



- Instructors:** Jane Moorhead
Email: janem@ece.msstate.edu
Office: Simrall 304
- Office Hours:** Wednesday 2:30-3:30PM
In-person in Simrall or WebEx
- Lecture Time:** Lecture MW 1:00 PM –1:50 PM, Rula 2030
- Lab Times:** Face-to-face lab time will be assigned based on the enrolled lab section
- Prerequisites:** Grade of C or better in ECE 3724
- Corequisites:** Credit or registration in ECE 3424
- Textbook:** None required.
Recommended: FPGA Prototyping By SystemVerilog Examples, by Pong P. Chu
ZyBooks: 4743 Digital Design
Runestone: ebook
- Hardware:** Digilent Basys-3 Development Board (must be purchased before lab 1)
Available from Digilentinc.com Get an academic discount.
- Website:** canvas.msstate.edu
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Course Description and Objectives

(Prerequisites: Grade of C or better in ECE 3724. Credit or registration in ECE 3424). Two hours lecture. Three hours laboratory. Hierarchical digital design using available design software. Computer aided design workstations will be used to give students access to state-of-the-art design techniques

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

1. Design/debug/test a complex digital system using the Verilog Hardware Description language (3.1, 3.6).
 2. Create designs using the Xilinx Vivado tool suite (3.7)
 3. Discuss the features of different FPGA families and their tradeoffs (3.6).
 4. Design a simple microcontroller peripheral such as timer, UART, I2C, or SPI module (3.2).
 5. Discuss the tradeoffs involved in different high-speed serial I/O technologies (3.6).
 6. Write a Verilog testbench for exercising a Verilog design (3.6).
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Methods of Evaluation and Standards of Achievement

Types of graded assignments include:



- (a) **Tests** – tests will be given during the semester after completion of each major topic. The test dates will be distributed on the first day of class with any changes announced with a minimum of one-week notice. Students may prepare one 8.5x11-inch equation note sheet.
- (b) **Final Exam** – an in-person final, comprehensive exam will be administered according to the university schedule for face-to-face students. For distance students, the exam will be available online with a 72-hour window of time to complete a 3-hour timed exam.
- (c) **Homework** – assigned continuously throughout the semester.
- (d) **Lab** – There will be several lab assignments. A template will be provided for each lab report. Students have 1 week to complete the lab work and submit the lab report. For lab assignments, each 24-hour period after the due date is 15 points off (so, no credit after 1 week late). Lab submissions more than 1 week late will not be accepted.
- (e) **Project**: Each student will implement a project on the development board.
- (f) **Class Participation** – attendance in class and participation in lab is compulsory. Please refer to attendance policy in this syllabus for more information about how attendance and participation is measured for face-to-face and distance students.

Grade Composition		Grading Scale	
Assignment Type	Percentage	Grade	Average
Tests	30%	A	90.0-100
Final Exam	20%	B	80.0-89.9
Laboratory	30%	C	70.0-79.9
Homework	5%	D	60.0-69.9
Class Participation	5%		
Project	10%		

The final exam (final quiz and final course assignment) will be administered according to the University exam schedule **on Thursday, December 12th, from 3:30PM to 630PM.**

LECTURE TOPICS (30 contact hours)

- I. Combinational logic in Verilog
- II. Implementation technologies; synthesis errors
- III. Fixed-point and saturating arithmetic
- IV. Sequential logic introduction
- V. Pipelining
- VI. Datapath design
- VII. Timers
- VIII. Memories
- IX. Serial interfaces

- X. High-level synthesis

LAB TOPICS (30 contact hours)

1. FPGA introduction
2. Debugging methodology
3. Saturating addition
4. Combinational datapaths
5. Pipelined datapaths
6. Datapath with control
7. Timer
8. FIFO
9. I2C TX module

Expectations for the Classroom and Communication

The following policies for course communication apply to **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.
- Email to the instructor must be sent from your official MSU email account (@msstate.edu).

The following policies for course communication apply to **students enrolled in the Distance section**:

- Faculty office hours will be hosted using WebEX or in person. For WebEx session, students can join using a computer or smartphone app.
- Students should expect to log in to Canvas no less than 3 times per week to access course information, lectures, and updates. Students **must** log in to Canvas within 24 hours after the face-to-face lecture to complete any unannounced quizzes that may have been posted.
- Please send an email for a phone or online appointment.

Grading Policies



Instructor-provided class materials are the only resources allowed while taking quizzes. **All quizzes, homework, 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.**

Students shall not bring or have any computing equipment in the exam, including programmable calculators, mobile phones, books, dictionaries, electronic organizers, notes or paper, and other materials as shall be authorized by the professor.

Students can use **one** formula sheet while completing exams.

Graduate Student Policy (Does not apply for Fall 2024 – no graduate students enrolled)

Graduate students will either have a research project and/or paper, extra work on selected labs, an extra lab assignment, or extra test questions. This additional assignment is 10% of the final grade; tests for graduate students are 30% of the final grade.

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

Distance students will also need:

- Webcam and microphone (computer or smartphone) to upload video responses to assignments or participate in virtual lab meetings / office hours.
- Video recording and editing software (Camtasia is available to download free from MSU ITS)

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.msstate.edu or www.bagley.msstate.edu/distance.

Laboratory Policies

Course materials for the lab meetings will be found at Canvas. Students are responsible for printing out/bringing a laptop, reading and understanding the materials for the respective experiments before the laboratory meeting.

You will need a Basys-3 board from Digilent Inc. and Xilinx development software to complete the labs. All lab work is done on your personal PC. The version of the Xilinx development software that we are using is Xilinx Vivado ML (the latest version) that can be downloaded from <https://www.xilinx.com/support/download.html>.



You are expected to have a working PC. A PC failure or loss of data (use the cloud!) is not accepted as valid excuses for late labs. The PC-based software is easy to install on any PC, and so if you have a backup of your data, you should be able to use some temporary PC to complete a lab until you can repair your own PC.

Attendance Policy for face-to-face instruction

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.

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.

UNIVERSITY POLICIES

MSU Syllabus via Canvas

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 describe 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>



MISSISSIPPI STATE UNIVERSITY™
— JAMES WORTH —
BAGLEY
COLLEGE OF ENGINEERING

Department of Electrical and Computer Engineering

ECE 4743 – Digital System Design
Syllabus- Starkville Campus