ESE 498 / ESE 499 – Capstone Design Projects for Electrical Engineering (498) and Systems Science and Engineering (499), Fall 2017

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Contact (Trobaugh or Schaettler): For brief questions, feel free to stop by if I am in my office. For longer discussions or to be sure I am available, please email for an appointment.

Course description: Capstone design project supervised by the course instructor. The project must use the theory, techniques, and concepts of the student's major: electrical engineering or systems science & engineering. The solution of a real technological or societal problem is carried through completely, starting from the stage of initial specification, proceeding with the application of engineering methods, and terminating with an actual solution. Collaboration with a client, typically either an engineer or supervisor from local industry or a professor or researcher in university laboratories, is encouraged. A proposal, an interim progress update, and a final report are required, each in the forms of a written document and oral presentation, as well as a Web page on the project. Weekly progress reports and meetings with the instructor are also required. Prerequisite: ESE senior standing and instructor's consent.

Note:
- This course will meet at the scheduled time only during select weeks. If you cannot attend at that time, you may still register for the course.
- Your project must be a design project, i.e., the problem must be open-ended, allowing multiple possible solutions or alternatives.
- You are strongly encouraged to collaborate with others, e.g., industry, research lab, faculty members, etc. Collaborations must be approved by the course instructor (who is responsible for the final evaluation of your project). All outside assistance must be acknowledged in your project documentation.
- Groups of three are preferred, although smaller groups are acceptable. Maximum group size is also three, and groups can combine students in ESE 498 and ESE 499 (as well as other departments).
- You are strongly encouraged to finish your project in one semester. If you would like to plan an extended project, please discuss with the instructors. You will need to propose a longer timeline with additional reporting requirements.

Examples of previous projects: for completed undergraduate research and senior design projects, see the department website. Note that this list includes projects for undergraduate research (ESE 497), EE Senior Design (ESE 498), and Capstone Design (Systems) (ESE 499). A list of completed projects from Fall 2016 and Spring 2017 is also included on Blackboard.

Grading: Your course grade will be assigned by the course instructors with possible review by other reviewers. Review will assess timely completion of these items with adherence to documentation guidelines (see below and on Blackboard):

- Weekly progress reports, each individual
- Weekly project meetings with the instructor (schedule TBD)
- One-page written proposal, due end of 2nd week, September 10
- Formal proposal, written and oral (written due end of week 4, September 24)
- Interim progress update, written, due approximately October 29
- Final project - assessment via report, presentation and webpage (report due last Sunday of classes, December 10)

as well as these general considerations:

- Project degree of difficulty
- Appropriate use of theory, techniques, and concepts of your major
- Interaction with instructors and collaborators or client and response to feedback
Note the following university guideline for grading:

A+/A/A-  Superior
B+/B/B-  Good or Very Good
C+/C/C-  Satisfactory
D+/D/D-  Unsatisfactory but passable or Low Pass
F       Failing

**Course Ethics/Academic Integrity**: The statement of the Undergraduate Student Academic Integrity Policy can be found at [http://www.wustl.edu/policies/undergraduate-academic-integrity.html](http://www.wustl.edu/policies/undergraduate-academic-integrity.html). In particular, review the sections on plagiarism and references of other work. You may not receive credit in this course for a project for which you have already received credit elsewhere (research with a faculty member, work in industry, course projects, etc.) Your project may be related to a previous project but you must include in both your proposal and final report a description of the prior work and how it differs from the current project.
Project documentation requirements

Additional formatting guidelines for all written documents will be distributed on Blackboard. Basic requirements are below. Submit all via Blackboard.

1. **Weekly progress reports: to be submitted on Blackboard each week, by each individual**
   Note: you should be devoting approximately 10-15 hours per week on your project. Each week, submit a written progress report with the items below. These reports will be reviewed in a weekly project meeting and also serve as a repository of your progress.
   a. List of major tasks/activities for the week (will likely continue week to week)
   b. For each task/activity
      i. Objective/purpose
      ii. Deliverable
      iii. Progress/status (and relation to overall timeline)
      iv. Time to finish
      v. Next steps
      vi. Approximate effort (hours)
   c. When possible, include example figures or supplementary material, e.g., videos

2. **One-page written proposal: due Sunday, September 10, midnight**
   Submit an initial proposal declaring your initial project interests and directions. Include the following items. Some elements may be tentative but group information and advisor (if using) should be firm.
   a. Group members
   b. Project advisor and/or other outside resources
   c. Project title (working title is ok)
   d. Basic description of project
      i. Problem statement (what problem are you trying to solve?)
      ii. Broad objectives or goals of the project
      iii. Specific objectives or aims of the project (may be tentative, candidate aims at this point)
   e. Timeline, e.g., Gantt chart or equivalent (approximate at this point, but aim for detail to the deadline for the formal proposal)
   f. Group and individual contributions, responsibilities
   g. Group member background (experience, courses, etc.) that qualifies you to complete the proposed project.

3. **Formal Project Proposal: due Sunday, September 24, midnight, presentations the following week**
   Submit a written proposal of your project, one proposal per group. Your proposal should include the following:
   a. Title page with all relevant data (name, affiliation, phone number, email address) about group members and the project advisor
   b. Abstract (brief, standalone summary of the project proposal)
   c. Background information (why the proposed project is worth doing)
   d. Aims or objectives of the project (specifically what you plan to do)
   e. Data to be collected and procedure for acquiring (if applicable)
   f. Anticipated methods and results (how you expect to accomplish your objectives)
   g. Timeline for completion of the project

4. **Interim progress update: due Sunday, October 29, midnight**
   Consider this document a draft of your final report. Sections should include
   a. Introduction with background information and the projects aims or objectives,
   b. Review of literature with references where appropriate,
   c. Methods used to date
   d. Preliminary results
   e. Current progress relative to timeline
   f. Next steps and anticipated obstacles
5. **Final Project: Report** due midnight Sunday, December 10, presentations the following week

You must submit a final report describing your project. It should include the following:

a. a title page;
b. a brief abstract on a separate page;
c. sections for the following or similar:
   i. Introduction and background
   ii. Problem statement and objectives
   iii. Methods
   iv. Results
   v. Discussion
   vi. Conclusions
   vii. Bibliography (references in IEEE or similar style ([link](#)) with appropriate citations in the body of the text)
   viii. Appendices – include for lengthy details, e.g., code written, extensive data used or results generated, etc.

The final report should not exceed 25 pages, excluding appendices. *Your final report should be submitted to any collaborators at least one week before the due date so they can review the report and you can incorporate any comments or suggestions in the final version.*

**Oral presentations**

Oral presentations will be 10-15 minutes per group with 5 minutes for discussion. Formatting is up to you, but your presentation should be logically organized, well-rehearsed, and professional. Presentations will be scheduled in sessions, and you will be expected to attend the entire session at which you present. Near final slides should be submitted to Blackboard by 6pm the night before the presentation.

**Web page: due Monday, December 11. Send the site link via email.**

You are required to create a web page describing your project. The web page is intended to give an attractive summary of your project and should be accessible to a general audience. It should not consist solely of your final report or presentation. For a good example of formatting project content for the web, see this [recent project](#). Note that many past sites were constructed using weebly. Unfortunately, these sites do not port well, so we no longer accept weebly sites. Sites from previous years are still good examples for formatting content.

The university has new site authoring capability that you are encouraged to use. It's based on WordPress and available at sites.wustl.edu. To get started, go to: [http://sites.wustl.edu](http://sites.wustl.edu). Click the Support tab and click on the [View the quick start guide](#) link on the middle of the page on the right. This will take you through the basic steps to create a web page. If you have trouble and can't resolve it on your own, let me know and I'll help you find a solution.

**Other notes:**

- You are also encouraged to consider publication of your work
  - SIAM has an online web-based publication for undergraduate research, [http://www.siam.org/students/siuro/](http://www.siam.org/students/siuro/)
  - Washington University publishes an undergraduate research digest, [https://undergradresearch.wustl.edu/publications/wuurd](https://undergradresearch.wustl.edu/publications/wuurd), and hosts an undergraduate research symposium, [http://undergradresearch.wustl.edu/share-your-research](http://undergradresearch.wustl.edu/share-your-research)