absence. Students are responsible for all material covered during class and any in-class announcements.

Attendance Policy for distance instruction

Distance students are expected to “attend” every class meeting by watching assigned lecture videos and reading assigned material. Both lecture and lab meetings are asynchronous, which means you can “attend” (e.g., watch videos) at a time convenient for your weekly schedule. However, you must attend class and turn in assignments according to the weekly class schedule and assignment due dates.

AI Policy: Permitted for Select Assignments in this Course with Attribution

Generally, students are **NOT** permitted to use generative AI tools such as ChatGPT for assignments except those authorized specifically by their instructor in the assignment directions. The unauthorized use of a generative AI tool to complete an assignment constitutes academic dishonesty and may be reported as an



Honor Code violation. All submitted work will be filtered through Turnitin's AI writing detection tool, and other screeners may also be used.

For assignments in which generative AI has been explicitly permitted by your instructor, students must give credit and cite any AI-generated material according to citation-specific rules (e.g., IEEE style), including in-text citations, quotations, and references. Any work with more than the allowable percentage of AI-generated material specified in the assignment instructions, if applicable, could be reported as an Honor Code violation. Students must also include the following statement in assignments to indicate use of a generative AI tool: "The author(s) acknowledges the use of [Tool Name] in the preparation of this assignment for [brainstorming, grammatical correction, citation, etc.]." Failure to acknowledge use of generative AI could be reported as an Honor Code violation.

Expectations for the Classroom and Communication

The following policies for course communication apply for **ALL students**:

- You are required to check your MSU email account regularly. This is considered an official means of communication by MSU for distance education students.
- The course materials will be accessed through Canvas.
- All class announcements will be posted on the Canvas website.
- Assignment submissions will utilize Canvas unless otherwise specified by the instructor.
- You are required to have access to a computer that connects to the internet.
- Students should direct correspondence to the instructor directly related to the class via the mail feature in Canvas.
- Students should not discuss specific exam questions.
- Students are encouraged to discuss homework together in a group, but the assignment should be completed individually.

The following policies for course communication apply to **students enrolled in ECE3714 Online**:

- Faculty office hours will be hosted in WebEx. Students can join using a computer or smartphone app.
- Students can correspond with each other via the general course discussion board. Please note that collaboration on individual assignments is not acceptable.
- Students should expect to log in to Canvas no less than 3 times per week to access course information, lectures, and updates.

Minimum Technology Requirements

The following minimum technology requirements are necessary **for all students** to complete the course:

- Computer with web browser, Microsoft Office, and Adobe Reader
- Internet access
- Webcam and microphone (computer or smartphone) to upload video responses to assignments or participate in virtual meetings / office hours.
- Video recording and editing software (Camtasia is available for free download from MSU ITS).



Quizzes are administered online via Canvas. **Ensure you have adequate internet access and power for your computer BEFORE you begin the quiz.** You will only be able to start the quiz one time. There are no time extensions available.

Technical Assistance

If you have questions about this course, please contact the instructor via Canvas messaging. For technical support (e.g., computer support, Canvas issues), please contact help@ece.msstate.edu or enr-dist-support@lists.msstated.edu or www.bagley.msstate.edu/distance.

Copyright

Copyrighted materials within the course are only for the use of students enrolled in the course for purposes associated with this course and may not be retained or further disseminated. Course materials must not be posted on any website or added to any database without the instructor's written permission. Do not distribute test problems, homework, or any other materials. Do not post course materials on websites such as chegg.com, slader.com, etc. Violations of this policy will be referred to the Honor Court.



Labs and Lab Reports

Labs and lab reports are an essential part of the course. The laboratory portion of the course will count for 25% of the final grade. Absence from the labs or failing to submit the lab report on time are highly discouraged. Failure to complete the lab (this includes turning in the lab reports) will result in a zero for the lab missed.

Labs will be performed every week. **You are expected to submit the lab report every week as we progress through the course material.** It is your responsibility to keep track of lab reports and their due dates on Canvas.

Lab report requirements are specified in the instructions for each major lab and can include items such as in-lab checkoffs, photos of circuitry, and simulation tool output. Lab reports will be submitted through Canvas. Labs will be graded based on task completion and task correctness. However, you will receive zero credit for merely writing down the correct answer. To receive credit, you must clearly document the processes you used in the lab experiment and the methods you used to obtain data values.

Each lab assignment will have a rubric posted that corresponds to the specific tasks and requirements of the lab assignment. For example, in lab 5, you will receive points for your code compiling, a screen shot that demonstrates the final values of the executed source code, answers to the lab reflection questions, and answers about the assigned lab concepts. BEFORE you begin lab each week, you are encouraged to view each rubric to understand how each lab will be graded.

Note: You may need to complete a few prelab activities before the beginning of each lab. These prelab activities may be checked-off at the start of lab, with the check-offs counting towards your final lab grade that week. Thus, if you do not complete prelab, you may lose points.

There will be a penalty for late lab reports submission. Refer to the Canvas lab course for lab details.
