Report on Curriculum Development Grant:  
*C490/P545: Embedded and Real-Time Systems*

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1. Products of the Project

I received the Curriculum Development Grant for the project titled “C490/P545: Embedded and Real-Time Systems” in March 2008. I spent two months in the summer of 2008 to develop this new course and taught the course first time in Fall 2008. The project has been successfully finished.

This project yielded important components for the new course: the syllabus, the lecture notes, the lab exercises and the project. Since this course is an advanced, lab-oriented course, I have spent a lot of efforts in designing the lab assignments and the final project. Using customizable robotics as the major vehicle, the challenging assignments and project greatly triggered students’ interests in embedded systems design -- they spent tremendous time and efforts working in the lab, especially for the final project (Robo-pong contest). I have attached the course syllabus at the end of this report. Some pictures and videos demonstrating students’ work can be found in the following webpage:  [http://www.cs.iusb.edu/~liqzhang/c490/f08/c490pv.htm](http://www.cs.iusb.edu/~liqzhang/c490/f08/c490pv.htm)

2. Description of Grant-Supported Activities

This grant has supported the following activities related to the developing of the new course:

- Purchasing two set of robotics development kit; each set includes one Handy Board, one LEGO Challenge Set and some extra sensors.
- Developing 4 lab assignments and the final project using the robotics development kits.
- Designing the course syllabus, selecting textbooks.
- Developing the lecture notes.

I taught this course first time in Fall 2008. The course received wide interests, and students’ evaluation was quite positive. It is tentatively scheduled to be offered again in Fall 2010, which by then is expected to be cross-listed as C490/P545.

3. Acknowledgement

I am thankful to the grant and everyone related to the approval and management of this grant. I would also like to thank my colleagues Prof. Dave Surma, Prof. James Wolfer, and Prof. Hossein Hakimzadeh in the Department of Computer and Information Sciences, for their support in applying this grant and their help in seeking other funding resources.
C490: Embedded and Real Time Systems

3 Credits, Mon/Wed, 4:00PM – 5:15PM
Instructor: Dr. Liqiang Zhang, Dept. of Computer and Information Sciences
http://www.cs.iusb.edu/~liqzhang/c490.htm

Course Description

Embedded systems are ubiquitous today. From cell phones, digital cameras, dishwashers, automotive devices, to aircraft, aerospace and medical devices, our lives are dependent on embedded systems. More than 98% of processors today are used in embedded systems. Moreover, recent advances in embedded systems, wireless networks, and sensing and control have led to a new computing paradigm called Cyber-Physical Systems. This new paradigm is expected to transform how we interact with the physical world in a way similar to the Internet transformed how we interact with one another.

This course will cover the fundamental concepts, theory and design principles of embedded systems. As a lab-oriented course, topics covered in lectures will be explored through challenging laboratory exercises/projects, where LEGO robots controlled by Handy Boards will be used as the platform.

Tentative Topics

- Overview and introduction of Embedded Systems
- Embedded system architecture
- Processor technologies
- Memory technologies and composition
- Interfacing and communications
- A/D and D/A conversion
- Sensor and actuators
- Real-time and control systems
- Wireless sensor networks
- Programming Handy Board/LEGO with Interactive C/assembly language

Required Text:


References:


Grading Scheme:
Your final grade will be based on the sum of five parts:

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<td>Homework/Labs/Project</td>
<td>500</td>
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<tr>
<td>Quizzes</td>
<td>50</td>
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<tr>
<td>First Midterm</td>
<td>200</td>
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<td>Second Midterm</td>
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<td>Attendance</td>
<td>50</td>
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<td><strong>Total points</strong></td>
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The final grade will be distributed as:

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Plus and minus grades are given if a total falls within 1.5% of the cutoff score; for example, a total of 886 will earn a B+.

Policies:

**Attendance:** Lecture attendance is very important. In addition to the normal lecture material, information regarding assignments, due dates, explanation and clarification of assignments, and material that is not covered in the assigned texts will typically be presented during each lecture. If you miss a class for any reason, it is your responsibility to become familiar with the material covered and to obtain missed handouts and notes. Perfect attendance for the semester adds 20 bonus points to your final grade. More than 2 absences will result in 10 points per absence (over 2) being subtracted from your final grade. Being excessively tardy for class or leaving class early counts as an absence.

**Homework/Lab assignments:** Each homework/lab assignment must be turned in by the start of class on the date that it is due. A 10-minutes grace-period will be given. After that, a submission is considered late. Late homework/lab submissions will be handled as follows:
After class has started on the due date, but by the midnight (12:00am) on the due date:

-10%

After midnight of the due date, but by the start of the next class after the due date:

-20%

After the start of the next class after the due date:

You lose all the points for that assignment!

**Reading assignments:** Be prepared to a lot of reading assignments. Readings and their timing will be assigned as the course progresses.

**Exams/Quizzes make-ups:** Missed exam can be made up only in the case of a properly excused absence. Make arrangements before missing exams. *Quizzes cannot be made up.*

**Academic Integrity:** All students enrolled in this course are expected to complete course work responsibilities with fairness and honesty. Scholastic dishonesty includes cheating and plagiarizing on assignments or examinations. Please read all the related issues at [http://www.iusb.edu/~judicial/](http://www.iusb.edu/~judicial/). Within this course, the scholastic dishonesty will result in a grade of zero for the first infraction and a grade of “F” for the second infraction.

**Disabilities notice:** If you need adaptations or accommodations because of a disability, if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please speak with me as soon as possible. Students also may call Disabled Student Services (520-4832) for additional information about services available at IUSB.

**C490: Embedded and Real Time Systems**