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**Instructors:**

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Office Hours:	Right after class	Wednesdays 6:30-9:20 pm
Office:	Simrall 337	

Notes on Office Hours: We want to meet with you! Please feel free to contact us in class or via email for arranging alternative meetings or discussions using digital technology.

**Lecture Time:** Tuesdays and Thursdays, 12:30-1:45 pm in 304 Walker

**Lab Times:** Starkville campus - lab time is assigned based on the enrolled lab section in 329 Simrall

**Prerequisites:** Grade of C or better in ECE 3724 and in one of the following: ECE 3424 or ECE 3244 or CSE 4153 or ECE 4833.

**Corequisites:** N/A

**Textbook:** No required textbook  
Recommended Texts:

- Reese, Bruce, and Jones, Microcontrollers: From Assembly Language to C Using the PIC24 Family, Charles River/Cengage Learning, 2008. ISBN-13: 978-1584505839
- J. Ganssle, The Art of Designing Embedded Systems 2/e, Newnes, 2008. ISBN-13: 978-0750686440

**Software:** The software will be introduced in or before the first laboratory session

**Hardware:** Starkville campus students: The hardware will be provided to in the first laboratory session.  
Distance campus student: Please reach out to the instructor at the beginning of the semester.

**Website:** [canvas.msstate.edu](http://canvas.msstate.edu)

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**Course Description and Objectives**

(Prerequisites: Grade of C or better in ECE 3724 and in one of the following: ECE 3424 or ECE 3244 or CSE 4153 or ECE 4833). Three hours lecture. Three hours laboratory. Advanced topics in embedded systems design using contemporary practice

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



- i. Design and prototype multitasking embedded systems
- ii. Integrate embedded microprocessor into a design via industry-standard communications protocols
- iii. Explain the issues confronting designers of systems using multiple power supply voltages and low-power requirements
- iv. Follow a progressive design specification while operating in a design team
- v. Explain the benefits of coding conventions, hardware and software design reviews, and software metrics
- vi. Identify and evaluate the hardware-software design options and tradeoffs for interfacing microcontrollers with peripherals, including data converters, sensors, LEDs, LCDs, switches, and keypads, in such a way to meet the design requirements with realistic constraints

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#### **LECTURE TOPICS (45 contact hours)**

- Introduction to embedded systems: applications, devices, and design tradeoffs (1 hour)
- Software development processes, multitasking software development, and operating systems for embedded systems (5 hours)
- Hardware interfacing of embedded microcontrollers to LEDs, motors, signal indicators, sensors, displays, switches, keyboards and other microprocessors (6 hours)
- Interrupts, interrupt service routines, interrupt serviceability, timers (3 hours)
- Asynchronous and synchronous I/O including serial, RS-232, SPI, I2C, and CAN (5 hours)
- Analog-to-digital and digital-to-analog and conversion, architectures, analog interfacing, and number representations (5 hours)
- Low-power system design and total system design and analysis (2 hours)
- Failure Mode and Effects Analysis (2 hours)
- Dissection of embedded consumer electronics (8 hours)
- Testing and course evaluation (8 hours)

#### **LABORATORY TOPICS (30 contact hours)**

1. Introduction to Embedded Systems Development Framework (3 hours)
2. C Program (3 hours)
3. Timer Device Driver (3 hours)
4. Serial Communication (3 hours)
5. Universal Serial Bus (3 hours)
6. Liquid Cristal Displays (3 hours)
7. Operating Systems (3 hours)
8. GNU Radio Introduction (3 hours)
9. GNU Radio Receiver (3 hours)
10. Recovery Session (3 hours)

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#### **Methods of Evaluation and Standards of Achievement**



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

Progress Exams	20%	A = 90 – 100%
Laboratory/Homework	25%	B = 80 – 90%
Dissection	20%	C = 70 – 80 %
Professionalism/class & team participation	10%	D = 60 – 70 %
Final Exam	25%	F = 0 – 60 %

According to the University exam schedule for Spring 2024, the final exam time for ECE 4724/6724 is **Tuesday May 7<sup>th</sup> from 3-6pm.**

Grades are not curved in this course. Your performance depends on how well you do, not on how everyone else does. The final exam is mandatory.

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### 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 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>



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## ECE 4724/6724 COURSE POLICIES

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### Exams

There will be progress exams and a comprehensive final exam. Use of prohibited materials or assistance during an exam will be considered a violation of the MSU Honor Code. See Section 2.2.6 in this syllabus.

### Missed Exams

If you miss a progress exam with a certified medical excuse or prior instructor approval, the grade computation will be adjusted. If you miss a progress exam without a valid excuse, you will earn a zero (0) grade on the progress exam. The final exam may not be missed except for the most extreme circumstances and must be approved by the university.

### Laboratory

The ECE4724/6724 laboratory (lab) is where most of the learning occurs, therefore it is imperative that you come prepared.

The laboratory TA will provide additional details about the lab organization during your first lab meeting. Labs will start meeting the second week of the course. If you fail to hand in two or more labs you will be assigned an F for the course laboratory grade regardless of your average. All labs will meet in Simrall 329<sup>1</sup>, unless otherwise announced. All labs will involve approximately 30 minutes of lecture before starting, so BE ON TIME! Unless otherwise noted, labs will be due at the beginning of your assigned lab period one week after the lab was performed.

Lab assignments are assigned for development during the lab sessions and need to be completed by the established deadline. Deadlines are enforced and late submissions will be penalized according to the following policy: 5% reduction of the grade every 6 hours. Submissions that are delayed by more than 48 hours after the deadline cannot be accepted, unless there is an emergency situation that is justified according to the university policy and approved by the TA. Lab submissions should be turned in by the start of next week's lab. Late timing will start to count starting from the next week's lab start time

### Dissection

Each person must perform a dissection and prepare a dissection report as specified in the dissection assignment. Your selected dissection device must be proposed to the instructor and approval granted before beginning the dissection. Each student's device must be unique, and a device that has not been dissected in previous semesters. See the class website for dissections from previous classes.

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<sup>1</sup>Your MSU ID card will provide access to the lab. Feel free to use the lab anytime. However, this room may also be used by other classes. If a lab section is scheduled, then those students have priority, and you will have to wait for their lab period to end.  
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### Mississippi State University Honor Code

I have no tolerance for academic dishonesty in any form, and neither does Mississippi State University. I will refer all academic dishonesty incidents to the MSU Honor Council as violations of the MSU Honor Code:

“As a Mississippi State University student, I will conduct myself with honor and integrity at all times. I will not lie, cheat, or steal, nor will I accept the actions of those who do.”

The MSU Honor Code specifies a first offense penalty of an “XF” grade for the course and academic probation. The MSU Honor Council also has the right to suspend a student for first offense. (Suspension is the minimum sanction for second offenses.) Failing grades earned due to violation of the MSU Honor Code cannot be forgiven via the Academic Forgiveness Policy. For more information on your obligations under the MSU Honor code, please visit <https://www.honorcode.msstate.edu/policy/>.

### Teaming

Engineers rarely work alone. Your teaming skills (along with your communication skills) are often the most important skill a future employer wants from you. This class will require that you work in an engineering design team.

All students will be asked to submit evaluations of how well they and their teammates perform as team members. These evaluations are used in assigning your individual scores. Malfunctioning teams must attempt to work out any problems themselves before approaching the TA or instructor. If repeated attempts to improve team function (including instructor intervention) fail, team assignments may be adjusted or labs may be assigned individually.

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### Attendance Policies

Please refer to 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.

### 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



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“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.

Further, once the design project is underway, you and your team will be required to meet once per a week with your course TA and/or instructors for a 30-minute team meeting. We will base the meeting time of team member and TA availability. Your team will also need to plan regular team meetings to communicate about the group project.

Course material will post by Monday and be due the following Monday.

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### **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.

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### **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](mailto:help@ece.msstate.edu) or [enr-dist-support@lists.msstate.edu](mailto:enr-dist-support@lists.msstate.edu) or [www.bagley.msstate.edu/distance](http://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.

## Tentative Schedule

Embedded Systems classes begin on Tuesday, January 16. There will be two progress exams, a mandatory final exam, and a dissection assignment—all individual assignments. The tentative schedule is provided below.

The laboratory schedule and logistics are provided separately.

Please keep yourself updated by listening to announcements and visiting the class canvas site and noting the assignments for each week.

Table I – Semester schedule\*.

Date	Time	Event
August 21		Classes begin
<b>August 22</b>	<b>12:30 am</b>	<b>ECE 4724/6724 lectures begin</b>
August 27	11:59 pm	Deadline to drop a course without a grade
August 28	5:00 pm	Deadline for registration or to add a course
<b>September 4</b>	<b>5:00 pm</b>	<b>Dissection proposals due in Canvas</b>
<b>September 17</b>	<b>12:30 am</b>	<b>Progress Exam #1</b>
October 2	11:59 pm	First progress grades
October 10-11		Fall break - no classes scheduled (subject to change)
October 14	5:00	Last day to drop a course with a W grade
<b>October 22</b>	<b>12:30 am</b>	<b>Progress Exam #2</b>
October 25	11:59 pm	Second progress grades
November 15		Last day to withdraw from the semester
<b>April 16</b>	<b>5:00 pm</b>	<b>Dissection journals due</b>
November 27-29		Thanksgiving Holiday – no classes scheduled
December 3		Classes end
December 4		Reading day
<b>December 10</b>	<b>12 - 3 pm</b>	<b>Final Exam</b>

\* Subject to change.