



EE 310-01 Digital Systems/Embedded Control

COURSE SYLLABUS: SPRING 2026

INSTRUCTOR INFORMATION

Instructor:	Dr. Sharif, Sheikh
Office Location:	AG/ET #219
Office Hours:	Monday and Wednesday, 10:00-10:40 AM. Tuesday, 2:00-2:30 PM or by appointment
Office Phone:	903-886-5960
Office Fax:	903-886-5960
University Email Address:	Sharif.Sheikh@etamu.edu
Preferred Form of Communication:	Email
Communication Response Time:	within 48 hours (weekdays)

COURSE INFORMATION

Textbook(s): AVR Microcontroller and Embedded Systems: Using Assembly and C, Mazidi, Naimi & Naimi ISBN: 978-0997925968

Lab Manual: Lab Experiments provided by the instructor. Students will use the lab workstations and/or their personal laptops to support programming exercises using the Arduino

Software(s): Microsoft Office, Arduino Integrated Design Environment (free), Tinker CAD (free), Atmel Studio 7 IDE (free), Quartus Prime Lite (free), LABVIEW...

Optional Material(s): AVR program (<https://www.youtube.com/watch?v=9e1wSQnttXY>), AVR Tutorials, codes (<https://www.avrfreaks.net>)...

COURSE DESCRIPTION

This course introduces the hardware and software architecture of the AVR Microcontrollers and its applications. It also includes embedded system types, programming the microcontroller in assembly and C, serial and parallel data transfer, interfacing I/O devices. Practical applications using Arduino and other devices will be developed through Lab exercises and course project design.

Student Learning Outcomes (Should be measurable; observable; use action verbs)

1. Recognize the major components of a microprocessor and microcontroller-based systems
2. Describe the difference between a microprocessor and a microcontroller

3. Analyze Assembly Language and C language programs for the AVR microcontroller, and debug errors in syntax and logic.
4. Illustrate program logic flow using flowcharts and develop assembly and C language programs from flowcharts.
5. Interface a variety of I/O devices to the microcontroller by incorporating ADCs and DACs.
6. Use appropriate Hardware and Software tools in the design, implementation, debugging, and testing of microcontroller-based systems
7. Develop and design interactive real-time applications with the AVR microcontroller
8. Perform experiments/course project independently as well as in a group.
9. Write a technical lab report.

COURSE REQUIREMENTS

Minimal Technical Skills Needed:

1. Prerequisite is EE 210 Digital Circuits (with a minimum grade of C). Working knowledge and understanding of electrical circuits.
2. Working knowledge and basic skills in using Microsoft Office products Word, Excel, and PowerPoint.
3. Working knowledge and basic skills at software programming in Assembly Language and/or C++ programming language or similar programming languages such as Python and MATLAB
4. Working knowledge and basic skills using electrical engineering lab equipment including breadboards, power supplies, oscilloscopes, multi-meters, and signal generators.
5. Working knowledge and basic skills in application of electrical engineering laws from Physics (Ohm's Law and Kirchoff's Voltage & Current Laws).
6. Working knowledge and basic skills in the application of Boolean Algebra and related Boolean laws and rules.

Instructional Methods:

The instructional methods will include lectures (modules), class discussions, course projects, assignments, problem-solving exercises, Lab reports, simulations using software and experimental measurements. Instructions will be based on the course textbook and on the Lab manual. Course materials, announcements, and lecture notes will be posted on the course website (D2L).

Lab Safety Training

Students registered for this course must complete the required Lab safety training before entering the Lab and undertaking any activities. There are no exceptions to this University policy. Failure to complete the required training will preclude participation in Lab activities and assessments.

Student Responsibilities or Tips for Success on the Course:

Students must attend classes, participate in classwork and discussions, and complete the required course assessments that support the anticipated learning objectives. Students are expected to regularly log into the course website (D2L) to download course material, submit their coursework as instructed, and follow up on new announcements. This course covers more advanced content that requires at least 6 hours of extensive study per week.

Assessments:

Assessments (assignments, lab reports, quizzes, exams) must be submitted by the specified due date mentioned on the D2L platform. Each assessment requires a separate solution report. Some assessments may require the submission of simulation files created using software. Any file that is flagged as infected with malware or viruses will not receive a grade. Make-up assessments are generally not offered without valid, documented justification. When approved, make-up work should be completed within one week of the missed assessment (if possible). Early communication is essential, and approval is not guaranteed.

Exams and Quizzes

The comprehensive exams (midterm and final) will be closed-book & closed-notes. Relevant scientific formulas will be provided in the supplementary sheet. The student will need to bring a scientific calculator for the exam. The use of a personal phone (or any other smart device) is strictly prohibited during exams. A makeup exam may be offered, but an official permit for absence that fulfills University procedures should be available on time.

Academic Integrity:

The first incident of academic misconduct will result in a zero for the assessment; further violations may lead to a failing grade in the course. All incidents will be reported to the department chair. If you are unsure whether something constitutes academic dishonesty, consult the instructor before submission. The AMUC Academic Integrity policy is included in the following sections.

Attendance:

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. Excessive absences may result in an 'F' grade. Because this course includes laboratory work, appropriate attire is required to reduce the risk of injury. Bluetooth earbuds or similar devices are not permitted while in the class/lab. The ETAMU attendance policy is included in following sections.

Lab Work:

Students will perform simulations and experiments to study the characteristics and practical applications of microcontroller circuits. The lab experiments/projects will be supported by software simulation and hardware implementation. Students will work in teams and must submit a group report in the specified format within one week. Late submissions will be subject to a penalty.

Lab Report must include the following:

1. Cover page: Your lab report cover page should include the following information:
 - Course name and title
 - Experiment number and title
 - Names of group members and their IDs
 - Instructor's name.
 - Date
2. Objectives: State clearly the objectives of the experiment
3. Equipment required: List of all the equipment and components used in the experiments
4. Introduction: Provide the necessary background to the problem that you are trying to solve in the lab and the approach to solving it.

5. Procedure: Each part of the lab experiment should explain the following:
 - Basic measurements and calculation
 - Explanation of the derived solution
 - Schematics developed that demonstrate the solution
6. Results and Analysis: Each part of lab experiment should have the following:
 - Include tests used to prove the solution worked.
 - Include drawing of the solution you built in lab.
 - State the observations made while performing in the lab and an explanation of your results.
7. Conclusions: In this section of the lab:
 - Describe what you did and learned from the lab.
 - Explain to what degree the objectives of the lab were achieved.
 - Describe possible real-time applications from the work done in the lab

Submit the files containing the circuit simulation, a schematic, and data which explain the lab results you obtained. Graphics must be created using a graphics program. Graphics in your lab reports may not be hand-drawn. Lab Reports are due (D2L) before lab time one week after the lab was performed. Marks will be deducted from the final lab grade for each 24 hours or portion thereof that a lab is late.

FINAL DESIGN PROJECT:

Students will be divided into Final Design Project Groups that are required to complete a course design project highlighting the knowledge gained through this course. The project should demonstrate the student's ability to link the theoretical knowledge and practical skills acquired in the course to real world applications. Students will work in a group of up to four students as assigned by the instructor.

The Final Design Project consists of multiple deliverables:

- 1) Final Design Project Proposal (Group Submission) Students will submit their project proposal at week 10 to the instructor for approval in the drop box on D2L.
- 2) Final Design Project Demo/Presentation/Report (Group Submission) Group PowerPoint presentations and report submissions are to be provided on D2L by due date/time.

The Final Design Project Demo/Presentation consists of:

- a) Final Design Project Demonstration – Project Groups will present a WORKING demonstration of their final design projects. This will be a live demonstration before the class (no D2L submission)
 - b) Final Design Project Presentation – Project Groups will present a PowerPoint presentation before class highlighting the design, construction, and testing process for their final design project. This will be a PowerPoint presentation using the template found on D2L.
 - c) Final Design Project Report – Project Groups will deliver a comprehensive report that captures group experiences in words and pictures concerning the design, construction, and testing of their project.
- 3) Final Design Peer Review (Individual Submission) All students are required to evaluate the performance of all group members including themselves. Everyone is required to submit the Peer Review form (provided on D2L) to the designated Peer Reviews folder on D2L by the due date/time.

STUDENT OUTCOMES (ABET):

The program must have documented student outcomes that support the program's educational objectives. Attainment of these outcomes prepares graduates to enter the professional practice of engineering. Student outcomes are outcomes (1) through (7), plus any additional outcomes that may be articulated by the program.

1. An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. An ability to communicate effectively with a range of audiences
4. An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. 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
6. An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. An ability to acquire and apply new knowledge using learning appropriate strategies.
- 8.

GRADING

Final grades in this course will be based on the following scale:

A = 90%-100%	A = 451- 500 Points (or equivalent)
B = 80%-89%	B = 401- 450 Points
C = 70%-79%	C = 351- 400 Points
D = 60%-69%	D = 301- 350 Points
F = 59% or Below	F = 300 & > Points

ASSESSMENTS

Weights of the assessments in the calculation of the final letter grade. The instructor reserves the right to adjust the schedule to meet the needs of the class, and any changes will be communicated

Assessment/ task	Weight	Tentative Date
Attendance	10%	
Assignments (5)	15%	Weeks: 3, 5, 7, 10, 13
Class Quizzes (3)	10%	Weeks: 3, 6, 12
Midterm Exam	20%	Week 8
Final Exam	20%	Week 16
Lab Work and Project	25%	Project presentation: Week 15.

OUTLINE/CALENDER

The instructor reserves the right to adjust the schedule to meet the needs of the class/lab, and any changes will be communicated promptly.

Week	Lecture Topics	Laboratory Sessions
1: 12 th Jan.	Introduction to Computing	L1: Lab Policies, Equipment, software
2: 20 th Jan. (Tuesday)	Microprocessors, Microcontrollers, AVR Microcontrollers	L2: LED-Based Traffic Light Controller
3: 26 th Jan.	Programming AVR Microcontrollers Using Assembly Language	L3(a): Interfacing Analog Devices and Servo Motor
4: 2 nd Feb.	Jump, Call Instructions	L3(b): Motor Speed Control using PWM
5: 9 th Feb.	Input/Output Ports and Interfacing	L4(a): Motor Speed and Direction Control with Ultrasonic Sensor

Week	Lecture Topics	Laboratory Sessions
6: 16 th Feb.	Arithmetic and Logical instructions, Directives	L4(b): Temperature Sensing and LCD Display
7: 23 rd Feb.	Addressing Modes	L5: Microchip AVR Studio (No report needed)
8: 2 nd Mar.	Memory Interface	Midterm exam
9: 16 rd Mar.	Programming AVR Microcontrollers Using C language	L6: Accessing Microcontroller Ports
10: 23 rd Mar.	Timmer and Counters	L7: Memory Interface
11: 30 th Mar.	Waveform Generation Using an AVR Microcontroller	L8: Interrupt and Timers
12: 6 th Apr.	Software-driven microcontrollers and hardware-driven digital systems (FPGA)	L9: Project work
13: 13 th Apr.	Basic FPGA circuits and Verilog Programming	L10: Project work
14: 20 th Apr.	Review	L11: Project work
15: 27 th Apr.	Project Presentation	
	Final exam	

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

Zoom Video Conferencing Tool

https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom_Account.aspx?source=universalmenu

ACCESS AND NAVIGATION

You will need your 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 903.468.6000 or helpdesk@etamu.edu.

Note: Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

COMMUNICATION AND SUPPORT

If you have any questions or are having difficulties with the course material, please contact your Instructor.

Technical Support

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

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

STUDENT RESPONSIBILITIES FOR COURSE

CWID and Password

You will need your 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 903.468.6000 or helpdesk@etamu.edu.

Technology-Related Issues

Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a ETAMU campus open computer lab, etc.

TECHNOLOGY REQUIREMENTS AND SUPPORT

Minimal Technical Skills Needed

Students will need reliable computer and internet access for this course. Students must be able to effectively use myLeo email, myLeo Online D2L, and Microsoft Office.

Learning Management System (LMS) – D2L

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 the technical requirements:

- View the [Learning Management System Requirements Webpage](#).
- Learn more on the [LMS Browser Support Webpage](#).

Technical Support

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found on the [Brightspace Support Webpage](#).

COMMUNICATION AND SUPPORT

Interaction with Instructor Statement

If you have any questions or are having difficulties with the course material, please contact your instructor. Correspondence will always be through university email (your “myLeo” mail) and announcements in myLeo online (D2L). You will not RECEIVE email through D2L, so be sure to check your ETAMU email for communication. Students are encouraged to check university email daily.

Include the Following in Emails with Instructor:

- Course name and subject in the subject line
- Salutation (Good afternoon, Dr. Jackson)
- Proper email etiquette (no “text” emails – use proper grammar and punctuation)
- Student name and CWID after the body of the email (possibly add to student signature on email)

COURSE AND UNIVERSITY PROCEDURES/POLICIES

Syllabus Change Policy

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The [Code of Student Conduct](#) is described in detail online in the [Student Guidebook](#).

Students should also consult the [Rules of Netiquette Webpage](#) for more information regarding how to interact with students in an online forum.

ETAMU Attendance

For more information about the attendance policy, please view the [Attendance Webpage](#) and the [Class Attendance Policy](#)

Academic Integrity

Students at East Texas A&M University are expected to maintain high standards of integrity and honesty in all their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty University Procedure 13.99.99.R0.03](#)

[Undergraduate Student Academic Dishonesty Form](#)

[Graduate Student Academic Dishonesty University Procedure 13.99.99.R0.10](#)

[Graduate Student Academic Dishonesty Form](#)

Use of Artificial Intelligence

East Texas A&M University acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources

Students with Disabilities-- ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

Office of Student Disability Resources and Services

East Texas A&M University
Velma K. Waters Library Rm 162
Phone (903) 886-5150 or (903) 886-5835
Fax (903) 468-8148
Email: studentdisabilityservices@etamu.edu
Website: [Office of Student Disability Services](#)

Nondiscrimination Notice

East Texas A&M University will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information, or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

Campus Concealed Carry Statement

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in East Texas A&M University buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and ETAMU Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all East Texas A&M University campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

East Texas A&M Supports Students' Mental Health – Counseling Services

The Counseling Center at East Texas A&M University, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit <https://www.etamu.edu/counseling-center/>

Mental Health and Well-Being

The university aims to provide students with essential knowledge and tools to understand and support mental health. As part of our commitment to your well-being, we offer access to Telus Health, a service available 24/7/365 via chat, phone, or webinar. Scan the QR code to download the app and explore the resources available to you for guidance and support whenever you need it.

