



**MCCOY SCHOOL OF ENGINEERING**  
**Course Syllabus: Fall 2026**

## **EENG 4124: Embedded and Real-time Systems**

### **Contact Information**

Instructor: Dr. Shahed Enamul Quadir

Office: Martin Hall 110

**Course & Lab Schedule:** *M/W/F: 10 am – 10:50 am and Lab: Th: 1:30 pm - 3:20 pm*

**Office hours:** *M: 2:00–4:00 PM; T: 1:00–3:00 PM; Th: 3:30–4:30 PM*

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### **Course Description**

This course introduces the fundamental concepts of embedded systems design using microcontroller-based systems. Topics include computer architecture, assembly language programming, data movement and manipulation, program flow control, digital input/output interfacing, timers, interrupts, and basic embedded software development. Laboratory activities provide hands-on experience in designing, implementing, and testing embedded applications using microcontroller hardware and software tools.

### **Course Pre-Requisites**

EENG/MENG 2204: Electronics

### **Other Prerequisites**

Basic computer skills

### **Textbook & Instructional Materials**

Embedded Systems Design, 2nd Edition, Brock J. LaMeres.

### **Student Handbook**

Refer to: [Student Handbook](#)

## List Of Topics Covered

|                                                                                       |                                                                                          |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Introduction to Embedded Systems</li></ul>    | <ul style="list-style-type: none"><li>• Program Flow Control</li></ul>                   |
| <ul style="list-style-type: none"><li>• Computer Architecture Fundamentals</li></ul>  | <ul style="list-style-type: none"><li>• Digital Input/Output Interfacing</li></ul>       |
| <ul style="list-style-type: none"><li>• MSP430 Microcontroller Architecture</li></ul> | <ul style="list-style-type: none"><li>• Timers</li></ul>                                 |
| <ul style="list-style-type: none"><li>• Assembly Language Programming</li></ul>       | <ul style="list-style-type: none"><li>• Stack, Subroutines, and Interrupts</li></ul>     |
| <ul style="list-style-type: none"><li>• Data Movement Instructions</li></ul>          | <ul style="list-style-type: none"><li>• Introduction to Embedded C Programming</li></ul> |
| <ul style="list-style-type: none"><li>• Data Manipulation Instructions</li></ul>      | <ul style="list-style-type: none"><li>• Embedded System Design Applications</li></ul>    |

*Additional material may be covered as time permits.*

## Grading

|                                                 |             |
|-------------------------------------------------|-------------|
| • Homework Assignments:                         | 10%         |
| • Quizzes:                                      | 10%         |
| • Laboratory Assignments:                       | 20%         |
| • Midterm Exam: 15% each                        | 30%         |
| • Final Exam(cumulative):                       | 25%         |
| • Professionalism, Preparation & Participation: | 5%          |
| • <b>Total:</b>                                 | <b>100%</b> |

## Course Organization and Assessment

### Lecture Format

This course meets three times per week for 50 minutes each session. Class time will focus on explaining key concepts, working through examples, and discussing practical problems related to embedded system design and programming. Not all textbook material will be covered in lecture, so students are expected to read assigned sections on their own to reinforce and deepen their understanding. Active participation in class discussions and problem-solving activities is strongly encouraged.

### Homework

Homework assignments will be given regularly throughout the semester to reinforce concepts covered in lecture. Each assignment will include several problems designed to build problem-solving skills and conceptual understanding. All assigned problems should be attempted, even if only selected problems are graded. Homework due dates will be announced in advance, and assignments are typically due about one week after they are assigned. Students are encouraged to keep their homework organized and well documented for future reference and exam preparation.

### Quizzes

Short quizzes will be given periodically throughout the semester to help students stay engaged with the lecture material and monitor their understanding of key

concepts. There will be approximately 3-5 quizzes, consisting of True/False and multiple-choice questions. Quizzes will focus on recently covered topics and are intended to be low-stakes assessments that support learning. Quiz dates and formats will be announced in advance.

### **Exams**

There will be two exams during the semester. The date and time for each exam will be announced at least one week in advance. The exams will not be cumulative; however, the final exam may include selected concepts from earlier material as appropriate. Exam format and coverage will be clearly communicated prior to each exam.

### **Extra Credit**

Extra credit opportunities may be offered at the instructor's discretion and, if provided, will be announced in advance and made available to all students equally. Extra credit is intended to support learning and cannot replace missed major assignments or exams.

### **Late Work**

Late work may be accepted within a reasonable time window with a modest penalty, unless prior arrangements are made or documented circumstances arise. Students are encouraged to communicate early if they anticipate difficulties meeting a deadline.

### **Midterm Progress Report**

In order to help students keep track of their progress toward course objectives, the instructor will provide a Midterm Progress Report for at-risk students through their WebWorld account. Midterm grades will not be reported on the students' transcript; nor will they be calculated in the cumulative GPA. They simply give students an idea of where they stand at the midpoint of the semester. Students with a midterm grade below a C should talk to the professor and seek out tutoring.

### **General Study Guidelines**

Students are expected to spend a few hours outside of class each week reviewing lecture notes, examples, and assigned material. It is strongly recommended to revisit in-class problems before starting homework assignments. Do not wait until the last day to prepare for exams or complete assignments. Students are encouraged to ask questions, attend office hours, and seek help whenever concepts are unclear. Studying with classmates is encouraged.

**Generative AI tools** may be used to help understand concepts, but students are responsible for verifying the correctness of any information. Generative AI should not be used to complete homework, laboratory work, quizzes, or exams unless specifically permitted by the instructor.

## Course Learning Objectives and Assessment Alignment

**Table 1: Course Learning Objectives Aligned with ABET Student Outcomes (1-7).**

| <b>COURSE OBJECTIVES</b>                                                                                                                           | <b>1</b> | <b>2</b> | <b>3</b> | <b>4</b> | <b>5</b> | <b>6</b> | <b>7</b> |
|----------------------------------------------------------------------------------------------------------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|
| Analyze MSP430 architecture and instruction execution                                                                                              | X        |          |          |          |          |          |          |
| Develop assembly-language programs for embedded applications                                                                                       | X        |          |          |          |          |          |          |
| Design digital I/O, timer, and interrupt-based embedded systems                                                                                    | X        |          |          |          |          |          | X        |
| Learn and apply embedded software development tools                                                                                                |          |          |          |          |          |          | X        |
| Implement and test embedded system applications using microcontroller hardware and software tools                                                  | X        |          |          |          |          |          | X        |
| Work effectively in laboratory or project teams                                                                                                    |          |          |          |          | X        |          |          |
| Ability to communicate embedded system concepts, laboratory procedures, and experimental results through oral and written technical communication. |          |          | X        |          |          |          |          |

**Table 2: Summary of ABET Student Outcomes.**

|          |                                                                                                                                                                                                                                              |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1</b> | an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.                                                                                                   |
| <b>2</b> | an ability to apply engineering design to produce solutions that meets specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.                   |
| <b>3</b> | an ability to communicate effectively with a range of audiences.                                                                                                                                                                             |
| <b>4</b> | an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |
| <b>5</b> | an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.                                                  |
| <b>6</b> | an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.                                                                                                 |
| <b>7</b> | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.                                                                                                                                              |

### Professionalism, Preparation & Participation

This portion of the course grade is based on regular attendance, preparation for class by completing assigned readings, active participation in class discussions, programming activities, laboratory exercises, teamwork, respectful classroom behavior, and professional conduct throughout the semester.

## **Conflict Resolution**

- In the event of an issue with the course or the instructor, the student should first contact the instructor. The faculty and the student will discuss the issue. Hopefully, a resolution is reached.
- The student should notify the faculty via email again if the issue still did not get resolved after the first communication.
- If not resolved, the student could then contact the Chair of the McCoy School of Engineering, Dr. Desai, face to face or via email, (raj.desai@msutexas.edu), and discuss the issue. Dr. Desai will discuss the issue at hand with the faculty member. Dr. Desai will discuss the result of this discussion with the student. Hopefully, a resolution is reached on the issue after this step.
- The student should notify the Chair via email if the issue still did not get resolved.
- The Chair will contact the Dean and try to resolve the conflict. In case the conflict deals with the student grade, he will forward the case to the Grade Appeals Committee, if necessary.

## **Academic Misconduct Policy & Procedures**

Academic Dishonesty: Cheating, collusion, and plagiarism (the act of using source material of other persons, either published or unpublished, without following the accepted techniques of crediting, or the submission for credit of work not the individual's to whom credit is given). Additional guidelines on procedures in these matters may be found in the Office of Student Conduct. [Office of Student Conduct](#).

## **Moffett Library**

Moffett Library provides resources and services to support student's studies and assignments, including books, peer-reviewed journals, databases, and multimedia materials accessible both on campus and remotely. The library offers media equipment checkout, reservable study rooms, and research assistance from librarians to help students effectively find, evaluate, and use information. Get started on this [Moffett Library webpage](#) to explore these resources and learn how to best utilize the library.

## **Desire-to-Learn (D2L)**

Extensive use of the MSU D2L program is a part of this course. Each student is expected to be familiar with this program as it provides a primary source of communication regarding assignments, examination materials, and general course information. You can log into [D2L](#) through the MSU Homepage. If you experience difficulties, please contact the technicians listed for the program or contact your instructor.

## **Recording Classes**

***\*Recording classes is generally prohibited without the professor's explicit permission.*** Such recordings, when permitted, are for personal use only and may not be uploaded to the internet or otherwise shared, transmitted, or published without the professor's prior consent. Some faculty may not permit recordings of their classes. When it is feasible and appropriate, students may record classes to accommodate disabilities under the Americans With Disabilities Act, with prior approval of Disability Support Services. Such recordings may not be uploaded to the internet or otherwise shared, transmitted, or published.

## **Refund and Repayment Policy**

A student who withdraws or is administratively withdrawn from Midwestern State University (MSU) may be eligible to receive a refund for all or a portion of the tuition, fees and room/board charges that were paid to MSU for the semester. HOWEVER, if the student received financial aid (federal/state/institutional grants, loans and/or scholarships), all or a portion of the refund may be returned to the financial aid programs. As described below, two formulas (federal and state) exists in determining the amount of the refund. (Examples of each refund calculation will be made available upon request).

## **Emergency Aid Resources for Basic Needs**

Unexpected life circumstances can affect anyone. If you are experiencing challenges meeting basic needs—such as housing, utilities, food, transportation, healthcare, technology, textbooks or other life necessities, resources may be available to help. Visit the [Student Emergency Support and Resources webpage](#) to learn more, and explore emergency support opportunities through MSU and how to access them. For additional information, please contact the Office of Student Affairs: Clark Student Center #108, (940) 397-7500, [student.affairs@mstuexas.edu](mailto:student.affairs@mstuexas.edu).

## **Services for Students with Disabilities**

In accordance with Section 504 of the Federal Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990, Midwestern State University endeavors to make reasonable accommodations to ensure equal opportunity for qualified persons with disabilities to participate in all educational, social, and recreational programs and activities. After notification of acceptance, students requiring accommodations should make application for such assistance through Disability Support Services, located in the Student Wellness Center, (940) 397-4140. Current documentation of a disability will be required in order to provide appropriate services, and each request will be individually reviewed. For more details, please go to Disability Support Services.

## **College Policies**

### Campus Carry Rules/Policies

Refer to: [Campus Carry Rules and Policies](#)

### Smoking/Tobacco Policy

College policy strictly prohibits the use of tobacco products in any building owned or operated by WATC. Adult students may smoke only in the outside designated-smoking areas at each location.

### Alcohol and Drug Policy

To comply with the Drug Free Schools and Communities Act of 1989 and subsequent amendments, students and employees of Midwestern State are informed that strictly enforced policies are in place which prohibits the unlawful possession, use or distribution of any illicit drugs, including alcohol, on university property or as part of any university-sponsored activity. Students and employees are also subject to all applicable legal sanctions under local, state and federal law for any offenses involving illicit drugs on University property or at University-sponsored activities.

### Campus Carry

Effective August 1, 2016, the Campus Carry law (Senate Bill 11) allows those licensed individuals to carry a concealed handgun in buildings on public university campuses, except in locations the University establishes has prohibited. The new Constitutional Carry law does not change this process. Concealed carry still requires a License to Carry permit, and openly carrying handguns is not allowed on college campuses. For more information, visit [Campus Carry](#).

### Active Shooter

The safety and security of our campus is the responsibility of everyone in our community. Each of us has an obligation to be prepared to appropriately respond to threats to our campus, such as an active aggressor. Please review the information provided by MSU Police Department regarding the options and strategies we can all use to stay safe during difficult situations. For more information, visit [MSUReady – Active Shooter](#). Students are encouraged to watch the video entitled “Run. Hide. Fight.” which may be electronically accessed via the University police department’s webpage: ["Run. Hide. Fight."](#)

### Course Schedule:

| <b>Week</b>                                     | <b>Activities / Assignments / Exams</b>                                                                                                               | <b>Due Date</b>                                                                    |
|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| Week 1 (Aug. 24 – Aug. 28)                      | Course introduction and syllabus review; Chapter 1: Introduction to Embedded Systems                                                                  | No major assignment; Obtain textbook; Suggested Reading: Chapter 3                 |
| Week 2 (Aug. 31 – Sept. 4)                      | Chapter 3: Computer Systems — computer overview, hardware, and software; selected Chapter 2 digital logic concepts introduced as needed               | Suggested Reading: Selected Chapter 2 topics and Chapter 4 before next class       |
| Week 3 (Sept. 8 – Sept. 11) (Labor Day Sept. 7) | Chapter 4: MSP430 Architecture — MSP430 hardware and software overview, LaunchPad development kit, documentation; Laboratory activities begin         | Lab activities begin (Tentative – See D2L); Suggested Reading: Chapter 5           |
| Week 4 (Sept. 14 – Sept. 18)                    | Chapter 5: Getting Started Programming the MSP430 in Assembly — assembly program structure, first assembly program, CCS debugger; Homework 1 Assigned | Homework 1 Posted (Tentative – See D2L); Suggested Reading: Chapter 6              |
| Week 5 (Sept. 21 – Sept. 25)                    | Chapter 6: Data Movement Instructions (Part I) — MOV instruction and basic addressing modes; Quiz 1 (Tentative)                                       | Quiz 1 (Tentative – See D2L); Suggested Reading: Continue Chapter 6                |
| Week 6 (Sept. 28 – Oct. 2)                      | Chapter 6: Data Movement Instructions (Part II) — additional addressing modes and programming examples                                                | Homework 1 Due (Tentative – See D2L); Suggested Reading: Continue Chapter 6        |
| Week 7 (Oct. 5 – Oct. 9)                        | Chapter 6: Advanced Addressing Modes and Programming Examples; selected Chapter 2 concepts reviewed as needed; Homework 2 Assigned                    | Homework 2 Posted (Tentative – See D2L); Review Chapters 1, 3–6 for Midterm Exam 1 |
| Week 8 (Oct. 12 – Oct. 16)                      | Review of Chapters 1, 3–6; Midterm Exam 1 (Tentative); Introduction to Chapter 7: Data Manipulation Instructions                                      | Homework 2 Due; Midterm Exam 1 (Tentative – See D2L); Suggested Reading: Chapter 7 |
| Week 9 (Oct. 19 – Oct. 23)                      | Chapter 7: Data Manipulation Instructions (Part I)                                                                                                    | Suggested Reading: Continue Chapter 7                                              |

| <b>Week</b>                                                                          | <b>Activities / Assignments / Exams</b>                                             | <b>Due Date</b>                                                                |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| Week 10 (Oct. 26 – Oct. 30)                                                          | Chapter 7: Data Manipulation Instructions (Part II); Quiz 2 (Tentative)             | Quiz 2 (Tentative – See D2L); Suggested Reading: Chapter 8                     |
| Week 11 (Nov. 2 – Nov. 6)                                                            | Chapter 8: Program Flow Instructions (Part I); Homework 3 Assigned                  | Homework 3 Posted (Tentative – See D2L); Suggested Reading: Continue Chapter 8 |
| Week 12 (Nov. 9 – Nov. 13)                                                           | Chapter 8: Program Flow Instructions (Part II)                                      | Homework 3 Due (Tentative – See D2L); Review Chapters 7–8 for Midterm Exam 2   |
| Week 13 (Nov. 16 – Nov. 20)                                                          | Review of Chapters 7–8; Midterm Exam 2 (Tentative); Begin Chapter 9: Digital I/O    | Midterm Exam 2 (Tentative – See D2L)                                           |
| Week 14 (Nov. 23 – Nov. 27) (Thanksgiving Holidays: Nov. 25–29; Campus open Nov. 25) | Continue Chapter 9: Digital I/O; begin Chapter 10 or 11 if time permits             | No major assignment                                                            |
| Week 15 (Nov. 30 – Dec. 4)                                                           | Chapter 12: Timers; selected Chapter 13 topics (if time permits); Final exam review | No major assignment                                                            |
| Final Exam                                                                           | Comprehensive Final Examination                                                     | According to the University Final Exam Schedule                                |

### **Reading Preparation**

Students are encouraged to complete the suggested textbook reading before each class. These readings are intended to prepare students for lectures, class discussions, programming activities, laboratory exercises (where applicable), and homework assignments.

**Note:** Homework assignments, quizzes, examinations, laboratory activities, chapter coverage, and suggested reading assignments are tentative. Students should refer to D2L for the most current schedule, announcements, assignment details, and due dates.

### **Disclaimer Statement**

Information contained in this syllabus, other than grading, attendance, and late assignment policies, may be subject to change with advance notice, as deemed appropriate by the instructor.

*Prepared by Dr. Shahed Enamul Quadir (Fall 2026)*