EE 6314 Advanced Embedded Microcontrollers
Spring 2004
MW 4-5:20pm, 105 GACB

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

Textbook:
Extensive references, datasheets, application notes, and class notes will be provided on the course web site at http://omega.uta.edu/~jlosh/.

Catalog Course Description:
6314. ADVANCED EMBEDDED MICROCONTROLLER SYSTEMS (3-0). Study of advanced microcontroller system designs with an emphasis on multi-tasking, real-time control of devices. Topics include: design of real-time control systems, programmable logic controller (PLC) hardware, USB peripherals, and network appliances. Prerequisite: EE 5314 or consent of instructor.

Comments on the Course:
As in EE5314, all topics will be accompanied with working hardware and software. A common prerequisite and smaller class size allow this class to be conducted in a collaborative team style, where system design, specification, and implementation are accomplished through a combination of individual and group tasks, with different members of the team having responsibility for varying parts of the design. Some flexibility in grading may be provided in students wishing to solve more difficult assignments.

Prerequisite Background:
Completion of EE5314 Embedded Microcontrollers (listed as EE5319) during Spring or Fall 2003 is required. Alternatively, strong performance in EE4342 may be sufficient for enrollment provided tha extra attention is afforded to learning all EE5314 demo board programs.

A good understanding of ANSI C is also required. On the PIC controller, code will be written using the CCS compiler and several Win32 applications will be written using Microsoft Visual Studio®.

Course Topics:
- Group decision on the class project topic
- Review of 16F877A assembly code (setup example)
- Study of the limitations of the 16F877A and transitioning to the 18F452
- Porting EE5314 demos to 18F452 ASM and C code (adding bootloader as an example)
- Study of the limitations of the EE5314 hardware platform (missing peripherals and conflicts)
- Design of a new hardware platform (superset of features)
- Porting 18F452 C code to new hardware platform
- Development of drivers for new peripherals (formal address/data buses, ps/2 keyboard, ethernet)
- Ethernet applications with MAC only support, ARP/RARP, ICMP (ping, ack, nack), IP, UDP
- Determination of the need for a real-time os (formulation of a flawed non-rtos design)
- Case study of real-time os problems (priority inversion on Mars, blocking threads)
- Converting old device drivers and functions to rtos-friendly handlers (data pumps, threads, …)
- Construction of a real-time operating system w/ PC programmability through RS-232 or ethernet
- Expansion to USB (time allowing)

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

Microcontroller resources:
- *PIC 16F874-77 Microcontrollers Datasheet*, Microchip, 2002
- *PIC 18F452 Microcontrollers Datasheet*, Microchip, 2002
- *PIC 16C745/765 Microcontrollers with USB Datasheet*, Microchip, 2000
- *Mid-range MCU Family Reference Manual*, Microchip, 1997
- *CCS C Compiler*, CCS Inc, 2003.

Important Dates:
First Class (Wednesday, 1/21), Project Plan Due Date (Monday, 2/2), Census Date (Wednesday, 2/4), First UG Drop Date (Friday, 2/27), Test 1 (Wednesday, 3/10), Midsemester (Friday, 3/12), Spring Vacation (Monday-Friday, 3/15-19), Last Drop Date (Friday, 4/16), Project Due Date (Monday, 5/3)

Performance Assessment:
- Grade scale: A (90-100), B (75-89), C (60-74), D (50-59), and F (0-49)
- Standard grade calculation: (Test + Mini Project 1 + Mini Project 2 + Mini Project 3) / 4
- Some flexibility in grading may be provided in students wishing to solve more difficult assignments.
- The instructor reserves the right to make reasonable changes in performance evaluation as needed.

Graduate Teaching Assistant:
Kim Youngjune, paul72kim@hotmail.com

Other GTAs Providing Lab Access:
Song Younghoon, song0625@hotmail.com (GTA for EE3310)
Mehrotra Sankalp, sankalpm4@hotmail.com (GTA for EE4342)

Lab Hours:
The goal is to have the lab open from Monday-Thursday from 9am to 10pm, Friday from 9am to 9pm, and Saturday from 9am to 3pm. Hours M-F before 6pm will fall under the EE Dept Open Lab Hours Policy. GTA's will cover hours after 6pm and on Saturdays. The lab may not be available at certain periods on these days, such as times around lunch or from 5-6pm.

Test (25% of Grade):
- Calculators, rulers, pencils, pens, books, and notes will be allowed during tests.
- Any device capable of compiling or emulating PIC 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.

Mini Projects (75% of Grade):
- Mini Project 1 (porting code to the 18F452) will be solved individually.
- Mini Projects 2 and 3 (hardware drivers and rtos topics) will consist of project teams.
- Some hardware will be needed for these projects, but its complexity will be minimal for most topics.
- Project deadlines will be announced as assignments are made.

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.