EE497 Senior Design

Introduction

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Goals of the class

Go through the whole design process, including:

- Problem definition
- Team building
- Project planning and management
- Project build
- Report writing
- Presentation
The following roles will be assigned:

- **Student**
  - Builds the project

- **Mentor**
  - Should be closely related with the area of project and support students with problem solving

- **Instructor**
  - First line duties: roles/mentors assignment, lectures, grades

- **Coordinator**
  - Top level duties: contacts with industry, Dean’s office, faculty. Funding.
Roles in Senior Design

The structure:
Roles in Senior Design

The structure of communication:

- **Student**
- **Mentor**
- **Instructor**
- **Coordinator**

- **Group 1**

Organizational questions
Technical questions related to Mentor’s area

Technical questions
Report questions
Roles in Senior Design

Duties of the students:

- Form a group
- Pick a project that meets the instructor's and coordinator's approval
- Work on the technical aspects of the project to get it done on a timely basis
- Keep a project journal with record of all notes, ideas, and meeting notes and dates
- Meet with the instructor weekly to discuss technical progress or issues. Evidence of meeting is required
- Meet with the faculty mentor weekly to provide a progress report. Evidence of meeting is required
- Meet deadlines with respect to the proposal, written reports, demonstrations and oral presentations
Roles in Senior Design

Duties of the faculty mentors:

- Meet with the assigned group biweekly (20 mins) to assess their progress, discuss their difficulties and guide them along. Keep record of the meeting by generating a paper trail or email trail.
- Attend the group's oral presentations, including final poster presentation during the competition.
- Read and correct the reports and suggest changes. Make sure that all the required elements are addressed.
- Make sure that they submit their report to the writing center before submitting it to you.
- Make sure that they are aware of all deadlines and stick to all deadlines.
- Assign a grade for project management, presentations and report writing. (20%)
- Suggested distribution of points (4% for meetings, 8% for presentations and 8% for report writing)
Roles in Senior Design

Duties of the instructor:

- Designing the topics with realistic constraints and content
- Work with the coordinator to form the teams and assign projects and faculty mentors
- Work closely with the students on design, building and testing of the project
- Assign a grade for the technical portion of the work (70%) and assign the final grade for the course by including grades from the faculty mentor and students, who are members of the group. (70% + 20% + 10% = 100%).
Roles in Senior Design

Duties of the coordinator:

- Obtain possible senior design project proposals from faculty members, industrial partners, ECE Board members, students and others. This should be done every semester before the start of the semester.
- Work with the instructor to form the teams and assign projects and faculty mentors
- Monitor students' progress by interacting with the faculty mentors
- Provide guidance to the students on oral (lecture and poster) and written presentations, application for funding
- Coordinate with the Dean's office (Caleen Johnson and Christine Wallace) project funding and competition
- Attend the group's oral presentations, including final poster presentation during the competition
What is a good project:

- Challenging (not a lab project!)
- Solving real engineering problem
- Doable – project must work at the end of Senior Design
- In the scope of your interest area
  - EE projects for EE students, CPE projects for CPE students
- With some relation to the other area
  - Example: electrical engineering + mechanical engineering
- Applicable in the industry
- Having a good project report
- Having a good presentation
Project

How to get the project topic:

- Ideas from other students
- Ideas given by faculty
- Ideas proposed by industrial partner
- Ideas provided by local alumni
What is a good team:

- Contains members that are able to cooperate without problems
- Contains members that communicate well between each other
- Contains members with various areas of knowledge (but that’s not necessary)
- Contains members that are ready to take a challenge of building the project
Senior Design class organization

Timeline and major goals:

- Spring 2016: EE 497
  - Proposal
  - Research about proposed idea:
    - how it is going to be done
    - what equipment/hardware/parts will be needed
  - Project:
    - Schematic – at least some of the modules
    - Simulation – at least some of the modules
  - Clear plan about future work:
    - Milestones and time required to accomplish them
  - Project report clearly describing the above
  - Presentation
Senior Design class organization

Timeline and major goals:

- Fall 2016: EE 498 – it is based on what you did in Spring!
  - All modules tested
  - Full schematic completed and simulated
  - Code written, compiled and tested
  - PCB layout and print
  - PCB assembled
  - Posters
Project milestones

Milestones for the project:

- Proposal of the project, in a written form
  - First consult with the instructor
- Problem statement
- Statement of the required:
  - Components
  - Skills
- Progress report
  - Problems encountered / solved
  - Work already finished
  - Detailed information about work done by each group member
- Final project
- Presentation
Proposal

Elements of the proposal:

- Title Page with place for Instructor and Mentor approval signatures and the project team members
- Problem description and background
- Current market solutions & why is this design better?
- The project faculty mentor
- The project objectives with constraint analysis
- Discussion of the need for and value of the project in the context of a customer's need, including any relevant background material. Clearly state the identified need.
Problem statement

To state the problem, include the following:

- Clearly describe the problem
- Provide high-level specification
- Include performance requirements
Problem statement

Other elements to include:

- Motivation / Background
- Project Goal
- System Specification or constraints
- User Scenarios
- Can this project be used for illegal or immoral uses? Can you protect against that?
- Evaluation Criteria
Documents should answer the following:

- Is there sufficient technical content in the project?
- Do the stakeholders agree on the project's purpose and scope?
- Do the stakeholders have a vision of how the product will be used?
- Do the stakeholders agree on project success criteria?
- Is the level of detail sufficient for a 3rd party to evaluate the success of the final result?
Final report

Mainly contains:

- the complete conceptual design of the device/system.
- the timeline of project implementation is required.
- required parts/modules
- test plan
Final report

Detailed components:

- Introduction summarizing motivation and problem statement (evolved from Problem Statement)
- System Specification (evolved from Problem Statement)
- Benchmarking results
- System Architecture
- Functional Analysis and Requirements
- Subsystem/Component Specification
- Subsystem/Component Alternative Generation and Trade-offs (for several of the most important design features)
Detailed components II:

- Results of any initial simulation, analysis, prototyping, experiments
- Presentation of Design
- Sketches, Diagrams, Schematics, Flowcharts, Control Block Diagrams, State Charts, etc.
- Systems Engineering analyses pertaining to issues such as size/weight/power/volume accuracy, reliability, errors, budgets, etc.
- Test plan
- Outline of a User Manual
Evaluation questions for the report:

- Are the requirements and constraints suitably defined?
- Is the design/project feasible from both technology and managerial perspectives?
- Is there strong rationale for the design?
- Is the design producible and sustainable over time?
- Is the proposed test plan appropriate?
- Is the intended field operation of the device suitably defined?
- Is the documentation sufficient for a 3rd party to understand the project design and management plan?
Timeline for each milestone:

<table>
<thead>
<tr>
<th>Week</th>
<th>Deadline</th>
<th>Phase to be completed*</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Feb 8</td>
<td>Written proposal of the project</td>
</tr>
<tr>
<td>6</td>
<td>Feb 22</td>
<td>Problem statement</td>
</tr>
<tr>
<td>8</td>
<td>Mar 8</td>
<td>List of required skills and parts</td>
</tr>
<tr>
<td>10</td>
<td>Mar 22</td>
<td>Progress report I</td>
</tr>
<tr>
<td>12</td>
<td>Apr 5</td>
<td>Progress report II</td>
</tr>
<tr>
<td>15</td>
<td>Apr 26</td>
<td>Final report</td>
</tr>
<tr>
<td>17</td>
<td>May 11</td>
<td>Presentation</td>
</tr>
</tbody>
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Please visit the class website for the accurate schedule.
Advices from colleagues

What would you advice to your friend, who is starting EE497?
Advices from colleagues

- Find a team + idea as soon as possible
- Pick a reliable group
- Pick a project with appropriate difficulty
- Come up with an idea and evaluate it carefully
- Do more work in EE497 and don’t procrastinate
- Try to work on everything as early as possible, because every project will have complications. The sooner these are realised the better.
- Follow your schedule
Advices from colleagues

- Already have your project idea and spend time playing with the major parts you will use (you know you need a microcontroller – start learning them immediately)
- Start early and plan ahead. Must not waste time.
- Make a big list of project ideas now and try to make your team early
- Don’t procrastinate!
- Have an early version of PCB completed prior to a final product. Design/assembly errors occur.
Advices from colleagues

- Be prepared and do majority of the work in EE497!! Don’t send in PCB design board late.
- Be more prepared and think about project topic before starting the class. Find group with different majors.
- If possible, partner up with EE & ME
- Always order extra parts
- Not to overthink your project.