



ECE 594, Microprocessor-Based System Design, Fall, 2026

(ECE 594L, Microprocessor System Lab, Fall, 2026)

- Instructor: Abu Asaduzzaman (DRZ)
- Department: Electrical and Computer Engineering (ECE)
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- Preferred Method of Contact: In person during student/office hours or via email
- Student Office Hours: Tue & Thu 12:30-1:30 PM and Wed 9:30-10:30 AM
- Classroom Day/Time: 261JB, Monday & Wednesday 12:30-1:45 PM
- Prerequisites: ECE 238, ECE 394, and IME 254 (or instructor's consent)
- Teaching Assistant (TA): Grading – To Be Decided (TBD) | Lab – TBD
- TA Contact: grading594@shockers.wichita.edu | lab594@shockers.wichita.edu

How to use this syllabus

This syllabus provides you with information specific to this course, and it also provides information about important university policies. This document should be viewed as a course overview; it is not a contract and is subject to change as the semester evolves.

Student Office Hours

My student office hours are listed on page one of the course syllabus. Please utilize this time to meet with me for course-related discussions: asking for extra help, seeking further clarification of material presented in class, and following up on aspects of the class they are interested in. These hours are not required for the course, but are available to help support you on your path to success.

Course Description

Introduces modern computer systems with an emphasis on big data computations and methodologies (such as parallelism and machine learning) necessary for data-driven decision-making. Discusses the future of computing systems and alternative computing technologies. Special attention is given to the following scholarly team activities: technical reading, writing, and presentation.

Definition of a Credit Hour

Example for 4 credit hour class: Success in this 4 credit hour course is based on the expectation that students will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally 3 hours per unit per week with 1 of the hours used for lecture) for instruction and preparation/studying or course related activities for a total of 180 hours.

Go to 4.08 / Definition and Assignment of Credit Hours for the policy and examples for different types of courses and credit hour offerings.

Honors Distinction Option

This course does not offer an **Honors Distinction Option**.

Measurable Student Learning Outcomes

Measurable Student Learning Outcomes: Undergraduate Level

Upon successful completion of this course, the student will be able to:

- understand microprocessor architecture and techniques to program microprocessor-based systems in Assembly and C/C++ Languages
- write and debug code to develop interfaces for vendor-supplied special-purpose chips such as interrupt controllers, programmable input/output devices, and sensor modules
- gain hands-on experience by solving lab assignments and conducting research activities on team projects

The following ABET Engineering Accreditation Commission (EAC) Student Outcomes (SOs) are aligned to this course:

- (EAC: SO-1) an ability to identify and solve problems related to microprocessor systems by applying principles of engineering, science, and mathematics
- (EAC: SO-6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use computer engineering judgment to draw conclusions
- (EAC: SO-7) an ability to acquire and apply new computing knowledge as needed, using appropriate learning strategies

Measurable Student Learning Outcomes: Graduate Level

After passing this course, graduate students will be able to:

- develop embedded systems using microprocessors, interrupt controllers, programmable input/output devices, sensor modules, etc.
- conduct appropriate experimentation, analyze and interpret data, and use computer engineering judgment to draw conclusions
- acquire and apply new computing knowledge as needed, using appropriate learning strategies

Required Texts/Readings Textbook

Please consult with the instructor before purchasing books for this course.

Textbook: None.

Textbook: None.

Reference Book: "Introduction to Microprocessor-Based Systems Design," Giuliano Donzellini, Andrea Mattia Garavagno, and Luca Oneto, Springer, 1st ed. 2022.

Reference Book: "Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C," Yifeng Zhu, E-Man Press LLC, any edition.

Reference Book: "Programming Embedded Systems: With C and GNU Development Tools," Michael Barr and Anthony Massa, O'Reilly Media, any edition.

Other Readings

Class notes and lab manual/assignments will be made available via WSU Blackboard.

Handouts on servicing interrupts and interfacing input/output devices (i) in Assembly Language using EASy68K and/or IDE68K editor/assembler and (ii) in C/C++ Language using CodeWarrior software package and DEMOEM hardware boards will be made available via WSU Blackboard.

Other reading materials (such as Internet of Things, research articles, etc.) will be made available via WSU Blackboard.

Other Equipment/Materials/Proctored Exams

"Microprocessor Tool-Boxes" (each box will contain an embedded system development board and required peripherals) will be available for students to borrow, allowing them to complete the lab/project activities. Students will be provided information about hardware, software, and service supports so that they can develop systems that fulfill public safety requirements and help economic growth.

If needed, students will be provided with information about computing servers and service support, enabling them to work on programming assignments and projects. More information will be provided during class lectures as needed.

Class Protocol, Conduct, and Decorum

In this course, all students are expected to contribute to a learning environment that is respectful and conducive to the free exchange of ideas. Respect for one another's identities, perspectives, and contributions is essential to our academic community.

Students are expected to engage with peers, instructors, and course material in a manner that reflects professionalism and mutual respect. This includes:

- Using respectful language at all times.
- Listening actively and allowing others to speak without interruption.
- Engaging in dialogue that values differing viewpoints without personal attacks or derogatory remarks.

Unprofessional conduct, e.g., off-topic activities, may affect your grades or even your academic career. Be respectful at all times. Students demonstrating confrontational, disruptive, or threatening behavior may be asked to leave the classroom immediately and

may not be allowed to return to the classroom for the remainder of the class period. Consequences of this behavior may also include (and are not limited to): Suspension from class for a minimum of one additional class period and report or referral to the WSU police department, Student Conduct, and the WSU Care Team.

Contact Policy

Although you may attempt to reach me by phone, email communication is always preferred. Feel free to email me any questions or concerns following these guidelines:

- Always use the course name in the subject line of the email
- Remember to sign your name.
- **Always** email me from your WSU email address. Emails sent from personal email servers like Gmail, Yahoo, etc., have a tendency to end up in my spam folder, and I never see them. You may also email me through Blackboard via the Email My Instructor tab. I also offer an Ask My Instructor forum on Blackboard, which allows common questions to be seen and responded to publicly.
- You should NOT contact me for tech support.
 - Any technical problems involving your computer or issues regarding file uploading or sharing should go through the Blackboard Support. You can contact them at 316-978-3909. You can also fill out a request for help form on their website: <https://wichita.edu/BbSupport>
 - However, if you have a problem with access or uploading assignments, you *should* let me know before your assignment is due. You will also have to accompany this notification with the file in question, so I can verify that it is completed by the due date/time.

Response Time

To Email and Ask My Instructor Questions:

As soon as possible, within 24 hours. If you do not receive a reply to your email within 24 hours, please resend me the email; it probably the email did not arrive in my Inbox.

Feedback on Assignments:

As soon as possible after the due date (including the late submission date/time). The answer key will be discussed in lecture sessions and/or shared via Blackboard.

Sexual Harassment, Discrimination, and Retaliation

Wichita State University is committed to creating a safe and healthy environment for all of our community members. This includes the elimination of sexual misconduct, relationship violence, and stalking within the University community. These incidents may interfere with or limit an individual's ability to benefit from or fully participate in the University's educational programs.

Students are asked to immediately report incidents to the University Police Department, (316) 978-3450 or students may contact the Title IX Coordinator at (316) 978-5177 or submit a report to the Office of Civil Rights, Title IX & ADA Compliance at [Office of Civil Rights, Title IX & ADA Compliance \(CTAC\) Report Form \(maxient.com\)](https://maxient.com).

Students may also report incidents to an instructor, faculty or staff member, who are required by law to notify the Title IX Coordinator. If a student wishes to keep the information confidential, the student may speak with staff members of the Counseling and Psychological Services (316) 978-3440 or Student Health Services (316) 978-3620.

Sexual assault prevention training is required of all students, faculty and staff. These trainings, in addition to being highly interactive and engaging, are based in research around the best practices for healthy communities. Students will need to complete this training in the fall semester before being able to enroll for the spring. For more information regarding the training, visit the CTAC website at: <https://www.wichita.edu/administration/ctac/training.php>.

Students with Disabilities

A disability is something that affects a major life activity. These life activities include, but are not limited to, learning, walking, breathing, hearing, and seeing, in addition to many other physical, sensory functions, and psychological disabilities.

If you are a student with a disability or believe you might have a disability that requires accommodations, please contact the Office of Student Accommodations and Testing (OSAT) at <https://www.wichita.edu/services/accommodations/index.php> to discuss reasonable and appropriate accommodations and eligibility requirements. It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability, OSAT will review your concerns and determine, with you, what academic accommodations are necessary and appropriate for you. For example, adaptations of teaching methods, class materials, or testing may be made on a case-by-case basis if warranted, as required by the Americans with Disabilities Act (ADA). All information and documentation of your disability is confidential and will not be released by OSAT without your written permission.

The Office of Student Accommodations and Testing (OSAT) is located in the Shocker Success Center, room 118, (316) 978-3309 (voice/tty) (316-854-3032 videophone). Students seeking an accommodation must complete the online application at: <https://hunter.accessiblelearning.com/Wichita/ApplicationStudent.aspx>.

Prohibition on Discrimination

Wichita State University is committed to being a welcoming campus for all students, staff, and faculty. [Wichita State University Policy 3.06 / Sexual Harassment, Discrimination and Retaliation for Employees, Students and Visitors](#) prohibits discrimination on the basis of federal and state protected categories. Retaliation against an individual filing or cooperating in a complaint process is also prohibited.

Students from all diverse backgrounds and perspectives are welcome in this course, and the diversity that students bring to this course should be viewed as a resource, strength, and benefit. All materials and activities are presented with the intent to be respectful of all students regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, or culture. Please let me know ways to improve

the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Complaints or concerns related to alleged discrimination may be directed to the Office of Civil Rights, Title IX & ADA Compliance (CTAC), Wichita State University, 316-978-3187, ctac@wichita.edu.

Syllabus Policies and Student Resources

All students should familiarize themselves with the course-related policies and student resources that can be found at www.wichita.edu/syllabuspolicies

These include:

- Important Academic Dates
- Inclement Weather Event and Emergency Event
- Academic Integrity
- Unauthorized Use of Generative AI
- Personal Identity Updates
- Concealed Carry Policy
- Video and Audio Recording
- Shocker Alert System
- Intellectual Property
- CARE Team
- Counseling & Prevention Services
- The Office of the Student Advocate
- Academic Appeals
- Student Health Services
- Heskett Center & Campus Recreation
- First Generation Students
- Tobacco Free Campus
- FERPA
- Student Resolution Guide

Grading Scale

WSU uses a +/- grading scale for final grades and to calculate grade point averages. In this class, grades are assigned according to the following chart. (Other classes might assign grades differently: Be sure to understand the different grading scales in all your classes.)

Points/Percentage	Letter Grade	Grade Points	Interpretation
93 and up	A	4.00	A range denotes excellent performance
90 – less than 93	A-	3.70	

Points/Percentage	Letter Grade	Grade Points	Interpretation
87 – less than 90	B+	3.30	
83 – less than 87	B	3.00	B range denotes good performance
80 – less than 83	B-	2.70	
77 – less than 80	C+	2.30	
73 – less than 76	C	2.00	C range denotes satisfactory performance
70 – less than 73	C-	1.70	
67 – less than 70	D+	1.30	
63 – less than 67	D	1.00	D range denotes unsatisfactory performance
60 – less than 63	D-	0.70	
0 – less than 60	F	0.00	

Assignments

List of grading assignments/components and values toward final grades is shown below. For exams and projects, different grading scales will be used for undergraduate and graduate students. Graduate students will have additional activities in the project assignments that have higher weightage. The same grading scale will be used for all students for homework, lab, and quizzes. Homework assignments and their due dates will be announced in class and/or made available via Blackboard. Similarly, the due dates for the Quiz, Exam, and Project will be announced in class and/or made available via Blackboard.

Grading Assignments/Components	Undergraduate	Graduate
Homework (five of six, take-home)	10%	10%
Lab (ten, experiment, and quiz)	10%	10%
Quiz (two of three, 30-minute, class-time)	20%	20%
Exam-1 (cumulative, 65-minute, class-time)	20%	15%
Exam-2 (cumulative, 65-minute, class-time)	20%	15%
Project (Proposal, Presentation, and Report)	20% (2+8+10)	30% (4+10+16)

Late Assignments

For homework assignments, late submissions will not be accepted after five days from the original due date/time. Homework scores will not be considered for letter grades. Exceptions include documented emergencies and prior consents.

Missed Assignments and Exams

Makeup for missed tests (Quiz and Exam) and Labs/Projects) will be given only when there is a genuine reason, with clear proof. It is the students' responsibility to provide the proof; if the reason for missing a test is illness, a doctor's note will be required. Students should contact the instructor before any makeup test.

Extra Credit

Extra credits are possible as/if needed. Depending on class performance after Week 10, if required, extra credit assignments and their due dates will be determined.

Teaching Assistants

Laboratory TA:

TBD <tbd@shockers.wichita.edu>
Office Hours/Room: TBD

Grading TA:

TBD <tbd@shockers.wichita.edu>
Office Hours/Room: TBD

The Lab TA is not allowed to solve lab assignments; the TA should provide lab support to students with the required hardware/software in the lab. The Grading TA is not allowed to solve problems; the TA should grade test papers and provide feedback to students for any missing points. If students have questions regarding assignments, they should contact the course instructor immediately.

Tentative Brief List of Topics to Cover

Introduction to Microprocessor-Based Systems

- Organization of Microprocessors: CPU, Memory, Registers, and Bus
- Programming Microprocessors in Assembly and C/C++ languages

Programming Microprocessor Systems using Assembly Language

- Review Assembly Language using EASy68K/IDE68K software package
- Processing Interrupts; Interfacing Analog/Digital Serial/Parallel I/O

Programming Microprocessor Systems using C/C++ language

- Review C/C++ Language using CodeWarrior IDE and DEMOEM board
- Programming Timer, Sensor, liquid crystal display (LCD), etc.

Embedded / IoT Systems

- Fundamental concepts and future of Embedded Systems
- Fundamental concepts and the future of the Internet of Things

Project/Research

- Sensing/Monitoring/Controlling Systems
- Low-Power Computing Systems

Tentative Schedule for 16-Week Classes

Week Mon	Note	Important Topics, Readings, Assignments, and Deadlines are listed so that you can organize your time and academic work.
W-01 08/17	Labs on Monday	ECE 594/594L: Course syllabus; Labs and Projects; K-probe Microprocessors: Internal Architecture: Hardware/Software
W-02 08/24	HW-1	Assembly: Main Routine and Subroutines; Homework discussion EASy68K IDE; HW-1 due on Wed via Bb; Lab discussion
W-03 08/31	Lab-1 HW-2	Lab-01 (Mon); Project: Groups, Topics, Grading, Proposal, etc. HW-2 (Wed via Bb); Quiz-1 discussion
W-04 09/07	Quiz-1	9/07 (Labor Day) No Class/Lab Quiz-1 (Wed, 30 pts, 30-min); Exceptions; Lab-02 discussion
W-05 09/14	Lab-2	Lab-02 (Mon); Exceptions and Interrupts; Software Delay Lab-03 discussion; Project: Groups (due), Labs (6-10) & Proposal
W-06 09/21	Lab-3 HW-3	Lab-03 (Mon); Interfacing Input / Output (I/O) Signals; Timers Project Proposal on Week 10; Lab-04 discussion
W-07 09/28	Lab-4 HW-4	Lab-04 (Mon); Embedded programming with C; DEMOEM Boards HW-4 (Wed); Lab-05/Quiz-2 discussion; and CodeWarrior IDE
W-08 10/05	Lab-5 Quiz-2	Lab-05 (Mon); Interfacing Concept; Lab-06 discussion Quiz-2 (Wed, 30 pts, 30-min); Exam-1 discussion
W-09 10/12	Fal-Brk Exam-1	Fall Break 10/10-10/13 (no class on 10/12 and 10/13), Makeup Labs Exam-1 (Wed, 65 pts, 65-min, Closed book)
W-10 10/19	Lab-6 Project	Lab-06 (Mon); Analog/digital input/output Project Proposal due (on Wed); Lab-07 discussion
W-11 10/26	Lab-7 HW-5	Lab-07 (Mon); Analog/digital input/output; ADC, DAC Project Proposal Updates; Lab-08 discussion
W-12 11/02	Lab-8 HW-6	Lab-08 (Mon); LCD Display; Project: Report and Presentation Internet of Things (IoT) technology; Lab-09/Quiz-3 discussion
W-13 11/09	Lab-9 Quiz-3	Lab-09 (Mon); Serial/Parallel I/O; Programming sensors Quiz-3 (Wed, 30 pts, 30-min); Lab-10 discussion
W-14 11/16	Lab-10	Lab-10 (Mon); Embedded Systems; Selected Research Articles Project: Discussion on Presentation and Report
W-15 11/23	Project Thx-Brk	Project Presentation on Monday and Report due by Saturday Thanksgiving Break 11/25-11/29 (no class on 11/25-11/27)
W-16 11/30	Exam-2	Future of IoT Microprocessor-based systems; Exam-2 discussion Exam-2 (Wed, 65 minutes, 65 points, Closed book)
Finals		None!
Note: A date in Column 1 indicates the Tuesday of that week. Here, 11/30 is Monday of Week 16.		

Laboratory Information

There is no teaching/research lab associated with this course; however, we will provide support to help you complete the programming assignments. Students in this course may need to access Beoshock, the HPC cluster at WSU, for their programming needs. Information about Beoshock (such as how to log in and how to run parallel programs) will be provided via lectures. If needed, we may meet in the Computer Architecture and Parallel Programming Laboratory (CAPPLab) in 312 Wallace Hall for additional help.

University Policies and Procedures

The Wichita State University Policies and Procedures Manual can be found at:

<https://www.wichita.edu/about/policy/>.

- 1) *July 21, 2026; prepared for Fall 2026 term; DRZ*
- 2) *August 5, 2026; updated using version 7.1.2026 template; DRZ*
- 3)

Wichita State News



Photo: File

Asaduzzaman's Computer Architecture and Parallel Program Laboratory (CAPPLab), WSU lab, has been named a GPU (graphics processing unit) Research Center by NVIDIA, the world leader in visual computing. *Wichita State University front/landing page on November 09, 2015.*



Abu Asaduzzaman standing in front of the Aurora Exascale Supercomputer at Argonne National Laboratory on July 31, 2025.