Syllabus: AME 3623: Embedded Real-Time Systems
(Spring 2009)

General Information

● Meeting time: Tu/Th 9:00-10:15

● Location: Carson Engineering 441

● Lab location: Felgar Hall 100/101

● Prerequisites: AME 2623 or equivalent, and CS 1313 or equivalent. Note that we will be doing programming in C.

● Available in the book store:

● Course web page: http://www.cs.ou.edu/~fagg/classes/ame3623

● We will also be making heavy use of Desire to Learn

● Instructor: Dr. Andrew H. Fagg
  ○ Office: EL 152
  ○ Phone: 325-8606
  ○ Homepage: http://www.cs.ou.edu/~fagg
  ○ Email: fagg--cs.ou.edu
  ○ Office hours: see the office hours page

● Teaching Assistant: Di Wang
  ○ Office: (lab) FH 100/101
  ○ Email: di --ou.edu
  ○ Office hours: TBA, or by appointment
Course Goals and Topics

By the end of this course, you should be able to:

- design and analyze digital circuits involving combinatorial and sequential components,
- design and implement embedded circuits involving microcontrollers, sensors, and actuators,
- program and debug embedded sensing and control software, and
- work in collaborative teams.

This is a very hands-on class: every student will be involved in the design, implementation, and programming for the laboratory exercises. Note that this component of the class will involve a non-trivial amount of time; students should plan their schedules accordingly.

Topics will include:

- digital logic and Boolean Algebra,
- sequential logic,
- number representations and arithmetic,
- basic processor design,
- embedded system development environments,
- processor input/output implementations and electronic interfaces,
- serial protocols and implementation,
- basics of operating systems (including concurrency and real-time issues), and
- issues in embedded hardware design.

Course Policies

- **Attendance:** We will discuss concepts and examples in class that are not in the textbook. Another student's notes are an inadequate substitute for class attendance. You are responsible for everything that is announced in class.

- **Class Web Page:** Most of the material that you will need can be found on the class web page located at: [http://www.cs.ou.edu/~fagg/classes/ame3623](http://www.cs.ou.edu/~fagg/classes/ame3623)
● **Desire to Learn:** This class will also use D2L, located at: [http://learn.ou.edu](http://learn.ou.edu)

Login with your 4+4 (typically the first four letters of your last name followed by the last four digits of your student number), using your standard OU password. If you have difficulty logging in, call 325-HELP. This software provides a number of useful features, including a list of assignments and announcements, an electronic mailing list, newsgroups, and a grade book.

I will update the main web site and the D2L page several times a week. When I update the site in any significant way, I will post an announcement on D2L telling you what has been added and where it is located. You are responsible for things posted on the site within 48 hours of the post.

● **Class Email Alias:** Urgent announcements will be sent through email. It is your responsibility to:
  o Have your university supplied email account properly forwarded to the location where you read email.
  o Make sure that your email address in D2L is correct, and forwards email to the place where you read it. I'll send out a test message during the first week of class. If you do not receive this message, it is your responsibility to get the problem resolved immediately.
  o Have your email program set up properly so that replying to your email will work correctly the first time. You can send email to yourself and reply to yourself to test this. I will not make any attempt to get bounced email messages delivered.

If you need assistance in accomplishing any of these tasks, contact 325-HELP.

● **Examinations:** There will be a midterm and a final examination. The dates are given in the class schedule. During examinations, students are expected to sit in assigned seats. Missing an examination without a previously approved excuse will result in a grade of zero for that examination.

● **Final Examination:** The final examination is Wednesday, May 13th from 8:00 to 10:00. The final is comprehensive, as required by College of Engineering policy. No final examinations can be given early, except as required by University policy.

● **Newsgroups and Email:** The newsgroup on D2L should be the primary method of communication (outside of class). This allows everyone in the class to benefit from the answer to your question, and provides students with more timely answers since both the TA and I check D2L at least once a day. Matters of personal interest should be directed to email instead of to the newsgroup, e.g. informing me of an extended personal illness. Posting guidelines for the newsgroup are available on D2L.

● **Academic Misconduct:** Feel free to discuss homework and labs with the instructor or the TA. However, **do not discuss, look at, or copy another student's solution to a homework assignment, as this is considered cheating.**
The four hardware projects will be performed in collaboration with 3-4 other people. Within groups, you are expected to discuss and share solutions. Discussion between groups is fine, but **the sharing of project-specific circuit diagrams or code is considered cheating.**

You may make use of the net as a reference as you are working on homework and labs. However, **downloading specific homework or project solutions from the net is considered cheating.**

Make sure that your computer account is properly protected. Use a good password, and do not give your friends access to your account or your computer system. Do not leave printouts, floppy disks or thumb drives around a laboratory where others might access them.

Programming projects will be checked by software designed to detect collaboration. This software is extremely effective and has withstood repeated reviews by the campus judicial processes.

Upon the first documented occurrence of collaborative work, I will report the academic misconduct to the Campus Judicial Coordinator. The procedure to be followed is documented in the University of Oklahoma Academic Misconduct Code ([http://www.ou.edu/studentcode/OUStudentCode.pdf](http://www.ou.edu/studentcode/OUStudentCode.pdf)). In the unlikely event that I elect to admonish the student, the appeals process is described in [http://www.ou.edu/provost/integrity-rights/](http://www.ou.edu/provost/integrity-rights/).

- **Tutors:** Tutors can be an excellent source of support for students who are having difficulty in the class, but only if the tutor is aware of the distinction between teaching students the material so that they can do their own work, and doing work for students. Tutors who do work for students are not only failing to help the students learn, they are abetting academic misconduct. Examples of misconduct include:
  - If your tutor is sitting behind you while you are typing and methodically telling you what to enter, he or she is abetting academic misconduct.
  - If you tutor is emailing files containing partial or complete programming projects to you, you will commit academic misconduct if you use those lines in your program.

A more effective use of tutoring services is to do problems that are similar to the assigned work, instead of doing assigned work. For example, it would be fine to work unassigned problems from the textbook with a tutor. This requires significant discipline, both on the part of the tutor and the part of the student. Copying from a tutor is as unacceptable as copying from another student. If your tutor doesn't know how to teach properly, please ask them to call or visit me and I will provide training and guidance. If you are tutoring someone else in the class, you can be accused of academic misconduct if this person copies your work.

- **Incompletes:** The grade of "I" is intended for the rare circumstance when a student who has been successful in a class has an unexpected event occur shortly before the end of the class. I will not
consider giving a student a grade of "I" unless the following three conditions have been met.

- It is within two weeks of the end of the semester.
- The student has a grade of C or better in the class.
- The reason that the student cannot complete the class is properly documented and compelling.

- **Accommodation of Disabilities:** The University of Oklahoma is committed to providing reasonable accommodation for all students with disabilities. Students with disabilities who require accommodations in this course are requested to speak with the professor as early in the semester as possible. Students with disabilities must be registered with the Office of Disability Services prior to receiving accommodations in this course. The Office of Disability Services is located in Goddard Health Center, Suite 166, phone 405/325-3852 or TDD only 405/325-4173.

- **Classroom Conduct:** Because cell phones and laptops can distract substantially from the classroom experience, students are asked not to use either during class (except in cases in which the laptop is required as part of a classroom exercise).

Disruptions of class will also not be permitted. Examples of disruptive behavior include:

- Allowing a cell phone or pager to repeatedly beep audibly.
- Playing music or computer games during class in such a way that they are visible or audible to other class members.
- Exhibiting erratic or irrational behavior.
- Behavior that distracts the class from the subject matter or discussion.
- Making physical or verbal threats to a faculty member, teaching assistant, or class member.
- Refusal to comply with faculty direction.

In the case of disruptive behavior, I may ask that you leave the classroom and may charge you with a violation of the Student Code of Responsibilities and Conduct.

- **Laboratory:** our class laboratory will be open once projects have been assigned. We must adhere to both the [FH 100/101 Policies](http://www.cs.ou.edu/~fagg/classes/ame3623_s09/syllabus.html) and the embedded systems lab policies. The latter are as follows:

  - No food or drink are allowed in the lab.

  - When leaving the lab, please be sure to clean up your workspace.

  - Because the equipment may be in short supply, please coordinate with others who will need these resources.

  - No equipment or supplies may leave the lab without the permission of the monitor.
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- No books may leave the lab (period).
- Please clear all guests with the lab monitor.
- Unless you have prior permission, please do not handle the projects of other class members.
- Always check your wiring before you power up your circuit (especially your power and ground connections).
- When removing chips from breadboards, always use an appropriate tool (not your fingers!).
- If you break something (including burning up a chip), please report it (don't just put it away).
- Students are expected to supply and configure their own laptop computers for project use.

Grades

Grades will be computed according to the following distribution:

- Midterm exam: 10%
- Final exam: 20%
- Five homework assignments and a small number of pop quizzes: 30%
- Four projects: 35%
- In-class participation: 5%

Grading notes:

- **Final grades:** will be assigned on a curve.

- **Project grades:** A group is first given a grade as a function of the quality of their work (factors include: correctness of the code, readability of the code, documentation, presentation by the group and the demonstration of the working code). If all group members contribute equally to the project (assessed in part by the group members), then all will receive the group grade. If there is an imbalance in the contributions, then the grades will be scaled accordingly (higher contributors will receive a higher grade and lower contributors will receive a lower grade). If a group member has already demonstrated a mastery of circuit building and/or coding, she/he should sit on her/his
hands and instead help the other group members work through the problems.

- **Grade questions:** Homework and project grade disputes should first be brought to the TA. If this does not resolve your question, please see me during office hours. Please note that I will examine the entire project or homework in question and your final grade may end up lower. All disagreements about the grading of projects or homework must be brought to the attention of the teaching assistant within one week of when the item was returned.

- **Desire to Learn Grade Summary:** D2L has a grade book that is used to store the raw data that is used to calculate your course grade. It is the responsibility of each student in this class to check their grades on D2L after each project or homework is returned. If an error is found, bring the graded document to me or the TA, and we will correct D2L.

- **Examination Grading Questions:** If there is a dispute about the grading of an examination problem, you may stay after class the day the tests are returned to discuss it. If you cannot stay at this time, return the paper to me and stop by during my office hours. Once a test has been removed from the classroom after it has been returned, the grade is final and will not be changed, even if it is found to be in error.

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**Projects and Homework**

- **Due dates:** Projects and homework assignments are due at 5:00pm on the date that is listed on the schedule.

- **Hand-in procedure:** Homework assignments may be handed in using the digital drop box on D2L, or in hardcopy form.

  Lab project reports may be handed in in either postscript or pdf format (no MSWord formatted-files); associated C code must be handed in as raw text. Both must be handed in using the digital drop box on D2L. Only one report is required for each group. In addition, individuals will be asked to hand in a short text evaluation of the project (more information to follow).

- **Late policy:** Because late assignments will seriously impact your ability to follow the next section of the course, you are required to hand in homework assignments on time. No late assignments will be accepted.

  Projects may be handed in late. If late by 0-24 hours, the project grade will incur a 10% penalty; if late by 24-48 hours, a 20% penalty will be imposed. Projects that have not been handed in by 48 hours will receive no credit.
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This page is online at http://www.cs.ou.edu/~fagg/classes/ame3623/syllabus.html

Andrew H. Fagg