

**Lecture:** MWF, 1:50-2:40, EB 2243

**Lab:** M 7-9:50pm, Tu 8:00-10:50, Tu 11:30-2:20, Tu 3-5:50, EB 3230

**Instructor:** Dr. Andrew Mason, EB 1217, [mason@msu.edu](mailto:mason@msu.edu)

**Office Hrs.:** Mon 10:30am-12:00pm: by appointment MWF 12:30-1:30pm

**Lab TA:** to be announced on class website

**Course Website:** <http://www.egr.msu.edu/classes/ece331/mason/>

A significant amount of material for this class will be posted on the course website, including lab materials and homework assignments. Please check regularly throughout the semester.

**Preferred Prerequisite:** CSE 232 or (EGR 102 and (CSE 251 or concurrently) and ECE 230)

**Required Text:**

Microcontroller Theory and Applications: HC12 and S12, 2<sup>nd</sup> Ed., Pack and Barrett, Prentice Hall, 2008, ISBN: 978-0-13-615205-7

**Reference:** H.-W. Huang, MC68HC12: An Introduction, 1<sup>st</sup> Ed., Delmar Learning, 2005, ISBN: 978-1401898120.

**Course Description:**

Microcomputers. Microprocessor architecture. Addressing modes. Assembly language programming. Parallel and serial input and output. Interfacing. Interrupts. Peripheral device controllers. Applications and design.

**Grading:**

The weight (%) for each graded component of the course is listed below. Final grades will be curved so that the course average is approximately the historical average for 300-level ECE courses.

20% Quizzes (4)

20% Midterm Exam

25% Final Exam

10% Homework (10 of 11)

25% Lab Assignments (11)

**Attendance and Conduct in Class:**

Students are expected to attend *and participate* in class. Taking notes is strongly encouraged to promote success in this course. Class participation includes asking questions, engaging in discussions and actively listening to lectures and discussions. I will try to maintain a relaxed and open classroom environment, and your questions and comments are always encouraged. Except for emergencies, use of cellular phones (for calls or texts) during class is prohibited. Laptops are permitted for taking/viewing notes, but emailing, web browsing, and otherwise disengaging from class are most strongly discouraged; it's disrespectful, disrupting to your classmates, and disadvantageous to your success in the course. The same goes for newspapers, crossword puzzles, etc.; save it for outside of the classroom.

**Exams:**

One midterm and one final exam will be given. The final exam will focus on material following the midterm exam but will include some semester-cumulative material. The exam dates are shown on the Course Schedule below, and makeup exams will only be allowed for extreme cases (major illness, death in immediate family, etc.), which must be documented.

**Quizzes:**

Short quizzes may be given throughout the semester to help students keep up with course material, to help identify some of the most important material in the course, and to encourage regular attendance and studying. Quizzes will be roughly 20 min followed by discussion of the solutions. Please bring pencil and paper to class for quizzes and plan to take notes on the quiz solutions to study for exams.

**Homework:**

Eleven homework assignments will be assigned throughout the semester with (tentative) due dates list on the Course Schedule Homework must be turned in at the beginning of class and no late homework will be accepted to facilitate prompt posting of solutions. The lowest homework grade will be dropped. Although homework is a small percentage of the overall grade, homeworks are designed to help you learn key concepts that will be covered on exams. So to do well in the course, you need to do the homework!

**PC Labs:**

Several times throughout the semester the class will meet in a DECS PC lab (typically EB 1307) to receive lectures on assembly language programming and write & test practice code under instructor supervision. See the Course Schedule below for planned PC lab dates. Work done in the PC labs will often be turned in with homework or will help prepare you to complete a homework assignment.

**Lab Assignments:**

Students must complete several lab assignments covering material from both ECE230 and this course. Labs will be directed by a TA under supervision of the instructor. Laboratory deliverables will be defined for each assignment. Many labs have pre-labs that must be completed before coming to the lab; be sure to check the assignment on the website well before your schedule lab time. Laboratory reports will be collected and graded. Lab report format will be discussed at the first lab meeting and a guide will be posted on the website. Professionalism is expected in the lab reports. Due dates will be specified by the TA, and late reports will not be accepted. Labs will be graded by the TA based on 1) completion of lab steps, 2) response to Discussion Points, 3) report quality.

Labs will begin the third week of class, on Jan 23. Lab material will be posted on the course website.

**Important:** You must have lab goggles for Lab 1. They can be purchased at the bookstore. You can not begin Lab 1 without them. Keep your goggle after this class because you will need them for all ECE labs.

**Absences:**

For absences due to illness, professional travel, or other excusable reasons, you must notify Dr. Mason ([mason@msu.edu](mailto:mason@msu.edu)) *before* class to make arrangements for missed quizzes, submit homework (e.g., by email), or arrange to attend a makeup lab. It is the student's responsibility to get notes, handouts, information, etc. for any missed class. Tentative dates for exams, quizzes, labs and homework due dates are shown in the Course Schedule below. You will be notified a week in advance of any change to this schedule.

**Cheating:**

Cheating in any form will not be tolerated! You are permitted to work on homework in small groups, but directly copying someone's homework is cheating; it will result in a zero-point score for all people involved. The same is true for lab reports. During quizzes and exams, use of any notes (or than what may be expressly permitted for a specific test), looking at anyone else's paper, etc. is considered cheating and will result in a zero-point score for the assignment and notification of the Dean's office.

## Planned Course Schedule:

	Date	Lecture	Reading	HW	Lab
M	Jan 9	Welcome, Intro, Syllabus		(due)	
W	Jan 11	Review: Number systems	App D		
F	Jan 13	Review: Digital logic	App E		
M	Jan 16	<i>MLK Day -no class</i>			
W	Jan 18	Computer history & definitions	1	HW1	
F	Jan 20	Microcontroller architecture; 68HC12 overview	notes		
M	Jan 23	Programmer's model; CCR	2.1	HW2	L1
W	Jan 25	CCR examples; ASM instr. format	2.3		
F	Jan 27	Instr. execution cycle			
M	Jan 30	ASM instructions I (overview, move, math)	2.2	HW3	L2
W	Feb 1	ASM instructions I (logic, test); <b>Quiz 1</b>			
F	Feb 3	Address modes I (inh, imm, dir, ext, ind-imm)	2.4		
M	Feb 6	Instr. chart examples; machine code; timing	(3.1)	HW4	L3
W	Feb 8	Structured programming; loops	2.7, 3.2		
F	Feb 10	<b>PC lab 1: ASM Simulators</b>	notes		
M	Feb 13	ASM instructions II (branch, bset/bclr)	2.6	HW5	L4
W	Feb 15	Address modes II (ind-inc, ind-dir, rel)	2.5		
F	Feb 17	Instruction timing; delay loops; loop instr.	3.1		
M	Feb 20	Address modes; Register Set; HC12 memory map	5.3, notes	HW6	L5
W	Feb 22	Parallel I/O ports, Operation Modes; <b>Quiz 2</b>	5.6		
F	Feb 24	<b>PC lab 2: ASM Programming</b>			
M	Feb 27	Examples, problems, exam review			
W	Feb 29	<b>Midterm Exam</b>			
F	Mar 2	Memory types & structures	8.2-.3, notes		
	Mar 5	<i>Spring Break Mar 5-Mar 9</i>			
M	Mar 12	External hardware interface examples	5.4, notes		L6
W	Mar 14	Midterm exam return & discussion			
F	Mar 16	Stack	3.3		
M	Mar 19	Subroutines; parameter passing	3.4-3.6	HW7	L7
W	Mar 21	Exceptions; Resets	6.1-6.3		
F	Mar 23	<b>PC lab 3: ASM Subroutines</b>			
M	Mar 26	Interrupts	6.4-6.10	HW8	L8
W	Mar 28	Interrupt service routines			
F	Mar 30	<b>PC lab 4: Quiz 3</b>			
M	Apr 2	Real-time clock and programmable timers	7.1-7.9	HW9	L9
W	Apr 4	Real-time clock and programmable timers			
F	Apr 6	Hardware synthesis	notes		
M	Apr 9	Data acquisition, D/A and A/D conversion	9.1-9.6	HW10	L10
W	Apr 11	Communication systems	10.1-10.6		
F	Apr 13	Communication systems			
M	Apr 16	Introduction to ARM controller	notes	HW11	L11
W	Apr 18	ARM assembly; <b>Quiz 4</b>			
F	Apr 20	Advanced topic	notes		
M	Apr 23	<i>CpE curriculum; VLSI careers</i>			
W	Apr 25	<i>final exam review</i>			
F	Apr 27	<i>Design Day -no class</i>			
Tu	May 1	<b>Final Exam</b> , 12:45-2:45pm			