CS33D-Microcomputer Architecture

Winter 2002-2003

Description: This class is an introduction to the hardware and low-level software of microcomputers, and their interaction, with simple applications. There is both a lecture and a laboratory component. The topics have been selected to give the student a base from which to pursue further aspects of hardware and software application.

Basic principles to be studied include: binary numbers, arithmetic and information coding; Boolean algebra; digital logic circuits; machine and assembly language programming; and interfacing hardware and software. A detailed course outline follows.

Beginning with number systems suitable to digital logic, basic logic gates and circuits will be introduced. Then using the basic circuits as building blocks, register circuits and memory devices are introduced. Then the synchronized operation of these devices on a "bus" is used to illustrate the basic microcomputer architecture. Then in the second half of the course, the programmed operation of the microcomputer is studied using assembly language. The course concludes with an introduction to interfacing hardware and software.

Prerequisites:	An introductory lab course in natural science or computer programming.
Textbook:	Malvino and Brown, "Digital Computer Electronics" (hardware topics); Handout material (software topics).
Meetings:	Lec MWF 12-1, WS-2602; Lab T 12-3, WS-2508

Instructor:	Dr. Mark W. Jacobs (mjacobs@nmu.edu)
Office:	WS-2509, 227-2557 or 227-2450
Hours:	Open. You can call to see if I'm there, first.
WWW:	http:/ /physics.nmu.edu/faculty /mjacobs http:/ /physics.nmu.edu/ courses/ cs330

Requirements: There will be a weekly quiz in lecture, two exams (midterm and final), and weekly lab exercises. Quizzes will normally be on Fridays, and cover the material since the last quiz, as an inducement to keep up. Lab exercises should be written up and handed in before you leave. You may work in groups, but you must hand in your own report.

Note: if you cannot be present for a quiz, exam, or lab exercise, you must make arrangements beforehand; except in extreme cases, missed assignments cannot be made up. Legitimate excuses include participation in university-sanctioned athletic events, etc. (Please do not ask to reschedule on the basis of an early vacation departure, etc.)

Grading: The scale for letter grades is not pre-determined, but should be close to the usual 90-A, 80-B, . . . one. The components are weighted as follows; the date of the midterm may be adjusted to coordinate with lecture topics.

Quizzes:	30% (Fridays, usually)
Midterm:	25% (Fri, Feb 28)
Final:	25% (Mon, Apr 28, 12-2pm)
Labs:	20%

ADA statement: "If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office at 1104 University Center (voice: 227- 1737, fax: 227-1714, tty: 227-1543). Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines."

CS330 Microcomputer Architecture
Winter 2002-2003
Instructor: Jacobs

2003	Mo	Tu	We	Th	Fr	Lecture (MWF noon, WS-2602)	Lab (T noon--3, WS-5008)	Quiz/Exam (F)
Jan	13	14	15		17	Representing data: Number systems. Binary arithmetic.		1. Number systems
	20	21	22		24	Binary logic: Operations. Gates. Truth-tables.	1. Diode logic (gates)	2. 2's compl, truth tables
	27	28	29		31	Designing circuits: Sum-of-products method. Karnaugh maps.	2. TTL logic (die circuit)	3. Karnaugh map, SOP circuit
Feb	3	4	5		7	Storing/manipulating bits: flip-flops. Timing diagrams.	3. Flip-flops	4. Flip-flops, timing diag
	10	11	12		14	Arrays of bits: Buffers. Counters. ROM.	4. Counter.. triggering	5. Buffer, counter circuits
	17	18	19		21	Data transfer: RAM. 3-state. Bus org.	5. Hardware project, 1/2 (*1)	6. ROM, RAM, 3-state
	24	25	26		28	Simple computer architecture: SAP-1. Machine cycle.	6. Hardware project, 2/2	MIDTERM EXAM
Mar	3	4	5		7	(Mid-semester break)		
	10	11	12		14	Programming: "Assembly". x86 CPO. Arith instr/flags.	7. Data storage/arithmetic	7. Addressing, arithmetic
	17	18	19		21	Flow control: Interrupts. Logic. Jumps.	8. Console i/o (ASCII codes)	8. Interrupts, jumps
	24	25	26		28	Advanced constructs: The stack. Loops. Procedures.	9. Procedures (Calculator)	9. Procedures
Apr	31	1	2		4	Interfacing: Procedures (cont'd). I/O ports.	10. Port i/o (Speaker)	10. Port i/o
	7	8	9		11	Interfacing: PPI card. Macros.	11. Interfacing, 1/2 (*2)	11. Macros
	14	15	16		18	Assembler directives: Macros. ASM listings.	12. Interfacing, 2/2	12. Assembler listings
	21	22	23		25	Special topics/examples. Course review.	(Disassembly)	(no quiz -- review)
	28							FINAL EXAM

==========

Notes

*1) Convert counter to keypad, voltmeter.

*2) Convert hardware projects (*1) to computer control.