CMPE-123B: Computer and Electrical Engineering System Design II

Winter 2011

Scheduled Class Times: 5pm - MWF (first class meeting must be attended)
Meeting Location: E2-280
Weekly team meetings: schedule to be arranged during the first class meeting.

Instructor:
Stephen Petersen (petersen@soe.ucsc.edu)
Office: BE 117; Office Hours: and by appointment
Tel: 459-4782 (office)

General Description:

This is the second course of a two-course sequence serving as the capstone of the electrical and computer engineering departments. It is a challenging and fitting opportunity for students to use their skills and knowledge obtained as an undergraduate engineering student in a practical, team-based engineering project. Projects are conceived during the first course of this sequence (123A) and presented at the design review.

A major aim of both courses is to seamlessly foster interdisciplinary teamwork. This quarter BME projects will split off and enroll in BME123B, while others, BME and CMPE team members will enroll in CMPE123b (this class). Thus, this class continues with project groups formed during 123a, the goal being that students will come to realize the productive potential of a team of motivated engineers with complementary skills. Project teams are encouraged to demonstrate independence and self-directed research. The role of the instructors is similar to that of VPs of engineering in industry. Each group will be treated as a design team with an elected team leader and possibly a deputy leader. Students will learn about effective teamwork, mutual responsibility and project management.

Experience will be gained from the entire cycle of engineering design, from concept and specification, experimental prototyping and verification, to the final design and implementation.

With the exception of the first week of the quarter, regular class meetings will not be held. In their place, weekly meetings will be held between project teams and instructors. Student team members are expected to take turns leading these meetings.

During the quarter students are expected to:

- Exercise judgment and independence in conceiving viable design project
solutions and necessary modifications following the iterative design cycle.

- Define a reasonable time-line with target milestones.
- Demonstrate ability to do independent research and assess suitable resources like application notes, data sheets, etc.
- Participate in peer-group evaluation of one's own work as well as the work of others.
- Keep technical engineering notes consistent with current industrial practice.
- Deliver satisfactory interactive oral presentations to the class.
- Demonstrate independence in self-motivated learning to master new topics necessary to successfully complete a project's design.
- Demonstrate technical competence in hands-on experimental laboratory work. This would include competence using all applicable laboratory test equipment for prototype concept evaluations.
- Understand measurement limitations, accuracy and applicable use of all equipment.
- Understand measurement interpretation.
- Demonstrate technical competence in mastering necessary programming languages/environments, EDA and CAD tools as required.

**Class Requirements:**

*Instructor meetings* – weekly meetings between project teams and instructor will be held (schedule determined during the first meeting of the quarter). Meetings should adhere to the following guidelines:

- Individual progress reports must be submitted for each team member along with a single report for the team’s progress. These must be submitted to the instructors on the previous day by posting them to SDP. Group reports should summarize the team’s progress along with an agenda for the meeting. Individual reports should include a brief summary of accomplishments over the past week. Teams should have 3 copies of all progress reports available at meeting time.
- For each meeting, a team member should be designated by the team to lead the meeting prior to meeting time. That person should be prepared to direct the meeting in an efficient manner to accomplish meeting goals. The first meeting is to be led by the project’s designated team leader. Instructors may elect to request individuals to lead meetings as the quarter progresses. Otherwise groups shall work this out prior to meeting times.
- Meetings agendas should address such topics as:
  - approach toward milestones
  - progress made by each team member (including whoever is leading the meeting
  - roadblocks encountered
  - anticipated progress
  - updated project direction
  - discussion of updated Gantt chart
  - other issues
Midterm and final self and peer evaluations – Teamwork is an important part of this course in project design and is largely evaluated by self and peer evaluations. These should be taken seriously as they will affect your overall evaluation. Self and peer evaluations will be done at the midterm and at the end of the course. Feedback given in the self and peer evaluations will be kept confidential. As part of the midterm evaluations, groups are expected to hold a team evaluation meeting to specifically discuss the team's performance and consider directions for improvement. Minutes must be kept and submitted along with the evaluations. A team meeting is optional for the final self and peer evaluations.

Project completeness: Final check off – At the end of the quarter, before final presentations, the instructors will meet with each group for a demonstration of project results. At the scheduled meeting, teams will go over project objectives and demonstrate results achieved. Where field work is involved, video may be very useful but they should clearly demonstrate the level of performance achieved. Since it is expected and normal for there to be some failures (as well as successes) in meeting objectives and specifications, analysis of failures should be addressed.

Project completeness: final presentation – Demonstration of results during the final check-off is likely to reveal problems. Project teams are expected to attempt to address these problems in order to present more complete results. Progress toward objectives made after final check off and before final presentation will be considered in evaluating overall team performance for the class.

One page summary – A very brief summary of project results is required at the time of the final presentations. The purpose of this summary is to provide a public record of your worthy engineering work at UCSC; it will be posted on SDP (and thus, made available to the general public). Points should be concrete and specific. Quantify where possible. There should be a brief project description, results and conclusions (limit to one page).

Final presentation (Poster session) – Groups are required to produce posters describing their projects. There will be a poster session where teams will have an opportunity to present their projects to the instructors and classmates. Poster formats will be discussed at the appropriate time during the quarter. For more information, see Scientifically Speaking (http://www.tos.org/pdfs/sci_speaking.pdf), an excellent document on what makes a good talk and poster.

Final presentations (Oral session) – A formal oral presentation of project results will be arranged for teams to present their work to the class, instructors and faculty. These presentations should follow guidelines laid out last quarter. In addition, teams will have the option of participating in a presentation to reviewers from industry in a contest format (held at the end of the Spring Quarter).

Final report – A final report is required as described in the final report guidelines. Teams should be incrementally working on this document over the entire quarter. A mandatory instructor check will be made at the time the midterm self and peer
evaluations are done. This check will insure your group has structurally complete first
draft quality document.

**Instructor evaluations** – A class meeting will be specifically scheduled for feedback and
evaluations at the end of the quarter.

**Evaluation Criteria:**

This class is different from other coursework. There are no assignments or tests and
evaluating individual and team performance is necessarily somewhat subjective. There
are, however, several deliverables required as described in the previous section.
Proficiency in project engineering is not just about meeting specifications. It is also
about how team members approach engineering challenges. Therefore, evaluation of
student performance in the course is approximately based on the following:

- 30% Overall Project (includes check-off and completion).
- 20% Final Presentation.
- 20% Final self and peer evaluation.
- 20% Instructor evaluation.
- 10% Project documentation and final report.

Students must attain at least a “C” grade an all categories to pass the class. Project
completeness is evaluated in terms of the team's ability to meet project specifications as
illustrated during a final check-off meeting and during the final presentation and in the
final report. Teamwork skills and team performance are evaluated based on weekly
meetings and on self and peer evaluations. Individual engineering design skills are
evaluated over the course of the quarter and through self and peer evaluations and are
reflected in the instructor evaluation component. Engineering professionalism is
evaluated by the final report and presentations and other project documentation, such as
the engineering notebook and binder. Each member of each team is expected to
demonstrate independence and proficiency and to complete design work in a non-
overlapping area of responsibility defined by their team roles.
Proficiency in project engineering involves the following:

1. Application of engineering design cycle including
   a. Conceptual formation and research.
   b. Testing of designs.
   c. Use of prototypes vs. final designs.
   d. Fabrication.
   e. Debugging.
   f. System integration
2. Application of principles of interactive project management and teamwork in engineering includes
   a. Exercising judgment and independence in setting clearly defined specifications and achievable goals.
   b. Creating a realistic schedule with target milestones.
   c. Managing team performance and resolving conflict.
   d. Allocation of resources.
3. Ability to work effectively as a team. Your teammate’s evaluation of you will have a significant affect on your letter grade.
4. Ability to present results in oral and poster presentations. This includes the quality of the slides, professionalism of the presentation and creativity of the delivery/slides.
5. Use of documentation including project binder and written reports.

Individually, team members are expected to:

1. Demonstrate ability in independent research
2. Demonstrate independence and self-motivation in mastering new topics necessary to successfully complete a project
3. Demonstrate technical competence in related hands-on experimental laboratory work. This would include competence using all applicable laboratory equipment such as oscilloscopes, spectrum analyzers, RF network analyzers, DVM, waveform generators, etc.
4. Show dedication to team and team project
5. Participate in peer group evaluations of each team member's work
6. Maintain quality and detail in documentation

Laboratory:

To accomplish the task of designing, prototyping and completing a project, students are being given the privilege of unlimited and unsupervised lab access. This includes the use of laboratory equipment (computers, printers, scopes, etc) and resources (web-access, email, ftp, etc) in a responsible and respectful manner. Any abuse of equipment or misuse of resources will result in the immediate loss of these privileges, and may result in disciplinary action by the University. The University rules regarding academic integrity will be enforced in all aspects of this course. Lab support will be provided by the Baskin Engineering Lab Support Group (bels@soe.ucsc.edu). Please report immediately any problems pertaining to the laboratory to them, they are also an excellent resource for parts. It is expected that you will keep the lab clean and orderly.
and respect other group’s equipment and space. The lab space is reserved for student enrolled in the class only. It is not a place for your friends to hang out. Please report any misuse immediately to the instructors. BELS will install any special software or hardware that you acquire and need. The instructors will also have root access on the computers and can install any required software needed in an emergency. In some cases students can be give local root access to the machines.

**Laboratory notebook:**

In keeping with industry practices students will be required to purchase a **bound** (8 1/2 x 11) engineering notebook. You will be required to keep a daily log of all activities related to your project. You will also need a large 3-ring, loose-leaf binder to organize and protect hardcopy material, such as data sheets/specifications and printouts of material pertinent to your project.

A nice lab notebook is available from: [http://www.bookfactory.com/lab010.html](http://www.bookfactory.com/lab010.html). Staples and Office Max also have good laboratory notebooks. The UCSC bookstore may have some also.