

Engineering Student Technology Committee

<http://www.engr.colostate.edu/ESTC>

College of Engineering

Colorado State University

1. Title of Proposal:

Further Enhancement of Lab Experience for Senior Design and OOP (Open Option Projects) Students

2. Proposal Participants:

Primary Contact for Proposal

Olivera Notaros, olivera@colostate.edu, Electrical and Computer Engineering

Check One: Faculty

Additional proposal participants

John Seim, John.Seim@ColoState.edu, Electrical and Computer Engineering

Check One: Staff

Additional proposal participants

Anthony (Tony) Maciejewski, aam@colostate.edu, Electrical and Computer Engineering

Check One: Faculty

3. Proposal Abstract (limit to 100 words):

This ESTC proposal requests funds for the acquisition of equipment and tools for PCB prototyping and 3D printing stations for the Engr B111 – Student Projects Lab. This lab is used by all students involved in the Senior Design and Open Option Project programs in the Electrical and Computer Engineering Department. Historically, ECE senior design projects have engaged students from electrical engineering, computer engineering, mechanical engineering, biomedical engineering (with ME), chemical and biological engineering, computer science, and marketing (COB), in the order of percentage of students. The aim of this proposal is to allow students to follow current trends in PCB manufacturing and 3D printing, making them more valuable for potential employers. If funded, this equipment will allow students to (1) stay current with the new technologies, (2) create prototypes much faster, without the need to send items out for manufacturing, (3) work together on different aspects of the project right here, on-campus and (3) become more marketable in the demanding job market. This ESTC project, if funded, will strongly and directly enhance educational goals and learning experience of every student working on ECE senior design or Open Option projects, whether being engaged as senior design student, independent study student, or just an enthusiast helping with a project.

4. Proposal Budget

Equipment	Price
OtherMill , small and portable desktop CNC for very fast and convenient PCB prototyping, two machines w/educational discount https://othermachine.co/	\$4,280
Tools for OtherMill machines: electronics kits, bits, brushes, nitto tapes https://othermachine.co/	\$200
Small tools for the lab , various: pliers, tweezers, scrapers, digital calipers, tool boxes, step-ladder http://www.amazon.com	\$450
Soldering station, Weller WESD51 , better quality, with temperature control and exchangeable tips http://www.amazon.com/Weller-WESD51-Digital-Soldering-Station/dp/B000ARU9PO/ref=sr_1_fkmr0_3?ie=UTF8&qid=1459437989&sr=8-3-fkmr0&keywords=weller+wesd251	\$135
Replacement Tips for Weller WESD51, two sets: http://www.amazon.com/Universal-ETS-Quality-Soldering-Station/dp/B00KV8E2HS/ref=sr_1_5?ie=UTF8&qid=1459437854&sr=8-5&keywords=weller+tips	\$60
Aoyue 968+ SMD Digital Hot Air Rework Station: http://www.amazon.com/Aoyue-968A-Digital-Rework-Station/dp/B006FA481G/ref=sr_1_8?ie=UTF8&qid=1459438175&sr=8-8&keywords=aoyue+int	\$175
Cordless soldering iron , for small and quick jobs https://www.circuitspecialists.com/cordless-soldering-irons	\$90
Hot air reflow with pre-heater https://www.circuitspecialists.com/circuit-board-pre-heating-systems	\$350
LulzBot TAZ 5 3D Printer https://www.lulzbot.com/products/lulzbot-taz-5-3d-printer	\$2,100
Dual Extruder Tool Head https://www.lulzbot.com/products/lulzbot-taz-dual-extruder-tool-head	\$375
FlexyDually Tool Head https://www.lulzbot.com/products/lulzbot-taz-flexydually-tool-head	\$375
Miscellaneous Add-Ons for 3D printer and workshop materials	\$800
Total requested funding:	\$9,390

5. Full description of proposal:

B111 Student Projects Lab was dedicated as a Lab for all students working on senior design and Open Option Projects last year. We have worked hard since then to populate lab with all tools, software and parts that students need to complete various types of projects. In the FA15 we have had 23 senior design and 11 open option projects and this semester we have 24 senior design, 3 open option and 39 sophomore (ECE202) projects using this lab.

Students working on the equipment available in the lab are mostly undergraduate students, although it is not uncommon to see graduate students coming in and using equipment or helping undergraduate students finalize their projects.

Additionally, first in the nation, Engineer in Residence Program is housed in B111, where more than 30 engineers come and interact with our students on almost daily basis.

Since August 2015, we have laid out the Lab setup:

- Design and Test area: benches with computers and test equipment
- Creation Lab area: 3D printers and etchers either purchased or donated last year, soldering station donated by Avago, and drill station
- Meeting areas: two separate areas / cubicles for team meetings
- Projection area: 8ft projection screen
- EiR area: desk for Engineer in Residence to sit and meet with students
- Freebie area: an area in which we place miscellaneous components, parts and kits donated to our department for student use

Close to 100 undergraduate students consider this lab to be their second home; they spend in the lab most of their time on campus.

Our goal is to bring more equipment for student use into this lab, exposing students to new tools and equipment important to finish their projects.

Given the increase in lab use, the existing PCB prototyping, soldering and 3D printing stations can not support the demand, and we need to consider bringing in more equipment.

The above proposed budget is aiming to allow us to do so.

Our department has recently received a commitment from Keysight to purchase a reflow oven for students creating PCB's with surface mount components. Beside this oven, we would like to introduce the following:

- OtherMill, a small, portable PCB prototyping machine (approx. 1ft x 1ft x 1ft, 16lbs)
- Additional 3D printer, since the ones we have in the lab at this time are printing most of the time and we could use at least one more
- Additional soldering stations to allow students to populate surface-mount and through-hole PCB's
- We need multiple small miscellaneous tools that are always needed in the lab, and plan is to purchase those using the above funding.

Our department is hoping to start a large, multi-year, multidisciplinary project that will engage students from different majors in building a robotics submarine and entering the national RoboSub competition. When this team becomes ready to enter the competition, our goal would be to allow students to bring some of the smaller and portable equipment with them, to be able to diagnose and repair their design in the hotel room, between two days of the competition.

Before submitting this proposal, we have talked to BME, EE, CpE and ME students that have been using this Lab in AY2015/16 and all of them were excited about the proposed changes and have agreed that proposed purchases will strongly contribute to their project experiences and will help future students using B111.

As explained, this proposed ESTC project will directly and substantially benefit education of undergraduate students in the College of Engineering. The list of requested laboratory equipment and computers is in compliance with the allowable expenditures described in the CFT manual.