ECE4005b Internetworking Design

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Class Hours: T/Th 4:35-5:55 PM in Van Leer C340
Office Hours: T/Th 9:30-11:00 AM

Class Laboratory: COC 311
Lab Hours: See Schedule on door it is an "open" lab; Lab T.A.s for this class post hours also. It is during these hours you may obtain laboratory help.

Lab TA: David Jeffery gt0624b@prism.gatech.edu
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Students will work in groups of 4, please attempt to find your own group of 4.

Class Web site (includes previous class projects):
http://users.ece.gatech.edu/~owen/academic.htm
If you miss a class meeting, check the Web Site for handouts and look in the class handout box outside of COC360.

Overview
This course satisfies the major design project requirement for EE and CmpE majors. Working in teams, students will complete a semester-long project requiring specification, design, implementation, and testing. Formal written project proposals and final reports are required and all students participate in oral presentations. Projects incorporate engineering standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political. Projects for this course are based upon prior coursework in electrical and computer engineering.

Goals

The EE and CmpE Design Experiences are intended to provide a "capstone" or major design experience that culminates the students' undergraduate engineering program, integrating their accumulated technical knowledge with practice-oriented aspects of design. The experience consists of a required preparatory course, ECE 4000 - Project Engineering and Professional Practice, plus a senior-level design project elective.

This experience is the primary mechanism for satisfying the following portion of ABET General Engineering Criterion 4, Professional Component:

Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier coursework and incorporating engineering standards and realistic constraints that include most of the following considerations: economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political.

Additionally, this experience is one of the elements for demonstrating that graduates possess the following attributes required by ABET General Engineering Criterion 3, Program Outcomes and Assessment:

(a) an ability to apply knowledge of mathematics, science, and engineering
(b) an ability to design and conduct experiments, as well as to analyze and interpret data
(c) an ability to design a system, component, or process to meet desired needs
(d) an ability to function on multi-disciplinary teams
(e) an ability to identify, formulate, and solve engineering problems
(f) an understanding of professional and ethical responsibility
(g) an ability to communicate effectively
(h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
(i) a recognition of the need for, and an ability to engage in life-long learning
(j) a knowledge of contemporary issues
(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Assessment of the effectiveness of the design experiences in achieving these objectives must be documented, primarily through appropriate written project reports. Use of additional methods, such as project reviews by industry partners, is also appropriate and desirable.

Course Format

Project topics for the EE design experience may be drawn from a single specialty within EE, across multiple specialties, or an EE element in a cross-disciplinary project. CmpE projects must include both hardware and software elements and trade-offs, but the project focus is not limited to computer architecture; appropriate projects from related areas such as digital signal processing, telecommunications, or VLSI design are strongly encouraged.

Requirements

Regardless of the specific format chosen, all EE and CmpE design project courses must satisfy the following requirements:

- Course hours and credits: Listed as 2-6-4 but conducted as 1-9-4.
- ECE 4000, Project Engineering and Professional Practice, must be a prerequisite.
- Students must work in teams.
- Projects are expected to span the full semester and include specification, design, implementation, and testing. Depending upon the project requirements and schedule, implementation and testing may be accomplished through computer simulations or similar methods.
- Formal written project proposals and final project reports are required. All group members are expected to contribute to the writing of the reports.
- Teams must make at least one formal oral presentation, with each team member participating in at least one presentation. Presentations may be associated with one of the written reports or may be used for intermediate project reviews.
- The content of the project must be based primarily on earlier coursework, rather than new material introduced in this course. CmpE projects must include both hardware and software elements and trade-offs.
- Projects must incorporate engineering standards and realistic constraints that include most of the following considerations: economic, environmental, sustainability, manufacturability, ethical, health and safety, social, and political. Note that projects are not required to include all of these factors and that additional coverage of these topics is included in the Project Engineering and Professional Practice course.
Procedures for determining student grades must reflect not only technical merit of the project, but communication skills, use of appropriate engineering practices, and achievement of related considerations.

Every Student must email a status report once every week on Monday. Each status report must contain the details listed below. The reports are considered late if received after Monday midnight. The purpose of these reports is to allow the instructor to evaluate group progress, evaluate if each member is doing their share of the work, and to determine if a group is putting everything off to the last weeks. These reports are very important and your grade will be reduced if you are unable to communicate what is going on. Here is a template of what every email status report must contain:

In the subject line: ECE4005A Your Own Name; Group # ;Status report Week #
Where the week number is obtained from the syllabus below.

In the body of the message:
1) Your Own Name; Group # Week # Status report
2) All Other Group Member Names:
3) Here is what I did this week:
4) Here is what my understanding of what each of the other members of my group did this week:
   Member name 1: details
   Member name 2: details
   Member name 3: details
5) Here are the things I plan to do/work on the next week
6) General comments and or problems and or needs

Reports/Presentations
Proposal, Critical Design Review, and Final Presentations require a written report and an in class power point presentation. Written reports are due at the beginning of class (before the presentation). Note you are required to provide final project source files (in tar format) as well as electronic copies of your final report and final power point presentation slides. These will be placed on the course web page archives.

Grading (Not Graduating this Semester):

| Weekly Status Emails/In class status reports | 10% |
| Formal Proposal Presentation                | 20% |
| Design Review Presentation                  | 30% |
| Final Demo/Presentation                      | 40% |

Grading (Graduating this Semester):

| Weekly Status Emails/In class status reports | 10% |
| Formal Proposal Presentation                | 20% |
| Design Review Presentation                  | 30% |
| Final Demo/Presentation                      | 40% |

Example Projects:

You are not required to use Linux to accomplish your projects, however that is strongly encouraged. You will be assigned one (or more if needed) hard disks that are removable so that you may work in COC311 whenever the lab is open.
1) The suggested project for groups that cannot find their own project is an Internetwork Packet Sniffer. A graphical Interface should be used to control and display the collection of Internet Packets. Decoding of the Packet contents should occur.

2) An Internet Telephone. Voice over IP using Linux. Demonstrate voice between two Linux machines on an ethernet network. You are required to write the code as opposed to downloading something that already works.

3) Network Security monitor that alerts a network manager automatically by email when access violations or unusual activity occurs.


5) A Wireless portable Linux IP telephone using existing software but integrating onto a portable wireless Linux Platform.

6) A wireless WWW server using a small “embedded system” PC

The use of small “embedded PCs” running Linux in your project is encouraged. We will have to purchase the components and although I cannot guarantee that I will be able to purchase what you require, I think it is highly likely that I can do this. Early identification of the hardware you require and information on how to purchase will increase the probability that we can acquire the components you will require.

Some links to possible sources for “embedded PCs” that will run Linux as well as displays, etc:

http://www.eg3.com/mfs.cgi/01/WebID/indmil/sbc/x86-base/company/5-p-z.htm#4#
http://www.advantech.com/epc/
http://www.compulab.co.il/products.htm
http://www.emjembedded.com/products/single/dimm.html#486
Linux PDA:
http://www.agendacomputing.com/
Display:
http://www.matrix-orbital.com/serial-lcd.htm
Description of a matchbox Linux Web Server:
http://www.edtn.com/embeddedinternet/prod004.html

Here is what is important in selecting an “embedded PC” for a Linux project according to Jochen Grimminger:

- Sound is needed and it must be supported by ALSA (Driver Family for Linux) and what's also important DUPLEX is needed !!!! Otherwise no telephony is possible! Sound is the feature that will narrow the choice !!
- The rest is almost easy, VGA is at least supported in VGA resolution to make programming a lot easier.
- the used PCMCIA chipset has to be supported (look into the HOWTO PCMCIA Homepage)
- ATAPI/Floppy/ I/O connector are really useful.
- ATA Flash compatible Flash Card (think about instead using IBM Microdrives that will make things a lot easier (and cheaper) if they are running under Linux (with the Microdrives you are not limited to a 2 Floppy distribution, so installation/configuration just works))

You are encouraged to think of your own project idea.
Best Guess at the schedule:
We do not normally meet on Thursdays. You are responsible for all announcements made during class meetings. Schedule changes, grading criterion changes, etc will be announced during class meetings.

Week 1:
Tu Aug 22    First Day of Class, Goals and Objectives, Class Administration Details. Discussion of example projects.
Th Aug 24    Turn in a copy of you resume, Group Selection Process begins

Week 2:
Tu Aug 29   Group Selection completed

Week 3:
Tu Sept 5    Fifteen Minute Pre-Proposals Presented

Week 4:
Tu Sept 12   Formal Proposal Presentations (One half of class) and all Group’s written proposal reports due
Th Sept 14    Formal Proposal Presentations (Other half of class)

Week 5:
Tu Sept 19   In class Status Reports

Week 6:
Tu Sept 26   In class Status reports
Fr Sep 29    Semester Drop Day

Week 7:
Tu Oct 3     In class Status Reports

Week 8:
Tu Oct 10    Design Review Presentations (One half of class) and all Group’s written reports
Th Oct 12    Design Review Presentations (Other half of class)
Fr Oct 13    Semester Mid Term

Week 9:
Tu Oct 17    In class Status Reports

Week 10:
Tu Oct 24    Holiday

Week 11:
Tu Oct 31    In class Status Reports

Week 12:
Tu Nov 7     In class Status Reports

Week 13:
Tu Nov 14    In class Status Reports

Week 14:
Tu Nov 21    In class Status reports

Week 15:
Tu Nov 28    In class Status reports
Week 15:
Tu Dec 5 Final Project Presentations and Demos (One half of class) and all Group’s written reports
Th Dec 7 Final Project Presentations and Demos (Other half of class)
Fr April 28 Last Day of Classes