CEG 411/611: Microprocessor-based system design
Fall 2001
Time: Tu-Th 11:00-12:15
Room: 148 Russ Engineering Center

Instructor: Ricardo Gutierrez-Osuna
Office: 401 Russ Engineering Center
Phone: 775-5120
Email: rgutier@cs.wright.edu
Office Hours: TBA

Teaching Assistant: Mohammed Tabrez
Office: 339 Russ Engineering Center
Email: tmohamme@cs.wright.edu
Office Hours: TBA

Catalog Description: Introduction to the design and development of software and computer-interfacing hardware for effective use of microprocessors in process control, data collecting, and other special-purpose computing systems. Software topics include assembly language programming, input/output, interrupts, direct memory access and timing problems. For non-majors only. 3 hours lecture, 2 hours lab.

Prerequisites: CEG260/EE 351, EE 301, EE 302 or equivalent courses. Prior knowledge of the following areas is required: digital electronics including combinatorial and sequential logic, decoders, memories, Boolean algebra, binary and hexadecimal numbers. Knowledge of the C programming language is also required.

Books:

- Microprocessor systems design, 68000 Hardware, Software and Interfacing, 3rd Ed. Alan Clemens, PWS Publishing Company, 1997, (Official textbook).
- SBC68K User's Manual 1.1, Arnewsh, Inc. (In Lab, also available at bookstore)
- CrossCodeC for the 68000 Microprocessor Family, Software Develop. Systems (In Lab).
- Programmer's Reference Manual.
- PI/T handbook (loaned for the quarter).

Course Objectives: The course has three basic objectives:

- Introduce the architecture of typical microprocessor systems
- Provide the foundations of assembly language programming
- Present the methodology for device programming and interfacing.

Course Outcomes: Upon satisfactory completion of the course, the student will be able to:

- Describe the programmer's model of the MC68000 microprocessor.
- Write assembly language programs using a variety of instructions and addressing modes.
- Apply assembly-level structured programming techniques using branching and subroutines.
- Write C language programs and describe how they relate to assembly-level code.

- Write device routines in C and assembly language using polling and interrupt modes.
- Program specific devices such as the PI/T parallel I/O and timer device, and the DUART serial I/O device.

Course Outline

- Module I: Programming (8 lectures)
  - MC68000 architecture (2)
  - Assembly language (5)
    - Instruction and addressing modes (2)
    - Flow control (1)
    - Subroutines (2)
  - C language (1)
- Module II: Peripherals (9)
  - Exception processing (1)
  - Devices (6)
    - PI/T timer (2)
    - PI/T parallel port (2)
    - DUART serial port (1)
  - Memory and I/O interface (1)
  - Address decoding (2)

Grading: The course grade will be the weighted sum of five grades. Grading will be straight scale (90-100 A, 80-89 B, 70-79 C, 60-69 D, below 60 F). These numeric thresholds may be lowered due to clustering, but will not be raised.

- **Tests**: There will be one midterm exam and one final exam. All tests will be closed-books, closed-notes. One double-sided, hand-written sheet (8.5 x 11") will be allowed. All tests will be comprehensive, with an emphasis on new material.
- **Homework**: Four homework problem sets will be assigned, approximately every two weeks. This material will not be graded; you are encouraged to do the problems to prepare for the quizzes.
- **Quizzes**: Four short quizzes will be held, approximately every two weeks. Quizzes will be based on recent homework and lecture material. All quizzes will be closed-books, closed-notes and no cheat-sheets will be allowed.
- **Laboratory**: There will be five laboratory assignments. An average Laboratory grade of 75% or higher is required to pass the course. There are three laboratory sections: Tuesday (9:00am-10:50am), Thursday (12:30pm-2:20pm) or Friday (10:00am-11:50am).

	Weight (%)
Quizzes	20
Laboratory	40
Midterm	20
Final Exam	20

Graduate students taking the CEG611 section will be assigned additional problems during tests and quizzes.

Laboratory rules: The following rules will be observed:

1. All Labs will be done on the PCs in Russ 339.
2. Lab reports are expected to be done professionally, both in structure and writing.
3. Lab reports are due the day of the following scheduled lab. A 10% penalty will be applied per day for late submissions.
4. You are expected to bring a floppy disk to the lab. Keep all your programs on your floppy disk. Do not leave any programs on the hard drives.
5. No manuals or equipment can be taken from the lab without approval from the instructor.

Missed Tests: Missed tests can only be made up in case of emergency or work conflicts, and will require supporting documentation. Whenever possible, these issues should be discussed with the instructor prior to the conflicting date. Missed quizzes cannot be made up.

Collaboration vs. Academic Dishonesty: Students are encouraged to exchange ideas and form study groups to discuss the course material and prepare for tests. However, discussions regarding Laboratory assignments should be kept at the conceptual level. Unless group projects are explicitly assigned, copying or sharing code on laboratory projects will be considered a violation of the University guidelines for academic honesty. These guidelines will also be followed to evaluate student conduct during quizzes and tests.

Tentative Course Schedule

	Week		Topics	Reading	HW	Quiz	Labs (Wed)
Module I: Programming	1	9/11	No class				
		9/13	Course introduction	1, Syllabus			
	2	9/18	MC68000 architecture	2.2			Lab I: Simulator usage, tracing execution
		9/20	MC68000 instruction set	2.1, 2.4-6	Set 1		
	3	9/25	Addressing modes	2.3		Quiz1	Lab II: Simple assembly, program control
		9/27	Program Control	2.5, 2.10			
	4	10/2	Subroutines I	2.7, 3.1			
		10/4	Subroutines II	3.2	Set 2		
	5	10/9	C language	3.3, 3.4		Quiz2	Lab III: Subroutines and stack frame
		10/11	Material Review				
Module II: Peripherals	6	10/16	**Midterm**				
		10/18	Exception processing I	6.1-4			
	7	10/23	PI/T timer, part I	pp. 670-677			Lab IV: PI/T timer
		10/25	PI/T timer, part II	pp. 670-677			
	8	10/30	PI/T parallel I/O, part I	8.3			
		11/1	PI/T parallel I/O, part II	8.3	Set 3		
	9	11/6	Memory and I/O interface	4.1-2, 8.1-2		Quiz3	Lab V: Parallel I/O, handshaking
		11/8	Address decoding	5.1-2			
	10	11/13	Address decoding	5.1-2			
		11/15	Serial I/O (if time permits)	9.1, 9.4-5	Set 4		
	11	11/20	Material Review			Quiz4	
		11/22	Thanksgiving (No class)				
Finals	12	11/27					
		11/29	**Final Exam, Russ 148,**				