

Statement of Needs

*For the Senior Design Project course in
the Department of Electrical & Computer Engineering at
the FAMU-FSU College of Engineering*

1. Purpose of Document

The purpose of this document is to communicate the needs of the ECE department's Senior Design Project course to the members of the ECE Department's industrial Advisory Board, as well as to other prospective sponsors and other interested stakeholders in the community.

2. Background

Each academic year at the FAMU-FSU College of Engineering, the Department of Electrical & Computer Engineering conducts a year-long (two-semester) Senior Design Project course sequence, in collaboration with the Mechanical Engineering dept., and (occasionally) the Industrial & Manufacturing Engineering dept., and (starting in academic year 2013-14) the FSU Department of Computer Science.

In this course, teams of (typically) 4-7 students are taken through a structured engineering design process, starting with needs analysis and requirements specifications, and proceeding through concept generation, system level design, detailed design, prototype construction and testing. The end result is a complete working prototype of a product, process, or system that is designed to meet the goals of an engineering competition, industrial development project, or (new in '13-14) entrepreneurial venture.

Projects involving the ECE department in the most recent (2012-13) academic year included:

1. **IEEE SoutheastCon Student Hardware Design Competition** – A mobile robotics competition. Five student teams competed internally; the local winning team went on to win the 3rd-place trophy at the IEEE regional SoutheastCon competition, beating all the major schools in the Southeast. (And in 2011-12, we brought home the 1st-place trophy!)
2. **Solar Car for the Shell Eco-Marathon Challenge** – The college has created several solar-powered cars over the years. The newest incarnation is a very small, light-weight vehicle intended to demonstrate maximum energy efficiency at this annual competition sponsored by Shell. This is a two-year project, and the current vehicle is planned to compete in 2014.
3. **AUVSI Foundation / ONR International RoboSub Competition** – This is our 3rd year of working towards participation in this annual competition, which will take place this July. The current prototype already won a "Best in Show: Innovative Undergraduate Project" award in an internal competition (DigiTech) at FSU in March.

4. **Cosmic Cube** – This is a follow-on to an NSF-sponsored research project managed through the FAMU Physics Dept. to develop low-cost networks of cosmic ray detectors. This year's project worked on developing a more portable, desktop-scale unit aimed at eventual commercialization.
5. **Coastal Drifters** – This is the 2nd year of a collaborative project between the Dept. of ECE and the FSU Geophysical Fluid Dynamics Institute (GFDI) and Dept. of Earth, Ocean, & Atmospheric Science (EOAS) to develop an inexpensive, free-floating instrumentation platform for tracking surface currents in shallow coastal regions. Researchers at other universities as well as the National Hurricane Center have expressed interest in using our system.
6. **Oil Spill Radar** – Another project sponsored by GFDI, this one is developing a small, portable radar system designed for performing experiments to empirically characterize how radar reflections vary in response to oil slicks of varying thickness, for the purpose of helping to analyze satellite SAR imagery of the ocean surface during oil spill incidents.
7. **Turf-Tec Impact Tester** – This project, sponsored by a local manufacturer, Turf-Tec International, is developing an inexpensive commercial product for measuring hardness of turf-grass and AstroTurf playing surfaces to help athletic fields meet industry standards for athlete safety, to help prevent concussions. The prototype is nearly complete and production is slated for Fall.
8. **RASC-AL Exploration Robo-ops Competition** – This competition, sponsored by the National Institute of Aerospace and NASA, aims to develop Earth-based mock-ups of planetary rover systems (like the Mars rover). This is our first year of participation in this particular competition, although our entry was derived from our entry from a similar competition last year. This year's team has already won \$10,000 from NASA to develop their rover, which is already working beautifully, and we hope that they will win this year's competition!
9. **AUVSI Student Unmanned Air Systems Competition** – This is our 2nd year of participation in this annual competition sponsored by the Association for Unmanned Vehicle Systems International; the goal of this system is to build a small aerial drone that will autonomously survey a land area and visually identify targets. The student team is nearly ready to compete in June!
10. **AIAA CanSat Competition** – This is our 1st year of participating in this annual competition to launch a small mock "satellite" payload on a sounding rocket; the payload is supposed to collect and transmit telemetry data to a ground station while controlling deployment of active descent mechanisms (parachute and propeller). This competition will take place in June.

3. Plans for Academic Year 2013-2014

We anticipate that many if not all of the above projects will be continuing in some form during the next academic year. In addition, we will be seeking to add a few new projects, because we expect an increase in enrollment in the Senior Design course (resulting from a general increase in ECE majors in the last few years, who have been working their way through the curriculum). We are estimating there will be ~60-70 ECE students enrolled in Senior Design in '13-14 (in contrast to ~50 this past year).

So far, we have two new sponsored projects tentatively lined up, with some others pending:

1. **King Arthur's Tools** – Update/improve a hoof-grinding product for a local supplier of hand tools for the equestrian/livestock market. Managed by ME Dept., w. possible ECE involvement.
2. **Pitch Bending Pedal** – A local musician/entrepreneur is sponsoring this project to develop a floor pedal and/or keyboard-mounted module to allow real-time frequency transposition of an arbitrary audio waveform.

4. Statement of Needs for 2013-14

In terms of the department's needs from outside parties (e.g., companies, investors, individual donors) to support our Senior Design efforts over the coming academic year, these include the following:

4.1. Dedicated Project Sponsorships

We are always looking for sponsors who are interested in sponsoring specific projects. This can either be an existing project, or a new project of the sponsor's choosing that meets some need of theirs. The sponsorship can take the form of a cash donation, or an in-kind donation of materials or services. If the sponsor is proposing a new project, we ask that they also make a commitment to project advisement. We have a form that prospective sponsors can fill out, at <http://www.eng.fsu.edu/~mpf/Prospectus.pdf>.

4.2. Blanket Senior Design Sponsorships

We also welcome, more generally, donations to the department to support our entire Senior Design effort, without regards to the specific project. These monies we will allocate as needed to fill gaps in funding that may exist in various projects. Donation checks can be made out to "FSU Foundation / Electrical & Computer Engineering" and mailed to Dept. of ECE, 2525 Pottsdamer St., Rm. 341, Tallahassee FL 32310. A cover letter should indicate that the funds are requested to be used to help support the Senior Design projects.

4.3. Entrepreneurial Partners

A new effort for the 2013-14 academic year is to encourage the formation of student-run entrepreneurial ventures, where a team of Senior Design students works together with the other students on the venture to develop a prototype product, process, or system, the demonstration of which will help support the fundraising and business goals of the venture. A successful "kickoff event" workshop was held Saturday, April 20th to solicit ideas for ventures and help get the ball rolling; more information about this event is online at <http://www.eng.fsu.edu/~mpf/kickoff.htm>. We would like to invite companies or individuals (who may be interested in helping spin off / start up new ventures to explore interesting new ideas) to partner with our students on such efforts, or to propose new ventures.

4.4. Estimated Funding Needs

The following table summarizes our best rough estimate, at present, as to the monetary requirements for the various Senior Design projects that we tentatively anticipate may continue or start up in 2013-14,

in terms of the amounts that the ECE Department would like to be able to contribute to these projects from the sponsorships that we raise (see Table 1 below):

Table 1. Funding Sought for 2013-14 ECE-Related Senior Design Projects

Proj. No.	Project Name	Already Commit	Est. Still Needed
1	SoutheastCon mobile robotics competition (~3 teams)	\$ -	\$ 3,000
2	Solar Car for Shell Eco-Marathon Challenge	\$ -	\$ 10,000
3	Robo-Sub Competition	\$ -	\$ 3,000
4	Cosmic Cube	\$ -	\$ 2,000
5-6	GFDI Instrumentation Projects (Drifters & Oil Radar)	\$ -	\$ 4,000
7	Turf-Tec Product Development	\$ -	\$ 2,000
8	Robo-Ops Competition	\$ -	\$ 3,000
9	SUAS (Drone) Competition	\$ -	\$ 2,000
10	CanSat Competition	\$ -	\$ 1,000
11	Hybrid Electric Vehicle Project	\$ -	\$ 10,000
12	New: King Arthur's Tools	\$ 2,000	\$ -
13	New: Pitch Bending Pedal	\$ ~1,500	\$ -
14-15	MORE NEW PROJECTS (TBD)	\$ -	\$ 4,000
Total funds sought for ECE Senior Design for 2013-14:		\$ 3,500	\$ 44,000

4.5. Conclusion

As the reader can see, substantial new funding commitments are still needed at this time if the ECE Department is going to be able to support the anticipated number of Senior Design projects at the desired level during the 2013-14 academic year. Generally, the higher the level of funding that can be devoted to each project, the more successful that project can be, the better the learning experience of the students is (since they get to work with more sophisticated components), and the more successful the performance at competitions is. Keep in mind that for some of the vehicle competitions, our students are competing against teams from other schools that have hundreds of thousands of dollars in sponsorships, and numerous graduate students and other staff members assisting. It is impressive that we have won trophies two years in a row now, just with our SoutheastCon teams, each of which got only \$1000 for the last two years. So, we have been using our funds very efficiently! But, we can always use more. We thank readers of this document in advance for their generous support of our efforts.