

# **EE 5314 Embedded Microcontroller System Design**

## **Fall 2010**

### **4:00-5:20pm MW, 105 NH**

#### **Instructor:**

Jason Losh, Ph.D.

[jlosh@uta.edu](mailto:jlosh@uta.edu)

Office Hours are after 5:20pm MW outside 105 NH or in 148NH as lab activities increase.

E-mail is the quickest method of contacting me on non-class days.

#### **Textbook:**

No textbook will be required for this course. Extensive references, datasheets, application notes, and class notes will be provided on the course web site at <http://omega.uta.edu/~jlosh/>.

#### **Listserv:**

Please sign up for the EE5314-L listserv to receive the latest updates (goto <http://listserv.uta.edu> to manage your subscriptions or send a message to [listserv@listserv.uta.edu](mailto:listserv@listserv.uta.edu) with no subject line and the command SUBSCRIBE EE5314-L as the message body).

#### **Catalog Description:**

5314. EMBEDDED MICROCONTROLLER SYSTEMS (3-0). Hardware/software development techniques for microcontroller systems with emphasis on hardware-software interactions, programming internal peripherals, and real-time control and conditioning of external devices. Topics include: code efficiency issues, pin reuse issues, interrupt-driven processing, USART operations, I2C and SPI bus peripherals, and use of internal peripherals.

#### **Prerequisite Background:**

Very good knowledge of at least one microprocessor or microcontroller is mandatory. Essential background includes assembly language programming, memory organization, memory mapping, bus timing, basic i/o interfacing, and interrupt operation.

A good understanding of BJT and FET circuits, Fourier series and transforms, 1<sup>st</sup> and 2<sup>nd</sup> order control loops, and basic communications will also be very useful.

#### **Course Topics:**

- Course introduction and discussion of course objectives
- Harvard v. von Neuman architectures
- Comparison of microcontroller and microprocessor architectures
- Study of 24FJ64GA002 microcontroller built-in devices including timers, PWM, interrupts, i/o ports, and a/d converters
- Determining microcontroller memory, speed, and capabilities to solve a task
- Interfacing with I2C, 1-wire, SPI, serial
- Measurement and instrumentation applications
- Device control: Motors, servos, relays, heavy AC and DC loads
- Real-time control applications

#### **Important Dates:**

First Class (Monday, 8/30), No Class (Monday, 9/6), Census Date (Monday, 9/13), Test 1 (Wednesday, 10/20), Last Drop Date (Friday, 11/5), Test 2 (Wednesday, 12/1), and Project Defense (Wednesday, 12/8 @ 4pm)

#### **Performance Assessment:**

- Grade scale: A (90-100), B (80-89), C (70-79), D (60-69), and F (0-59)
- Grade calculation: (Test 1 + Test 2 + Project) / 3
- The instructor reserves the right to make reasonable changes in performance evaluation as needed.

**Graduate Teaching Assistants:**

All office hours are in the lab (148 NH).  
Hours and GTAs to be announced.

**Lab Orientation:**

EE department policy requires that students utilizing 148NH attend a safety orientation session.

**Tests:**

- Calculators, rulers, pencils, pens, books, and notes will be allowed during tests.
- Any device capable of compiling or emulating microcontrollers or microprocessors can not be used during in-class portions of the tests.
- The take home portions of Test 1 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.

**Cost:**

No textbook will be required.

An in-circuit debugger will be provided to check out for the semester to teams of 3 and off-campus students. If adequate numbers of programmers are available, teams of 1 and 2 members will also be provided in-circuit debuggers for check out. Programmers are also available for use in 148NH. For students unable to utilize the provided programmers, a programmer will need to be purchased.

Parts required for the project will generally be less than \$25 per team.

**Projects:**

- Project teams will consist of one to three team members. No teams of 4 or more will be allowed under any conditions, without exception.
- Projects will be defended on the last class day during class hours.
- A lab in 148NH is available to construct the hardware portion of your project and test your project, provided you attend a mandatory lab safety orientation.

**Academic Integrity:**

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, Series 50101, Section 2.2)

EE Department Policy requires that you sign and return a letter acknowledging the College of Engineering Ethics policy.

**Americans with Disabilities Act:**

The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 92-112 - The Rehabilitation Act of 1973 as amended. With the passage of federal legislation entitled Americans with Disabilities Act (ADA), pursuant to section 504 of the Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide "reasonable accommodations" to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests

with informing faculty of their need for accommodation and in providing authorized documentation through designated administrative channels. Information regarding specific diagnostic criteria and policies for obtaining academic accommodations can be found at [www.uta.edu/disability](http://www.uta.edu/disability). Also, you may visit the Office for Students with Disabilities in room 102 of University Hall or call them at (817) 272-3364.

**Student Support Services:**

The University of Texas at Arlington supports a variety of student success programs to help you connect with the University and achieve academic success. These programs include learning assistance, developmental education, advising and mentoring, admission and transition, and federally funded programs. Students requiring assistance academically, personally, or socially should contact the Office of Student Success Programs at 817-272-6107 for more information and appropriate referrals.