ECE441
SENIOR DESIGN PROJECT

Term: Fall 2012 / Winter 2013 / Spring 2013
Text: Design for Electrical and Computer Engineers
      Ralph M. Ford & Chris S. Coulston

Administrator: Donald Heer
email: heer@eeecs.oregonstate.edu
phone: x7-2978
office: KEC1117

COURSE OVERVIEW

ECE441/2/3 is the Electrical Engineering capstone design sequence. The course is intended to follow the engineering design model shown. The cycle is divided out over the various terms with the intention of a finished fully tested project being ready for the engineering expo. Research projects are also possible using the same model.

During ECE441, we will be describing the system level architecture. Once the top-level design is completed, we will continue to design the sub-blocks based on our specifications. While it will not be required, some basic implementation of the individual blocks is suggested as it will help create the design.

In ECE442, We will finish the implementation of the sub-blocks and after each one has been implemented and validated it will be integrated into the system level. Complete validation will not be needed until ECE443, but some of the system requirements will need to be validated during ECE442.

Finally in ECE443, we will finish out the project passing all system validation tests and presenting projects at the Engineering Expo.

It is important to remember that success in this course is your responsibility. Do not depend on the faculty advisor, sponsor, or mentor to keep your project on schedule. Advisors and mentors will support and guide you in completing your project successfully, but you must take the initiative and seek out their help. A successful project is worth your effort and provides a tangible example of your capabilities to potential employers.

COURSE LEARNING OUTCOMES

At the completion of the courses, students will be able to perform the following tasks:

1. Write a concise project description stemming from an identified objective. (ABET outcomes e, f, g)
2. Collect and review technical information on a project from relevant external resources. (ABET outcomes e, j)
3. Project the impact constraints for projects (Resources, Time, Finances) (ABET outcomes d, f)
4. Identify project milestones (ABET outcomes d, g)
5. Acquire tooling and hardware (components) for a breadboard / prototype. (ABET outcome k)
6. Present project information succinctly to a technically aware audience.
   (ABET outcomes a, f, g)

**WIC Requirements:**

7. Develop and articulate content knowledge and critical thinking in the discipline through frequent practice of informal and formal writing.

8. Demonstrate knowledge/understanding of audience expectations, genres, and conventions appropriate to communicating in the discipline.

9. Demonstrate the ability to compose a document of at least 2000 words through multiple aspects of writing, including brainstorming, drafting, using sources appropriately, and revising comprehensively after receiving feedback on a draft.

**Academic Dishonesty**

At Oregon State University academic dishonesty is defined by the Oregon Administrative Rules 576-015-0020.1.a-c as: *An intentional act of deception in which a student seeks to claim credit for the work or effort of another person or uses unauthorized materials or fabricated information in any academic work.*

Academic dishonesty includes:

- **CHEATING** - use or attempted use of unauthorized materials, information or study aids or an act of deceit by which a student attempts to misrepresent mastery of academic effort or information. This includes unauthorized copying or collaboration on a test or assignment or using prohibited materials and texts.

- **FABRICATION** - falsification or invention of any information (including falsifying research, inventing or exaggerating data and listing incorrect or fictitious references.

- **ASSISTING** - helping another commit an act of academic dishonesty. This includes paying or bribing someone to acquire a test or assignment, changing someone's grades or academic records, or taking a test/doing an assignment for someone else (or allowing someone to do these things for you). It is a violation of Oregon state law to create and offer to sell part or all of an education assignment to another person (ORS 165.114).

- **TAMPERING** - altering or interfering with evaluation instruments and documents.

- **PLAGIARISM** - representing the word or ideas of another person as one's own OR presenting someone else's words, ideas, artistry or data as one's own. This includes copying another person's work (including unpublished material) without appropriate referencing, presenting someone else's opinions and theories as one's own, or working jointly on a project, then submitting it as one's own.

**IEEE Code of Ethics**

As a community of Electrical and Computer Engineers, we have a duty to present ourselves and our profession to each other and the public in the best light possible. The IEEE has a code of Ethics that should always be considered. It reads:

“We, the members of the IEEE, in recognition of the importance of our technologies in affecting the quality of life throughout the world, and in accepting a personal obligation to our profession, its members and the communities we serve, do hereby commit ourselves to the highest ethical and professional conduct and agree:

1. to accept responsibility in making decisions consistent with the safety, health and welfare of the public, and to disclose promptly factors that might endanger the public or the environment;
2. to avoid real or perceived conflicts of interest whenever possible, and to disclose them to affected parties when they do exist;
3. to be honest and realistic in stating claims or estimates based on available data;
4. to reject bribery in all its forms;
5. to improve the understanding of technology, its appropriate application, and potential consequences;
6. to maintain and improve our technical competence and to undertake technological tasks for others only if qualified by training or experience, or after full disclosure of pertinent limitations;
7. to seek, accept, and offer honest criticism of technical work, to acknowledge and correct errors, and to credit properly the contributions of others;
8. to treat fairly all persons regardless of such factors as race, religion, gender, disability, age, or national origin;
9. to avoid injuring others, their property, reputation, or employment by false or malicious action;
10. to assist colleagues and co-workers in their professional development and to support them in following this code of ethics."
MAJOR ASSIGNMENTS AND PERCENT OF COURSE GRADE

LATE WORK POLICY
All late work will receive no credit. Only pre-discussed exceptions will be accepted.

BEAVERSOURCE SETUP AND PROJECT DESCRIPTION (30 POINTS) – GROUP GRADING
Your group will need to establish a webpage that will act as a permanent repository of your project design. This webpage will be the primary method of showing your project to people both inside and outside of the university. You must use the BeaverSource system for your webpage. Once your group has been assigned, we will add your ONID accounts to the appropriate BeaverSource projects. Your webpage is due 4PM on Monday of Week 3.

Scoring: 30pts. - Satisfactory, 0pts. - Unsatisfactory
If your web page is considered unsatisfactory, you will be given until 4pm on Friday of Week 3 to revise it for full credit.

PROJECT SPECIFICATION (TECHNOLOGY REVIEW) (100 POINTS) – GROUP GRADING
Submitted via BeaverSource
In this review you will explain what your project is (in your own words, do not simply copy the description from class), what design issues are involved, and what’s been done to date in this area. The primary purpose is to review the ‘state of the art’ and find other projects that you can borrow ideas from. To write this report, you will need to conduct library research, patent searches, interview your sponsor, etc. Cite your sources according to IEEE format (see http://standards.ieee.org/guides/style/section7.html for details). The report will be carefully reviewed for technical content and quality of writing by your group’s faculty advisor and project sponsor.

The specification is due 4PM on Monday of Week 4.

PROJECT SPECIFICATION (PRELIMINARY DESIGN) (150 POINTS) – GROUP GRADING
Submitted via BeaverSource
For this submission, you will revise your previous work and will brainstorm together to develop a list of possible design solutions along with a brief technical description of the feasibility of each with supporting calculations and analysis as appropriate. From this list of possible solutions, the group will identify a general approach they feel is most appropriate. This is not necessarily a specific design, but rather a general group of similar designs. You must include a system-level block diagram and explain all inputs or outputs clearly.

The specification is due Monday at 4PM the 6th week of the term.

PROJECT SPECIFICATION (FINAL DESIGN) (250 POINTS) – INDIVIDUAL GRADING
Submitted via BeaverSource
This final project specification submission should completely define the project. Parts and supplies will be ordered from this submission so special attention should be paid to your budgetary analysis. The final design must be fully specified so that construction of a prototype and parts ordering can begin during the winter break.

The specification is due at 4PM on Monday of Finals Week.

DESIGN PRESENTATIONS (100 POINTS) – GROUP GRADING
The presentations will be a 10 minute recorded presentation. You are responsible for recording your presentation. We are not expecting master video work, but the audio and video should be of a decent quality. This means that voices should be clear compared to other noises and that the video should be of a high enough quality to see all details. The Library can check out a video camera to your group. This is a good way to ensure nice video and sound.

The presentations are due 4PM on Monday of Week 8.

PEER BLOCK REVIEW (50 POINTS) – INDIVIDUAL GRADING
By Monday of Week 9 by 4PM, each student must submit one of the blocks they are responsible for to the online grading system. Another student will be randomly selected to review the block in question for technical merit based on the rubric that will be used in the final grading. For this assignment, each student is graded based on what they submit and how ‘insightfully’ they grade the block they are assigned. No student will have any effect on another student’s grade.

The final review is due 4PM on Wednesday of Week 9.

MONTHLY 1:1 MEETINGS (50 POINTS) – INDIVIDUAL GRADING


Each student is required to attend two 1:1 meetings with the course instructor approximately 4 weeks apart. Sign-up are done via the Google™ Calendar link. Points are assigned based on student preparedness and promptness.

**Bi-Weekly SCRUM Meetings (170 Points) – Individual Grading**
Submitted during special time
Starting week 3 of the term, each group will meet with the teaching assistants during a special time every other week. The meeting will be 30-45 minutes in length. These meetings will be based on the SCRUM model and will cover what happened in the previous sprint, examine any new customer stories, and define what will be accomplished over the next sprint. The TA does not assign the scores per student. These points are assigned by the project customer (or course instructor).

**Reading Quizzes (50 Points) – Individual Grading**
During each week, there will be a quick quiz covering assigned reading for the week. The quiz is in the first 10 minutes of Wednesday’s classroom session.

**Peer Reviews to Accompany Final Design Proposal (50 Points) – Individual Grading**
Printed copies to Instructor (KEC1148)
All group members will individually prepare a “peer review,” which will be handed in at the same time as the Final Design Proposal. In these reviews, students will reflect on their peers’ work. This is due on 4PM on Monday of Finals week.

**COURSE SCHEDULE**
The course schedule and details of each lecture is available on the ‘Google™ calendar.’ While no changes are expected, please review it periodically to double check.

**IMPORTANT INFORMATION**

**Budget**
Each group will have access to a budget of $300 starting in November. Projects that have an industry sponsor will be awarded $600. If you need additional funding, you will need to locate that on your own or supply it from your own resources.
There are multiple opportunities for free/or sample parts, but beware: YOU GET WHAT YOU PAY FOR. If you need parts from the vendors below, follow the steps to get parts:

- **Analog Devices**
  - Go to the link below and fill out the form.
  - [https://form.analog.com/Form_Pages/corporate/parts.aspx](https://form.analog.com/Form_Pages/corporate/parts.aspx)

- **National Semiconductor**
  - Go to the link below.
  - Find your part.
  - If there is a sample button, send the part number to Donald Heer.
  - If there is not a sample button, the part cannot be sampled.

- **Texas Instruments**
  - Enter the TI Analog University Design Contest at the link below. Follow the steps to sample parts.

**BeaverSource**
BeaverSource is a university sponsored tool for project management. At a minimum you will use BeaverSource to organize and display your design specification. You are encouraged however to fully utilize the abilities of the tool since it is likely to make your life easier. Some important things you could look into are the SVN abilities for software, and more advanced use of the ticketing/bug tracking systems.