ECE4006D Internetworking  Design Section of Class

Last Modified: 11/14/02

Instructor: Henry Owen
Office COC Building Room 318
Email: henry.owen@eecom.gatech.edu
Phone: 404-894-4126
Class Hours: T/Th 0305-0425 PM in Van Leer C456
Office Hours: TBA

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: Yusung Ke  yukung@ece.gatech.edu
Pratik Bang  pratik@resnet.gatech.edu

Students will work in groups of 4 or 5.

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:

- 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.** The reports are considered late if received after Monday midnight. Each status report must contain the details listed below. 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: ECE4006D Your Own Name; Group # ;Status report Week #
Where the week number is obtained from the syllabus below. Your first email report will be on Monday September 2 and will be a week 3 (not week 1) report. No email report is required for weeks 1 and 2.

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

**In Class Status Reports**
Groups give an informal verbal in class summary report of progress as well as problems are verbalized. Other groups as well as the instructor make suggestions and help determine potential solutions, activities, and or meetings that are necessary to resolve issues. If you do not participate in this process your final grade will be penalized. Individual group meetings with the instructor are frequently set up in class.

**Evaluations of your own group other group milestones**
During the in class proposal, critical design review, and final presentation you will be given evaluation forms to fill out on both your own group as well as other groups. If you do not actively participate in this part of the evaluation process your final grade will be penalized. The results from peer review will be taken into account (but not necessarily dominate the grading process) by the instructor during grade assignments.

**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.

**Proposals** should answer the following types of questions:
What is the product you plan to design and prototype? What competitor’s products exist and how will your product differ from theirs? What are the specific building blocks (tasks) of the project and the time line (schedule) for accomplishing these building blocks or milestones? What is the order in which you will accomplish the tasks? How are the tasks divided up and who is assigned what tasks? If there is a Graphical User Interface, what will the screens look like and what information will they display? What are the challenges and anticipated problems of the project in general and the tasks specifically? What is the degree of difficulty and the risk involved in each task? What will you demonstrate at the end of the semester and what will this demo be exactly? What will you need to have supplied to accomplish the project and the demo? What parts, components, number of computers, configuration, etc.? What parts of existing products or code will you use and what will you design and implement? How will product testing be accomplished?
How much are other products selling for and how much will it cost to develop yours? Bibliography and web links related to your project. The report should include a table of contents and contain an Appendix of Power Point Slides used to present the proposal.

**Critical Design** review reports and presentations should answer the following types of questions. The report should be an expansion of the proposal to include additional technical details and any documentation or code that has been started. How stable is the solution? Has the method of how to complete the project stabilized or are changes in direction and initial software still occurring? How much progress has been made on the product? What is working at present? What can be demonstrated at present? How well was the original schedule followed? Were milestones met? Were all tradeoffs examined and were the reasons for choosing the solution reasonable? How is product testing being accomplished? Is documentation being completed in parallel or is the product documentation appearing to be delayed until the last minute? How much and of what type documentation is included in the report? Bibliography and web links related to your project. Appendix of presentation slides.

The **final report** should include the following:
- Table of Contents in report
- Report logically organized
- Technical explanation of how the code works, flow charts/diagrams
- If there is a Graphical User Interface, what do the screens look like and what information do they display?
- Report sufficient detail to reinstall, recreate, modify for future revisions by others
- References/Bibliography and web links related to your project
- Clear explanation of other approaches attempted and why not used in end product
- The level of the Complexity of Project and the “coolness gee wow” factor
- How Successful was the group in delivering the product
- Estimate of selling cost in dollars
- Marketing section of report to sell product to customers/instructor
- Estimate of support required for customers to install/use in the future
- Comparison to other existing companies products: What competitor’s products exist and how does your product differ from theirs?
- Economics
- How much are other products selling for and how much did it cost to develop yours?
- Has the instructor been offered stock options?
- Clear credit to others that assisted the group/project
- Clear explanation of which project member did what.
- Schedule that was projected versus schedule that actually resulted and why
- What were the specific building blocks (tasks) of the project and the time line (schedule) for accomplishing these building blocks or milestones? What was the order in which you accomplished the tasks?
- How were the tasks divided up and who was assigned/accomplished what tasks?
- What were the challenges and problems of the project in general and the tasks specifically? What was the degree of difficulty in each task?
- What was the total accumulated number of person hours required to complete this project?
- What test plan if any was used
- How was testing done?
- How have you made sure there are no bugs in your product release?
- Conclusions on what should be changed in the product and why

**Appendix of final report and also WEB page creation containing electronic files of report, final presentation, and code**
- Commented Source code printout included in an Appendix
- State what versions of all supporting software/operating systems.
- Clear delineation of what code was written and what code existed prior to project
- Make files included in printouts and in electronic copy of code
- Instructions on how to load/install all components
- User document where how to run code/demo clearly explained; Clear instructions for someone else to run a demo without authors standing by
Source code on Software on floppy disks or in compressed file that can be downloaded, and instructor was able to get the source code from group
Presentation slides included in an Appendix
Clear diagram of demo testbed
Written explanation of what the demo is and what one should see
Good oral description of the demo
Demo clear, successful, organized, showed performance characteristics both good and bad
Presentation of Hard Drives to instructor so instructor can repeat Demos at a later time.

Grading:

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<th>Percentage</th>
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<tr>
<td>Weekly Status Emails/In class status reports</td>
<td>5%</td>
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<td>Filling out Evaluations for your and other group milestones</td>
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<td>Formal Proposal Presentation</td>
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<td>Design Review Presentation</td>
<td>30%</td>
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<tr>
<td>Final Demo/Presentation</td>
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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) DDOS Traffic Generator using one linux box to create the traffic

7) A SNORT network intrusion detection appliance

8) An Anomaly detector for intrusion detection

9) Web Page programming/setting of a VCR

10) TViO/replay that does not require subscriber service

11) TVIO auto channel sniffer to show no ads but always show for example news. When an ad comes on change channel to channel with no ads
11) NMAP OS finger print filter so cannot tell OS type.
12) Packet header Anomoly header detector for DDOS detection
13) Put extra functionality in the TCP protocol stack to detect DDOS and signal a firewall.
14) Browser based sniffer to display sniffed packets
15) mail sniffer to display sniffed emails
16) Auto Driver scoring system

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. See [http://users.ece.gatech.edu/~owen/academic.htm](http://users.ece.gatech.edu/~owen/academic.htm) regularly for class announcements and information on old classes.

Week 1:
Tu Aug 20  First Day of Class, Goals and Objectives, Class Administration Details. Discussion of example projects. Turn in survey forms.

Th Aug 22  Groups assigned and initial project topic discussion in each group.

Week 2:
Th Aug 29  Group discussions on project details

Week 3:
Th Sept 5  Informal Fifteen Minute Group Pre-Proposals Presented; What does the group plan to do, what equipment is necessary, does the remainder of the class think your project is realistic?

Week 4:
Sept 10.  Instructor On Travel, No Meeting this week.

Week 5:
Th Sept 19  25 Minute Formal Proposal Presentations and written proposal reports due at beginning of class

Week 6:
Th Sept 26  In class Status reports
Fr Sep 27  Semester Drop Day

Week 7:
Th Oct 3  In class Status reports

Week 8:
Th Oct 10  In class Status Reports
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<tr>
<th>Date</th>
<th>Event</th>
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<tr>
<td>Fr Oct 11</td>
<td>Semester Mid Term</td>
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<td>Week 9:</td>
<td>In class Status Reports</td>
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<td>Th Oct 17</td>
<td>In class Status Reports</td>
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<tr>
<td>Week 10:</td>
<td>25 Minute Design Review Presentations and Group’s written reports due at beginning of class</td>
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<td>Th Oct 24</td>
<td>In class Status Reports</td>
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<td>Week 11:</td>
<td>In class Status Reports</td>
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<td>Th Oct 31</td>
<td>In class Status Reports</td>
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<td>Week 12:</td>
<td>In class Status Reports</td>
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<td>Th Nov 7</td>
<td>In class Status Reports</td>
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<td>Week 13:</td>
<td>In class Status Reports</td>
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<td>Th Nov 14</td>
<td>In class Status Reports</td>
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<td>Week 14:</td>
<td>Project Work day, no class meeting</td>
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<td>Th Nov 21</td>
<td>Project Work day, no class meeting</td>
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<td>Week 15:</td>
<td>Holiday</td>
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<td>Th Nov 28</td>
<td>Holiday</td>
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<td>Week 16:</td>
<td>25 Minute Final Project Presentations and Demos after class; all written reports due Location different from classroom, VL218 LCD projector yes, Internet connection no.</td>
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<td>Tu Dec 3</td>
<td>25 Minute Final Project Presentations and Demos after class</td>
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<tr>
<td>Th Dec 5</td>
<td>25 Minute Final Project Presentations and Demos after class</td>
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<tr>
<td>Fr Dec 6</td>
<td>Last Day of Classes</td>
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