ECE Senior Design
Sponsor Information

May 2017
Benefits of Sponsoring Projects

In addition to having a design problem addressed by ECE Senior Design students, other benefits to sponsoring include:

• An opportunity to evaluate ECE senior students as prospective employees.

• An opportunity to work with bright, early career, enthusiastic, unbiased individuals with new ideas and ways of working.

• A chance for ECE students and faculty to learn more about your company.

• Access to the latest in laboratory equipment, software applications, development tools, new technologies.

• Establishment of a continued relationship with the NCSU ECE department.

• An opportunity to help with the development of STEM students for the greater good of North Carolina and the US.

For project submission deadlines refer to the Senior Design Sponsorship webpage.
Reasons a Company may want to Sponsor a Senior Design Project

- Proof of Concept (PoC) for a project where a company does not have the engineering capability or chooses not to allocate internal resources to the project.
- Development of an electronic/computer system for which the sponsor does not have in-house skills or capability.
- Development of ancillary products or systems freeing a company’s engineers for higher priority work.
- Development of productivity tools for design, testing, monitoring, controlling, and/or manufacturing operations.
- To gain access to new technologies (for learning or future development).
Sponsoring a Project

- Senior projects come from a number of sources: industry sponsors, faculty or NCSU centers (FREEDM\ASSIST), and student derived ideas.
  - For example: In Spring 2017 there were 52 projects and the sources were:
    - 37 Industry sponsored projects
    - 15 Faculty and or Center sponsored projects

- Each project starts with a problem statement and then project assignment works as shown below:

  - Industry Sponsors are asked to support the following:
    - Definition of meaningful Problem Statements
    - Provide Mentoring of Student Projects
    - Provide Financial support for Sr Design program
    - Suggest an idea to ECE Sr. Design Faculty a semester in advance to allow for a couple of iterations and discussions to solidify the project descriptions for an upcoming semester.
Financial Support

• The ECE Senior Design program is self-funded
  – All senior projects (including unsponsored ones) are financed from the senior design budget.
  – Laboratory upgrades and materials are paid for from this budget.
  – Engineering services such as 3D printing, PCB manufacture, Machining, etc. as required for the projects are paid from this budget.
  – Some student training (such as LabVIEW or EagleCAD) is paid for from this budget.

• We request the following donations from sponsoring organizations:
  $7,500 Established Companies
  $5,000 Entrepreneurial Companies
  $2,000 Individuals projects

• Donations are made to the NC Engineering Foundation and directed to ECE Senior Design projects.
  – The funds are administered under the discretion of the Director of the ECE Design Center.
Mentoring

• The purpose of the senior design project is to prepare our students for success in the “real world”.
• Students greatly benefit (and really appreciate) working with technical mentors from industry.
• Where possible, we ask sponsoring companies to provide technical mentoring to the student team (1–2 hrs a week). This includes:
  – Meet with students and agree on Project Scope.
  – Meet regularly with student team (weekly or biweekly).
  – Provide guidance on design approach, technical solutions, project plans, etc.
  – Work with senior design faculty in acting as part of the “management team” overseeing the student project.
  – Attend Design Reviews and Design Day demonstrations.
  – Support evaluation of the student team at the end of the project.
  – Note that a faculty advisor will be assigned to projects with non-technical sponsors.
## List of Recent Corporate Sponsors

| US Army Research Office (ARO) |
| US Air Force |
| Volvo |
| Power America |
| Doggett Concrete Construction |
| FREEDM Systems Centers |
| Sensus |
| Olaeris |
| NC RIoT |
| Cirrus Logic |
| Duke Energy |
| Assist |
| Hanes Brand |
| Schneider Electric |
| Pentair |
| IBM |
| Jessup |
| Crabtree Rotary, District 7710 |
| Miller Patent Services |
Preparing our students

Collaborative, Communicative, Creative, and Flexible are the “Most Wanted” traits in employees according to CEOs

Gap Analysis from Chegg Fall 2013 Survey

<table>
<thead>
<tr>
<th>Skill</th>
<th>Student</th>
<th>Hiring Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing slide presentations in concise, compelling way</td>
<td>60%</td>
<td>75%</td>
</tr>
<tr>
<td>Organization</td>
<td>54%</td>
<td>73%</td>
</tr>
<tr>
<td>Writing to summarize results, convey information, etc</td>
<td>51%</td>
<td>70%</td>
</tr>
<tr>
<td>Prioritizing work</td>
<td>50%</td>
<td>77%</td>
</tr>
<tr>
<td>Writing to communicate ideas or explain information clearly</td>
<td>49%</td>
<td>71%</td>
</tr>
<tr>
<td>Incorporating information to develop strategic insights</td>
<td>46%</td>
<td>63%</td>
</tr>
<tr>
<td>Managing a project by identifying key steps, resources &amp; timelines</td>
<td>46%</td>
<td>57%</td>
</tr>
<tr>
<td>Public speaking (e.g., giving a presentation)</td>
<td>43%</td>
<td>54%</td>
</tr>
<tr>
<td>Making a decision without having all the facts</td>
<td>37%</td>
<td>47%</td>
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<tr>
<td>Managing a meeting</td>
<td>34%</td>
<td>49%</td>
</tr>
<tr>
<td>Creating a budget or financial goal</td>
<td>30%</td>
<td>52%</td>
</tr>
</tbody>
</table>

Very/Completely Prepared to use this skill in the workforce today
(Students, n=2,001)

Very/Completely Prepared to use this skill in my organization today
(Hiring Managers, n=1,000)
The Capstone Course of ECE Undergraduate Education

• The ECE Senior Design experience is a two semester course (ECE 484 & ECE485) designed to prepare students for the workplace through hands on experience in the design and development of a real world solution.

• Students learn about the product life cycle and about development processes utilizing system engineering and project management techniques.

• Students working in teams start with a problem statement, then define product requirements, evaluate possible solutions and perform design tradeoff analyses, develop prototypes with core technology, then define a system solution, develop a project plan, and share a presentation of their system design and plan at a design review.

• Next students complete their detailed design and then build working systems and subsytems and verify their solution.

• Students then present their prototype solutions at Engineering Design Day.

• Finally, students document their design process and design solution in a final report. The final report also includes a summary of lessons learned and possible future enhancements.

• Students leverage productivity tools to manage their solutions and collaborate as a team (Google Docs, Calendar, Mail, Hangouts and Slack, etc.)
Our Reference Engineering Product Life Cycle

Senior Design
Students continually iterate through their designs, learning from each iteration from early prototypes to Alpha and beta testing.
Learning Outcomes ECE484
(First Semester)

• Describe the product life cycle with a focus on the R&D Engineering perspective and also describe different “product delivery streams” that run in parallel to the engineering process (Sales & Marketing, Industrial Design, Product Management, Operations, Sourcing, Manufacturing, Customer Service, Repair, Finance, Stakeholder feedback).

• Perform market research, technology trend research, and competitive analysis to identify and refine potential project ideas.

• Learn about the innovation process – research, ideation, distillation, proof of concept and prototyping.

• Learn about Team Roles and Team Stages. Take Personality assessment and learn about how to leverage personal strengths for and within a team.

• Gain an understanding of Systems Engineering approach and apply this approach through study, definition, specification, trade-off analysis, design, and verification planning of a product concept.
ECE484 Deliverables

- Develop a set of product requirements for a product concept.
- Develop a project plan for completing and managing a project in electrical and computer engineering.
- Design a system to meet defined functional requirements and desired real-world constraints.
- Write a formal technical document that describes a problem and a system to solve that problem including its high level operation and specification of a product design.
- Identify the main design challenges and the system picture.
- Diverge and look at several different solutions and their potential in fulfilling the product requirements.
- Give an oral technical presentation to a technical audience describing the problem, various possible approaches, solutions and the preliminary design solution.
- Get hands-on with various technologies and tools needed for the project, verify and test them and start working towards preliminary design and the first prototype.
- Produce prototype demo(s) encompassing the core technologies to solve the problem. Also present the future vision for the product to be finished next semester.
Learning Outcomes and Deliverables in ECE485 (Second Semester)

• Refine and deliver a detailed design for the product based on the prototype observations, empirical data, user and sponsor input on the prototype.
• Create multiple prototypes as needed.
• Critical design review: Give an oral technical presentation to a technical audience describing the detailed design for the final product.
• Produce a lab bench demo proving the major aspects of the final detailed design.
• Build and verify a working prototype of the designed system.
• Manage as a team the project; create and prepare for program reviews - deliver bi-weekly project presentations where schedule, accomplishments, issues, and risks are presented to faculty and industry members every 2 weeks.
• Practice group dynamics and team building in designing, building, testing, and demonstrating the project.
• Demonstrate the functionality and operation of a system for a general audience. Alpha Demo (Subsystem functionality), Beta Demo (first Integrated System Functionality) and Final Demo on Design Day (Fully packaged and tested system).
• Write a formal technical document that describes a system, its detailed operation, and its construction.
• Perform post-development analysis (e.g., lessons learned, future project enhancements etc.)
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