EE 4342 Microprocessor System Design Project
Spring 2003
TTh 5:30-6:50pm, 108 NH (Lecture)
T or Th 7:00-9:50pm, 148 NH (Lab)

Instructor:
Jason Losh, Ph.D.
jlosh@uta.edu
Office Hours are before 4pm in 208 WH, after 7pm 148 NH, or in the 509 NH by appointment.
E-mail is the quickest method of contacting me on non-class days.

Textbook:
Use the textbook used in your EE3310 coursework. Extensive references, datasheets, application notes, and class notes will be provided on the course web site at http://omega.uta.edu/~jlosh/.

Modified Catalog Course Description:
Design principles for digital and analog instrumentation utilizing open computer architectures (ISA) and proprietary microcontrollers. The course is intended to provide a comprehensive design experience in microprocessor- and microcontroller-based applications. Will include bus protocol analysis, timing design, simulation, prototype development, and physical debugging of digital circuits. Prerequisite: EE 3310, EE 3317, EE 3340 and senior standing.

Comments on the Course:
All topics discussed in class will be accompanied with demonstrations in class using real hardware and software (C and assembly based). While the emphasis of the in class portion is the 8086 and 8088 microprocessors and PIC microcontrollers, students are free to use other microprocessors and microcontrollers for project construction.

It is estimated that project costs will range from $150 to $400 per team. This cost is mitigated since no textbook is required for the course.

Prerequisite Background:
Familiarity with the 8086 processor or a very good knowledge of other processors, such as the 8088 or 68000, or microcontrollers, such as the HC11 or 8051, is essential. Essential background also includes assembly language programming, memory organization, mapping, and timing, basic i/o interfacing, and interrupt operation. Also, knowledge of C or C++ is important.

A good understanding of BJT and FET circuits and Fourier series and transforms will also be very useful.

Course Topics:
- Course introduction and discussion of course objectives
- Presentation of suggested topics
- Microprocessors and microcontrollers supported in lab: Intel, Microchip, and Motorola
- Platform demonstrations (ISA bus PC and 16F877A/16C765 PIC designs)
- Comparison of microprocessor and microcontroller architectures
- Review of 8086 assembly language programming and high-level language function calls
- Introduction to 16F877A assembly language and high-level programming
- Comparison of 8086 code and 16F877A microcontroller code
- Review of 8086 maximum-mode architecture, interfacing, timing, and memory
- Memory: organization and interfacing, refresh, ROM (EPROM and flash) and RAM
- Interrupts: software and hardware interrupts, interrupt service routines, and interrupt hooking
- Interrupts v. polling: latency, effective rates, and efficiency
- Clock issues: timers, interface reference clocks, sampling clocks, and asynchronizing blocks
- I/O issues: digital and analog signal interfacing, isolation, ground loops, noise, and EMI
- I/O buses and interfaces: PCI, ISA, RS-232/422/423/485, IEEE-1284, and USB

Additional References:
Many resources will be provided in addition to the textbook. These documents will be posted at http://omega.uta.edu/~jlosh/.

Digital resources:
- *Digital Logic Design Principles* by Balabanian and Carlson, 2001, ISBN 0-471-29351-2
- *An Engineering Approach to Digital Design* by Fletcher, 1980, ISBN 0-13-277699-5

80x86 software resources:
- *The Art of Assembly Language Programming* by Hyde, http://cs.smith.edu/~thiebaut/ArtOfAssembly/artofasm.html
- *Intel Architecture Software Developer's Manual, vols. 1 through 3*, Intel 1999
- *The Programmer's PC Sourcebook* by Hogan, 1988, ISBN 1-55615-118-7

80x86 hardware resources:
- *Intel 386™ DX Microprocessor Datasheet*, Intel, 1995
- *Intel Pentium® Processor with MMX Technology*, Intel, 1997
- *Intel Pentium 4® Processor with 512-KB L2 Cache*, Intel, 2002
- *Microprocessors vols. 1 and 2*, Intel, 1992, ISBN 1-55512-150-0
- *Microprocessors and Interfacing – Programming and Hardware*, 2nd ed. by Hall, 1992, ISBN 0-07-025742-6
- *The 8088 and 8086 Microprocessors – Programming, Interfacing, Software, Hardware, and Applications, 3rd ed.* by Triebel and Singh, ISBN 0-13-010560-0
- *Microprocessor Systems: The 8086/8088 Family*, 2nd ed. by Liu and Gibson, 1986, ISBN 0-13-580499-X

Microcontroller resources:
- *PIC 16C745/765 Microcontrollers with USB Datasheet*, Microchip, 2000
- *PIC 16F84A Microcontroller Datasheet*, Microchip, 2001
- *PIC 16F874-77 Microcontrollers Datasheet*, Microchip, 2001
- *PICDEM User's Guide*, Microchip, 2001

Important Dates:
First Class (Tuesday, 1/13), MLK Jr. Holiday (Monday, 1/20), Project Plan Due Date (Thursday, 1/30), Census Date (Wednesday, 1/29), First UG Drop Date (Friday, 2/21), Test 1 (Tuesday, 3/11), Midsemester (Friday, 3/7), Spring Vacation (Monday-Friday, 3/17-23), Last Drop Date (Friday, 4/11), Test 2 (Thursday, 4/24), Project Due Dates (Tuesday and Thursday, 4/29 and 5/1), Last Day of Classes (Friday, 5/2), Grades Due (Tuesday, 5/13), Grades Available Online (Wednesday, 5/14)

Performance Assessment:
- Grade scale: A (90-100), B (75-89), C (60-74), D (50-59), and F (0-49)
- Grade calculation: (Test1 + Test2 + Project × 2) / 4
- The instructor reserves the right to make reasonable changes in performance evaluation as needed.

Graduate Teaching Assistants:
Rayner Barboza, raynerbarboza@hotmail.com, M 10am-1pm in 205.10 NH, T 7-10pm in 148NH
Young Hoon Song, song_uta@hotmail.com, W 6-9pm in 254.9 NH, Th 7-10pm in 148NH
Liao Chen, liaochen@yahoo.com, MW 1-4pm in 254 NH

Tests (50% of Grade):
- Calculators, rulers, pencils, pens, books, and notes will be allowed during tests.
- Any device capable of compiling or emulating any 80x86 code can not be used during in-class portions of the tests.
- Take home portions of tests will be due within one week of assignment.
- No makeup will be provided for any test.
- Any request for re-grading must be submitted to the grader within one week of the return date.

Project (50% of Grade):
- Project teams will consist of one to three team members.
- The initial project plan is due on Thursday, 1/30.
- Interim deadlines will vary upon the project chosen.
- The final project will be presented in class on either Tuesday, 4/29 or Thursday, 5/1.
  (random assignment to defense day unless enough volunteers chose Tuesday)

Academic Honesty:
It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University. "Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts." (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22). ANY CHEATING WILL RESULT IN SEVERE PENALTIES. All work submitted must be original. If derived from another source, a full bibliographical citation must be given.

To be eligible to participate in two or three member project teams, you will be requested to sign and return a letter acknowledging the College of Engineering Ethics policy.

Americans with Disabilities Act:
If you require an accommodation based on disability, please feel free to meet with me during the first week of the semester to make sure that you are properly accommodated. Contact Dr. Cheryl Cardell (272-3670) or Mr. Jim Hayes (272-3364) for more information.