EE 4390 Microprocessors
Fall 2002
Course Information and Policies

Instructor: Steve Barrett
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Class Time: T, Th 8:00 - 8:50 AM, EN2105

Office Hours: MWF, 1:00 – 3:00 PM, EN5060

Text: "68HC12 Microcontroller: Theory and Applications," Daniel J. Pack and Steven F. Barrett (P&B), Prentice-Hall Inc., 2002, ISBN 0-13-033776-5

Course Notes: Course notes may be purchased Wyoming Union Copy Center

Grading:

Exams (2)	40%
Homework	10%
Final Examination	30%
Laboratory Work	20%
Total	100%

Prerequisites: It is expected that the student has had a class in digital circuit design and is familiar with conventional logic and memories. It is also assumed the student has some programming experience, preferably in C. Prior knowledge of assembly language is useful but not required.

Objectives: The course provides an introduction to design of microcomputers, controllers, and instruments which use microprocessors. Central processing unit (CPU) architecture, bus structure and timing, input-output interfaces and devices, assembly language programming, assemblers, compilers, editors and simulators will also be discussed and applied in the laboratory portion of the course. This course emphasizes **design.** The Motorola 68HC12 microcontroller will be used as the target microcontroller for the course.

Requirements: The course consists of two one-hour lectures and a two-hour laboratory per week for a total of 15 weeks. Students will work as two person teams in the laboratory. All students are expected to satisfactorily complete all of the laboratory assignments. Some labs will require a formal write-up; others only require documented C code or assembler list files. Even though you work with a partner, you will be expected to do your own work. If you copy any code from another source, you must reference the source in your program. In addition to the lab, two exams will be given throughout the semester and a required comprehensive examination. Some homework will be assigned and graded. Grades will be awarded at the standard 90%, 80%, 70%, and 60% break points.

Homework: Homework sets will be periodically given with prescribed due dates. ***Assignments must be handed in at the beginning of class time on the specified due date. No credit will be given for late assignments.*** Assignments must be worked neatly, showing all of your calculations and clearly indicating all answers by underlining them or drawing a box around them. Typically, one or two problems will be graded from each assignment.

Attendance: Attendance at every scheduled class session is highly encouraged. Students who are habitually absent will be at a disadvantage. Students are responsible for all material presented in class. Attendance is required for scheduled examination times. Students who miss an examination must obtain an excuse according to the rules on page 27 of the UW bulletin. For absences not covered by these rules, students must contact the instructor immediately to avoid a grade of zero for missed examinations. **Lab attendance is mandatory.**

Laboratory: **Lab attendance is mandatory.** The laboratory is an integral part of the course. The schedule for the laboratory and the procedures for completing the experiments and write-ups will be described at the first lab meeting. ***Satisfactory performance on each laboratory experiment is required for successful completion of the course.***

Suggestions: This course covers considerable material. Some recommendations for success include:
- Attend every class -- new material is covered each lecture
- Read assigned material in advance as detailed in the syllabus
- Start homework assignments early. Seek instructor help as needed early.
- Don't ignore homework. It comprises 10% of your grade. It is the best preparation for exams.
- Ask questions in class, during discussions, and during office hours

Policies: You are encouraged to discuss course topics and assignments with one another. However, the homework solutions and the laboratory requirements (reports, code, etc.) turned in by each student must consist of that individual's own work as noted in the Electrical Engineering Department Course Policies (available in the Department office or from the instructor) and the University of Wyoming Academic Policies and Procedures.

Session	Date	Topics	Reading	Homework	Laboratory
1	T, Sep 3	Course Overview		Skills Review	
2	Th, Sep 5	68HC12 Overview	Chp 1 P&B		
3	T, Sep 10	Programming Model Motorola Assembly Language Instruction Execution Cycle **Worksheet:** 68HC12 Instruction Operation	2.1, 2.2, 2.3	**Due:** Skills Review HWS1: A1, A3-A6	**Meet in lab**
4	Th, Sep 12	Addressing Modes **Worksheet:** Addressing Modes	2.5		
5	T, Sep 17	68HC12 Instruction Set, Branching Instructions, ImageCraft ICC12 Directives	2.4, 2.6, ImageCraft handout	**Due:** HWS1 HWS2: F1-F5, F7-F9, F11, F12	**Meet in lab**
6	Th, Sep 19				
7	T, Sep 24	68HC12 Hardware Overview	5.1 – 5.4	**Due:** HWS2 HWS3: A5, A7, A8, C1 (use VISIO)	Introduction to the HC12 Teaching Platform
8	Th, Sep 26	68HC12 Subsystems, 68HC12 Memory System	5.5 – 5.6, 8.1 - 8.4		
9	T, Oct 1	Serial Communications Interface	10.1 – 10.4	**Due:** HWS3 HWS4: F1-F7, A1, A2	
10	Th, Oct 3				
11	T, Oct 8	Advanced Assembly Programming	Chp 3	**Due:** HWS4 HWS5: F2-F5, A4, C1	Serial Communications Interface
12	Th, Oct 10				

13	T, Oct 15	Programming in C	handout	**Due:** HWS5 HWS6: programming assignment	
14	Th, Oct 17	**Exam #1**			
15	T, Oct 22				Keypad and Liquid Crystal Display (LCD) Interface
16	Th, Oct 24	Analog-to-Digital Converter - fundamental concepts	9.1 – 9.4		
17	T, Oct 29	- 68HC12 ATD System - ATD registers	9.5 – 9.8	**Due:** HWS6 HWS7: F1, 2, 4, A1, 2,4, C1 (in C)	
18	Th, Oct 31	**- ATD programming**			
19	T, Nov 5	Standard Timer Module - fundamental concepts	7.1 – 7.4	**Due:** HWS7 HWS8: F1, 2, 3, A4, 5	Digital Voltmeter Using the Analog-to-Digital Converter
20	Th, Nov 7	The Timer Module	7.5 – 7.6		
21	T, Nov 12	Input Capture	7.8	**Due:** HWS8 HWS9: C1 (in C)	
22	Th, Nov 14	Output Compare	7.8		
23	T, Nov 19	Exceptions – Resets and Interrupts	Chp 6	**Due:** HWS9 HWS10: F5, A4, C1 (in C)	Precision Square Waves with the Timer Module
24	Th, Nov 21				
25	T, Nov 26	**Exam #2**			
26	Th, Nov 28	**Thanksgiving – no class**			
27	T, Dec 3	Serial Peripheral Interface	10.5	**Due:** HWS10	Output Compare with Interrupts
28	Th, Dec 5				
29	T, Dec 10	Welcome to the real world! - Switches/indicators - switch debouncing - noise - reducing noise susceptibility - power conditioning - electrical characteristics - interfacing and fanout	handout		
30	Th, Dec 12				
Final	T, Dec 17, 8 – 10 AM				