COVID-19 and Wichita State University

Wichita State will follow federal, state, and county public health recommendations and mandates related to university operations. The COVID-19 pandemic is a complex, challenging, and fluid situation, which continues to evolve rapidly. Students consistently should review https://www.wichita.edu/about/COVID-19/index.php for the Wichita State COVID-19 Response for information throughout the semester.

ECE 594, Microprocessor-Based System Design, Fall, 2021

ECE 594L, Microprocessor System Lab, Fall, 2021

- Instructor: Abu Asaduzzaman (DRZ)
- Department: Electrical Engineering and Computer Science (EECS)
- Office Location: 253 Jabara Hall (JB) building
- Telephone: +1-316-978-5261
- Email: Abu.Asaduzzaman@wichita.edu
- Preferred Method of Contact: Via email or zoom/phone during office hours
- Student/Office Hours: Zoom/phone, Monday and Wednesday 2:00-2:45 PM and Zoom/phone, Monday 3:45-4:30 PM (CS 594L)
- Classroom, Day/Time: Zoom/261JB, Monday and Wednesday 12:30-1:45 PM
- Lab, Day/Time: Zoom/262JBC, Monday 3:45-6:15 PM
- Prerequisites: ECE 238 and ECE 394
- Corequisites: ECE 594L
- Teaching Assistant (TA): Lab – Abdurrahman Basalan | Grading – DRZ
- TA Contacts: Lab – abdurrahman.basalan@wichita.edu | Grading – DRZ

COVID-19 and Fall 2020 CS 594 (L) Course

CS 594: Microprocessor-Based System Design

Planned Course Design: Fully remote, synchronous delivery (HYB) - not a true hybrid course

Testing Type: Required online testing

Suggested technology recommendations or other information: Students will need: good Internet connection; computer/laptop with zoom/audio/video;

CS 594L: Microprocessor System Lab

Planned Course Design: Optional in-person content delivery, with synchronous remote delivery (HYB)

Testing Type: Required online testing

Suggested technology recommendations or other information: Students will need: good Internet connection; computer/laptop with zoom/audio/video; Students will have to: install software package(s) provided/suggested by instructor.

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. Any changes should be shared via lecture and/or Blackboard.

University Policies and Procedures

The Wichita State University Policies and Procedures Manual can be found at: https://www.wichita.edu/about/policy/.

Academic Integrity

Students at Wichita State University are expected to uphold high academic standards. WSU will not tolerate a lack of academic integrity. Students are responsible for knowing and following the Student Code of Conduct http://webs.wichita.edu/inaudit/ch8_05.htm and the Student Academic Honesty policy http://webs.wichita.edu/inaudit/ch2_17.htm. When the faculty member determines sanctions are warranted for violations of academic integrity, regardless of severity, the faculty member must report the infraction to the Office of Student Conduct and Community Standards. If you need more information about the process or wish to appeal a decision, please visit https://www.wichita.edu/about/student_conduct/ai.php

Homework (HW) assignments in this course are individual assignments (unless otherwise stated). Students can discuss with others, but they should not write the solution together; one's submission (wording/coding) should be reasonably different from other submissions. "Collaboration is good, cheating is not!" There will be severe consequences for academic dishonesty. Cheating (such as copying word-for-word from other sources) in any test will automatically result a Fail grade in this course; this grading policy applies to all parties involved (including the ones who help/show).

Course Description

Presents knowledge and skills required to design and program microprocessor-based systems. Introduces vendor-supplied special-purpose chips such as interrupt controllers and programmable input/output devices. Laboratory activities give hands-on experience.

Measurable Student Learning Outcomes

Measurable Student Learning Outcomes: Undergraduate Level

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

- Understand the fundamental concepts, challenges, and opportunities of microprocessor-based systems.
- Identify, formulate, and solve microprocessor system problems by applying principles of engineering, science, and mathematics.
- Develop microprocessor projects and conduct experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.

Measurable Student Learning Outcomes: Graduate Level

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

- Design and develop microprocessor-based systems using hardware (such as DEMOEM board) and software (such as CodeWarrior).
- Analyze and critically assess microprocessor-based systems, their applications, and related research articles.
- Understand the importance and benefits of microprocessor-based systems and engage in life-long learning of microprocessor-based (embedded and/or Internet of Things) systems for professional success.

Required Texts/Readings Textbook

No textbook. Please talk to the instructor before buying books for this course.

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

Students will be provided information about hardware, software, and service supports so that they can complete lab assignments and projects. More information will be provided during class/lab lectures as/if needed.

Class Protocol

Due to COVID-19, fall 2020 CS 594(L) is a remote/online course; however, class/lab participation is still crucial. ”Participation” involves reading the assignments thoroughly, reading handouts provided by the instructor/TA, watching all videos uploaded on Blackboard, contributing to class discussions, and completing tests/labs as assigned. To be successful in this class, you should be checking your student email regularly and logging in to this course at many times as require every week.

There are points on class/lab performance. It is expected that students join the instructor and/or TA before classes/labs start. Students are always encouraged to ask questions, especially if they find ambiguity in assignments and materials covered.

Contact Policy

Due to COVID-19, email communication is preferred. Feel free to email me any questions or concerns following these guidelines:

- **Always** email me from your WSU email address. Email 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 a Discussion Forum on Blackboard which allows common questions to be seen and responded to publicly.
- Always use the course name in the subject line of the email.
- Remember to sign your name.
- If you have a problem with accessing or uploading assignments, you should let me know as soon as possible before the 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.
- 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 OneStop. You can contact them at 316-978-3909. You can also fill out a request for help form at their website: https://wichita.edusupportcenter.com/sims/helpcenter/common/layout/SelfHelpHome.seam?inst_name=wichita

Response Time

To Email and Discussion Forum Questions:

As soon as possible within 24 hours. If you do not receive reply to your email within 24 hours, please re-send me the email, probably the email did not arrive to my Inbox.

Feedback on Assignments:

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

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 of 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	
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 are shown below. Different grading scales will be used for undergraduate and graduate students on quiz, exam, and project. Graduate students will have additional activities in the project assignments that have higher weightage. The same grading scale will be used for all students on class performance, homework, and lab. Homework assignments and their

due dates will be announced in class and/or made available via Blackboard. Similarly, other due dates will be announced in class and/or made available via Blackboard. Due to COVID-19, assignments and values may be changed!

Grading Assignments/Components	Undergraduate	Graduate
Class Performance (random check)	3%	3%
Homework (five of six, take home)	10%	10%
Lab (ten, experiment and quiz)	10%	10%
Quiz (two of three, 30-minute, class-time)	14%	12%
Exam-1 (~ Week 5, 60-minute, class-time)	16%	15%
Exam-2 (~ Week 10, 65-minute, class-time)	16%	15%
Exam-3 (cumulative, 70-minute, class-time)	16%	15%
Project (Proposal, Presentation, and Report)	15%	20%

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.

Late Assignments

For homework assignments, late submissions will not be accepted after five days from the original due date/time. Up to 50% points may be subtracted for any late submission. Exceptions include documented emergency situations and prior consents.

Missed Tests and Labs

Makeup for missed tests (Quiz, Exam, and Project) and labs will be given only when there is a genuine reason, with clear proof. It is 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.

Teaching Assistant(s)

Laboratory TA:

Abdurrahman Basalan, abdurrahman.basalan@wichita.edu
Office Hours/Room: Lab Hours, 262JBC/Zoom

Grading TA:

DRZ <DRZ>
Office Hours/Room: DRZ

The Lab TA should be in the lab for the entire session to assist students and grade lab assignments. The Grading TA (if any) should grade test papers. However, the TAs are not allowed to solve student problems (any problem). If students have any questions regarding the course materials and/or laboratory assignments, they should immediately contact the course instructor.

Syllabus Policies and Student Resources available at www.wichita.edu/syllabuspolicies

Information on:

- Important Academic Dates
- Academic Integrity
- Definition of a credit hour
- Video and Audio recording
- Shocker Alert System
- Intellectual Property
- CARE Team
- Counseling and Prevention Services
- Student Health Services
- Heskett Center and Campus Recreation
- Inclusive Excellence
- First Generation Students
- Names and Pronouns
- Disability Services
- Title IX
- Concealed Carry Policy

Laboratory Information

The main purpose of the lab section is to provide students enough hardware, software, and service supports so that they can complete lab assignments and projects. Due to COVID-19, fall 2020 CS 594(L) is a remote/online course; however, we will provide full support so that you can perform the lab assignments. A lab TA will assist you with the lab assignments. In addition, the course instructor will be available as/if needed. If required and possible, you can meet the TA and/or instructor in the Computer Architecture and Parallel Programming Laboratory (CAPPLab) in 256 Jabara Hall. Optionally, students may form groups (the number of students in a group will be determined after the regular enrolment period is over) to borrow one "Microprocessor Tool-Box" per group. It must be noted that "Microprocessor Tool-Boxes" belong to the EECS department and students are required to return all of them in good working condition at the end of the semester.

Definition of a Credit Hour

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. [Note: one unit of credit means one credit-hour.]

Brief List of Topics to Cover

Introduction to Microprocessor-Based Systems

- Basic Organization of a Microprocessor: CPU, Memory, Registers, and Bus

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 Systems / Internet of Things

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

Project/Research

- Sensing/Monitoring/Controlling Systems
- Low-Power Computing Systems
- Hardware-Based Security Systems

Tentative Schedule for 16-week fall classes

Week	Dates	Note	Important topics/readings, assignments, due dates, and reminders are listed here so that you can organize your time and academic work.
1	8/17 8/19		CS 594 (L): Course syllabus; Lab/Project; K-probe; Microprocessor Architecture; HW-1 Assign;
2	8/24 8/26	Lab HW	IDE68K Assembly Language; Subroutine; Exceptions; HW-1 (Wed); Lab/Project Groups; Lab-01 discussion;
3	8/31	Lab	Lab-01 (Mon); Project: Topics, Grading, Proposal;

Week	Dates	Note	Important topics/readings, assignments, due dates, and reminders are listed here so that you can organize your time and academic work.
	9/2	HW	HW-2 (Wed); Programming Interrupts; Quiz-1 discussion;
4	~~9/7~~ 9/9	Quiz	9/7 (Labor Day) No Class/Lab; Quiz-1 (Wed, 30 points, 30 minutes); Lab-02 discussion;
5	9/14 9/16	Lab Exam	Lab-02 (Mon); Interfacing I/O; Exam-1/Lab-03 discussion; EXAM-1 (Wed, 65 minutes, 65 points, Closed book);
6	9/21 9/23	Lab Update	Lab-03 (Mon); Project: Topics, Grading, Proposal; Timers; Lab-04 discussion; Proposal due on Week 11;
7	9/28 9/30	Lab HW	Lab-04 (Mon); Embedded programming with C; HW-3 (Wed); DEMOEM/CodeWarrior; Lab-05 discussion;
8	10/5 10/7	Lab HW	Lab-05 (Mon); Project: Proposal, Grading, etc. HW-4 (Wed); Interfacing Concept; Quiz-2/Lab-06 discussion;
9	10/12 10/14	Lab Quiz	Lab-06 (Mon); Analog/digital input/output; Lab-07 discussion; Quiz-2 (Wed, 30 pts, 30-min); Proposal due on Week 11;
10	10/19 10/21	Lab Exam	Lab-07 (Mon); ADC, DAC; Exam-2 and Lab-08 discussion; EXAM-2 (Wed, 65 minutes, 65 points, Closed book);
11	10/26 10/28	Lab Update	Lab-08 (Mon); LCD Display; Project: Report, Presentation; Project: Proposal due (on Wed); Lab-09 discussion;
12	11/2 11/4	Lab HW	Lab-09 (Mon); Serial/Parallel I/O; Programming sensors; HW-5 (Wed); Watchdog timer; Lab-10 discussion;
13	11/9	Lab HW	Lab-10 (Mon); Future of IoT Microprocessor-based systems;

Week	Dates	Note	Important topics/readings, assignments, due dates, and reminders are listed here so that you can organize your time and academic work.
	11/11		HW-6 (Wed); Internet of Things (IoT) technology;
14	11/16 11/18	Quiz	Future of IoT technology; Exam-3 discussion; Quiz-3 (Wed, 30 pts, 30-min); Project: Presentation, Report;
15	~~11/23~~ ~~11/25~~		11/23-11/29 (Thanksgiving) No Classes;
16	11/30 12/2	Project Exam	Project Presentation: Team-work, via Zoom, PPT slides; Final Report: Team-work, via Blackboard on Study day; EXAM-3 (Wed, 65 minutes, 65 points, Closed book);
~~Finals~~		~~N/A~~	~~None~~

[Adopted from fall 2020; CS 594 → ECE 594; DRZ on 3/20/2021]