

# EECE.3170: Microprocessor Systems Design I

Fall 2016

## Syllabus

### Course Meetings

Section 201: MWF 8-8:50 AM, Ball 206

Section 202: MWF 11-11:50 AM, Ball 314

### Course Website

*Main site:* <http://mjgeiger.github.io/eece3170/f19/index.htm>

*Schedule:* <http://mjgeiger.github.io/eece3170/f19/schedule.htm>

### Course Discussion Group

All course announcements will be posted on the course Blackboard page. You are responsible for checking that site, as well as the sites listed above, on a regular basis.

### Instructors

Dr. Lin Li (*Sec. 201*)

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Office: Ball 310

Office hours: Thursday/Friday 1-3 PM

Dr. Michael Geiger (*Sec. 202*)

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Office: Ball 301A

Phone: 978-934-3618 (x43618 on campus)

Office hours: Monday/Wednesday 2-3 PM; Tuesday 12:30-2 PM, or by appointment

During office hours, student questions are our top priority. Feel free to stop by the office, e-mail questions, or schedule a one-on-one appointment. Office hours are subject to change.

### References

No textbooks are required for this course. Relevant reading material will be posted on the course schedule page.

### Course Overview

Description: This course provides an introduction to microprocessors. It uses assembly language to develop a foundation on the hardware, which executes a program. Memory and I/O interface design and programming. Study of microprocessor and its basic support components, including CPU architecture, memory interfaces and management, coprocessor interfaces, bus concepts, serial I/O devices, and interrupt control devices. Laboratories directly related to microprocessor functions and its interfaces. 3 credits.

Prerequisites: EECE.2160 (ECE Application Programming) and EECE.2650 (Logic Design)

### Course Overview (cont.)

Course Objectives: By the end of this course, you should understand and/or be able to use all of the following:

1. **Microprocessor Software Architecture:** Data formats, types, and alignment. Memory addressing and organization. Stack operation.
2. **Microprocessor Instructions:** Instruction formats and types: data transfer, arithmetic, logical, shift/rotate, conditional execution, program control, subroutines.
3. **Assembly Language Programming:** Ability to write, modify, and debug programs written in assembly language. Translation of high-level code to assembly language. Programs that integrate assembly and high-level code.
4. **Microprocessor Interfacing:** Memory and I/O interfacing. Bus cycles.
5. **Interrupt Processing:** Hardware and software interrupts.
6. **Microcontroller-based Systems:** Microcontroller architecture and instruction set. Microcontroller programming using both assembly language and high-level code. Design and debug microcontroller-based circuits.

Grading: Grades will be computed on an A to F scale; no A+ grades will be assigned, in accordance with UMass Lowell policy. The weights assigned to the various items are:

Homework/lab assignments	55%
Exam 1	15%
Exam 2	15%
Exam 3	15%

Incomplete grades will only be given in exceptional situations, and the student must be passing the class at the time the grade is requested.

The following rubric describes how grades will be assigned if no grading curve is applied. A grading curve may be used at the instructor's discretion, depending on the overall course average at the end of the term. Grades will not be curved down, meaning that the table below describes the minimum letter grade you will earn for a final average in each of the ranges shown:

<u>Range</u>	<u>Grade</u>	<u>Range</u>	<u>Grade</u>
> 92	A	78-79	C+
90-92	A-	73-77	C
88-89	B+	70-72	C-
83-87	B	68-69	D+
80-82	B-	60-67	D
		< 60	F

**Your grade is based strictly on the work you do during the semester. Please do not ask for extra credit work to improve your grade—any extra credit work we give is available to the whole class, not just the students who ask for it.**

Class participation: You are responsible for all material discussed or announced in class. You are expected to attend class regularly and participate in any in-class discussions, as such exercises are essential to your learning. Although lecture attendance is not explicitly required, regular attendance will improve your understanding of the course concepts.

Exams: Make-up exams will only be offered in exceptional circumstances. You must notify your instructor as early as possible in order to determine an appropriate make-up date.

Assignment policies: Your assignments will be a mix of typical homework problems, programming assignments, and labs that involve both programming and hardware interfacing. All assignments will be posted on the course web page.

Assignment policies include the following:

- All assignments must be completed individually unless explicitly specified. You may be allowed to work in groups for lab assignments.
- Late assignments are penalized at a rate of 10% per day.
- Some programming assignments may require an instructor to check off the completion of one or more milestones within the assignment.

### **Academic Honesty**

**All assignments and exams must be completed individually unless otherwise specified.** You may discuss concepts or material covered in class, but may not share any details of your solutions to assigned problems, including algorithms and code. Plagiarism (in this course, copying code from an outside source) will also be treated as an instance of cheating.

Students may discuss assignments in general terms and may help one another fix specific errors, such as compiler errors or output formatting. In this case, students must note in their program header that they received assistance from a classmate. However, any sharing of your work—even if used only to help a classmate solve a specific error—is an academic honesty violation.

Any assignment or portion of an assignment violating this policy will receive a grade of 0 for all parties concerned. Depending on the severity of the infraction, or in cases of repeat violations, the instructor may give additional penalties, up to and including a failing grade in the course.

Further information on the University Academic Integrity policy can be found at:

<https://www.uml.edu/Catalog/Undergraduate/Policies/Academic-Policies/Academic-Integrity.aspx>

### Course Schedule

This schedule contains a tentative schedule of topics we will cover throughout the term; the course website will contain the most up-to-date version. The web page will also describe which reading materials are associated with each lecture.

Please note that the exam dates are fixed—the first exam will be held on **Monday, September 30 in class**, the second exam will be held on **Friday, November 1 in class**, and the third exam will be held **during finals, at a date/time to be determined**.

Week	Date (M)	Lecture Topics
1	9/2	<i>No Monday lecture—Labor Day</i> 1. Course introduction 2. Role of ISA; data types
2	9/9	3. Data storage and addressing <i>Tuesday, 9/10: last day to add without permission number</i> 4. x86 introduction 5. Assembly basics; data transfer instructions
3	9/16	6. More data transfer instructions <i>Tuesday, 9/17: last day to add/drop course</i> 7. Arithmetic instructions 8. Multiplication and division instructions
4	9/23	9. Logical and shift instructions 10. Rotate and bit test/scan instructions 11. Exam 1 Preview
5	9/30	<b>Monday, 9/30: EXAM 1</b> 12. Conditional execution 13. Exam 1 Review
6	10/7	14. Jump/loop instructions 15. Subroutines 16. HLL and x86 assembly
7	10/14	<i>No Monday lecture—Columbus Day</i> 17. HLL and x86 assembly (continued) ( <i>Tue. 10/15</i> ) 18. HLL and x86 assembly examples 19. PIC introduction
8	10/21	20. PIC instruction set 21. PIC instruction set (continued) 22. PIC instruction set (continued)
9	10/28	23. PIC assembly programming 24. Exam 2 Preview <b>Friday, 11/1: EXAM 2</b>
10	11/4	25. PIC assembly programming (continued) 26. Exam 2 Review 27. PIC assembly programming (continued)

**Course Schedule (cont.)**

<b>Week</b>	<b>Date (M)</b>	<b>Lecture Topics</b>
11	11/11	<i>No Monday lecture—Veterans Day</i> 28. PICkit basics <i>Thursday, 11/14: Last day to withdraw</i> 29. Working with delay
12	11/18	30. PIC interrupts 31. Analog to digital conversion 32. Practice problems
13	11/25	33. Topics TBD <i>No Wednesday, Friday lecture—Thanksgiving Break</i>
14	12/2	34-36. Topics TBD
15	12/9	37. Topics TBD 38. Exam 3 Preview <i>Classes end Thursday, 12/12</i>
	TBD	<b>EXAM 3 (DATE/TIME TBD)</b>