

## Senior Capstone Project Proposal

The project is designed for a team of students working toward completion of a project, within two semesters<sup>1</sup>.

|   |   |
|---|---|
| <b>Title</b>                                  | Microprocessor in loop test setup   |
| <b>Sponsor</b>                                | Contact person: Kevin Fox<br>Company name: Franklin Electric  |
|   | Contact info: <a href="mailto:Kevin.fox@fele.com">Kevin.fox@fele.com</a> , 260-704-1479   |
| <b>Description</b>                            | <p>Develop a microprocessor testing setup that interfaces Matlab and Simulink with embedded C to quickly test software changes directly on the intended hardware. This will allow engineers to receive information from the microprocessor at a faster rate and send variable values into the microprocessor via USB. The project will involve embedded C and Matlab software design, software testing, and validation. The full development and design will require EE &amp; CE skills.</p> <p><u>High Level Specification:</u></p> <ul style="list-style-type: none"> <li>• <b>Hardware:</b> <ul style="list-style-type: none"> <li>○ Development Kit with Franklin Electric’s selected microprocessor.</li> <li>○ Use communication over USB between PC and microprocessor.</li> <li>○ Potential Schematic and PCB design to be done in Altium.</li> </ul> </li> <li>• <b>Software:</b> <ul style="list-style-type: none"> <li>○ PLECS simulation to model Variable Frequency Drive (VFD) behavior.</li> <li>○ Matlab and Simulink software development.</li> <li>○ The software platform shall be responsible for interacting with the Franklin Electric products.</li> <li>○ The user interface shall have the functionality of monitoring and controlling the information in and out of the microprocessor.</li> <li>○ Data logging at defined interval for post-processing and analysis.</li> <li>○ Generate standard testing scripts to run repetitive regression tests quickly.</li> <li>○ Documentation: Create sequence diagrams, user manual, test procedures, etc. as needed.</li> </ul> </li> </ul> |
| <b>Disciplines<br/>(ME, EE,<br/>CS, etc.)</b> | EE, CpE (3-4 students)  |

<sup>1</sup>In general, one semester has 15 weeks. For a 3 credit hours course, a student is expected to work minimum of 8 hours per week for the project which is equivalent to minimum of 120 hours.

<sup>2</sup>This information is for reference purposes only, and it will help us to identify a suitable faculty advisor and form student teams..

|  |  |
|--|--|
| <b>For ECE</b>                                   | Please provide details about the expected project contents. For hardware, please list the possible techniques, such as PCB design, analog circuit, signal conditioning, RF circuit, PLC, embedded system firmware, and robotic control. For software, please list possible programming languages, such as Python, C, C++, C#, Java, and Javascript. <sup>2</sup> |
| <b>Estimated budget</b>                          | \$10,000 budget. Anticipated to use less.  |
| <b>Technology Disclosed? If so, what?</b>        | EAR99<br>Internal Proprietary Software   |
| <b>Additional requirements</b>                   |  |
| <b>NDA or IP Assignment agreement requested?</b> | Yes, to be provided to all involved.   |

**Technology and ECCN:**

“If your project involves ‘technology’ that is either (a) not publicly available or (b) includes proprietary source code (not executable files), then it requires an ECCN.” ‘Technology,’ for this purpose, is defined as “information necessary for the development, production, use, operation, installation, maintenance, repair, overhaul or refurbishing of an item. Technology may be in any tangible form, such as written or oral communications, blueprints, drawings, photographs, plans, diagrams, models, formulae, tables, engineering designs and specifications, computer-aided design files, manuals or documentation, electronic media or information revealed through visual inspection.”

Interactive tool to determine ECCN:

<https://www.bis.doc.gov/index.php/export-control-classification-interactive-tool>

**NDAs and IP Assignments:**

The sponsoring company typically has NDAs and IP assignment forms that it wishes to use. Neither the NDA nor the IP assignment is an agreement with Purdue directly; these agreements are between the students and the sponsoring company. Of course, our office can review the company-provided documents to be certain it aligns with Purdue’s standards. Alternatively, our office has draft agreements which we could provide for the sponsor’s use. Again, as NDAs are between the student and the sponsor, Purdue cannot be a party to or advise the sponsor or the student on the NDAs, other than to outline some basic expectations as to fairness and suitability of the NDA to a student project.

**Sponsor Acknowledgements:**

By way of background, Purdue University professors who have senior capstone class projects involving outside sponsor companies notify our office so that we can prepare an acknowledgement form for the sponsoring company’s completion. This is not a contract but an acknowledgement form signed by sponsoring companies which lays out Purdue’s guidelines regarding class projects and outside company inputs, potential export control issues, and student intellectual property. Some sponsoring companies offer a monetary donation to the project, but that is not a requirement.

<sup>1</sup>In general, one semester has 15 weeks. For a 3 credit hours course, a student is expected to work minimum of 8 hours per week for the project which is equivalent to minimum of 120 hours.

<sup>2</sup>This information is for reference purposes only, and it will help us to identify a suitable faculty advisor and form student teams..