Syllabus for CS 273 — MACHINE PROGRAMMING AND ORGANIZATION

Spring 1998, Section 2

Goals:

1. To understand the general structure of a computer and how a program is executed. To examine and use a representative architecture (the Motorola MC68HC11 microcontroller) and its machine and assembly languages, in order to be able to extract the salient features of other computer architectures.

2. To learn how high-level language constructs are actually implemented on a computer. Examples are for-loops, while-loops, case-statements, variables, arrays, structures, pointers, linked-lists, characters, signed and unsigned integers, functions and procedures, call-by-reference parameters, call-by-value parameters, returned values. This understanding will make you better at comprehending, debugging, and writing efficient high-level language programs.

3. To significantly advance your problem-solving and debugging skills, and your ability to write readable, well-documented, non-trivial programs, through extensive simulator and hardware programming labs and assignments.

4. To examine and implement the hardware and software needed to interface a representative computer peripheral device, in order to gain an understanding of relevant issues involved in computer peripheral interfacing. To learn and implement the interrupt control mechanism, which is a key component of much interface (and other) software.

5. To learn and implement rudimentary memory management.

6. To populate and test a printed circuit board, in order to gain a general familiarity with electronic components.

7. To enhance your verbal communication and analytical reading skills.

Prerequisites: at least a C in CS171 (CS271) or EE162

Textbooks:

1. Motorola M68HC11 Reference Manual (donated by Motorola, Inc.)

2. Motorola MC68HC811E2 Programming Reference Guide (donated by Motorola, Inc.)

3. *Microcontroller Technology*, 2nd edition, by Peter Spasov. Prentis Hall, ISBN 0-13-362724-1, 1996. **A copy is on reserve in New Library.**

4. Course notes packet available in the CS office (SH123); cost is the cost of copying.

Lab Fee: $35 payable in SH123

Main Topics:

1. **Software and Written Work:** The first part of the course will focus on binary number representation (unsigned and signed representation, signed and unsigned overflow), assembly-language programming (instruction set architecture of the MC68HC11, assembler directives, addressing modes), instruction execution (cycle counting and the fetch/execute cycle), translation into machine code, and execution of high-level languages (including condition codes and branching and subroutines).

   Programming during this part of the course will be done on a simulator, working on the Linux machines in the cs domain.

2. **Hardware-Related Work:** The second part of the course will focus more on hardware. We will cover interfacing, including serial communication, downloading, digital sensors, analog sensors, and motor control, and the stack and interrupts.

   You will populate a printed-circuit card with electronic components that will include a MC68HC11 microprocessor, build a motorized vehicle made of LEGOs, and implement hardware and software to interface motors and sensors that are part of the LEGOs vehicle. The later labs and final project assignment will lead you, incrementally, to the completion of a specific project.

Grade Basis:	1. labs (about 12)	21%
	2. programming (about 5) and written (about 3) assignments	16%
	3. class participation	03%
	4. final project	15%
	5. quizzes (about 5)	10%
	6. midterm	15%
	7. final	20%

Quizzes and Exams: are **open manuals** (but no calculators).

Software and Written Assignments:

- **Software and written assignments must be your own individual work.**

- Please submit a hardcopy to the TA and, for software assignments, e-mail a copy of your source code to the TA. Your TA is Jun Pu (junpu@cs.nmsu.edu). His mailbox is in the CS office.
- **Software assignments that do not assemble will receive no credit.** (Be sure to check your program after you add comments.)

Labs:

- Labs will be done in pairs, with partners rotating from week to week. There are

$$\left(\begin{array}{c} n \\ 2 \end{array} \right) = \frac{n!}{2!(n-2)!} = \frac{14!}{2 \times 12!} = \frac{14 \times 13}{2} = 91$$

  different pairings!
- Each lab is due at the beginning of the next lab session, unless explicitly stated otherwise.
- **Attendance at lab session is required to receive credit for that lab** (stopping by isn't good enough).

Final Project: You and a single partner will share a board and car. **Otherwise, the final project must be done on your own.**

Late Penalty:
The late penalty for assignments and labs is 10% per day (including weekend days) up to a maximum of 50%. Assignments will not be accepted if they are more than five (5) days late. This policy will be strictly adhered to, because solutions will be posted.

Buying the boards: At the end of the semester the boards will be sold for $10 each. If we have more takers than boards, we will have a drawing to determine winners. The funds will pay for components not paid for by lab fees and equipment.

Class meetings: TTh 10:20-11:35, SH113
Lab meetings: Thurs 11:45-1:25, SH118

Instructor: Professor Jan Wiebe
Science Hall, Room 163
646-6228
wiebe@cs.nmsu.edu
http://www.cs.nmsu.edu/ wiebe
Office Hours: Mon, Fri 2-3pm
and by appointment (requested and scheduled via email)

Important Dates:		
	midterm exam:	Thurs March 12
	last day to drop with W:	Wed March 18
	no class:	April 10
		March 2-6
	final exam:	Tues May 12 10:30am-12:30pm

I Grades: The grade of I (incomplete) may be given only if you are unable to complete the course due to documented circumstances beyond your control that develop after the last day to withdraw from the course. Appropriate circumstances include illness and death or crisis in your immediate family. Consult the university catalog for regulations regarding an I grade. In no case will an I grade be assigned to avoid a grade of D or F in the course.

S/U Grades: If you elect to be graded under the S/U option, you must declare your intention when registering for the course. All work in the class will be graded in a manner identical to that for students choosing the letter grade option. At the end of the semester, your final letter grade in the course will be used to assign either an S or a U. In accordance with Faculty of Arts and Sciences regulations, you must achieve a minimum grade of C in order to receive a grade of S.

Academic Conduct: The guidelines for academic conduct are state in the NMSU Student Handbook. Any violations of the code as stated in the handbook will result in a grade of F for the course in addition to any further sanctions imposed by the university.

Miscellaneous: If you have, or think you have, a disability that interferes with your academic progress, you may contact Services for Students with Disabilities at 646-6840 (V) or 646-1918 (TTY) for an appointment. Services for Students with Disabilities is located in Garcia Annex, Room 102. Current and appropriate documentation will be required in order to receive services.

Safety Escort Service Escorts are available to help people during the period sundown to 12:30am. Interested students should call 646-1111.