



Capstone Marketplace

Sponsor: USSOCOM

By

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20 F Street Conference Center

20 F Street NW

Washington, DC

www.sercuarc.org



What is Capstone Marketplace?

Our mission is to match multidisciplinary student teams with challenging engineering projects.



SE Capstone Marketplace

Embed Systems Engineering principles into young students.

- Develop course materials and conduct pilot courses in 14 diverse institutions
- Assess impacts on SE learning, career interest and interest in DoD problems

Civilian Universities

1. Auburn University
2. Missouri University S & T
3. Penn State University
4. Southern Methodist University
5. Stevens Institute of Technology
6. University of Maryland
7. University of Virginia
8. Wayne State University

Service Academies

1. Air Force Institute of Technology
2. Naval Postgraduate School
3. Air Force Academy
4. Military Academy – West Point
5. Coast Guard Academy
6. Naval Academy



WHY – Objectives	WHAT - Initiatives
<p>Inform students on appropriate decorum while working with the SERC: the applicable Intellectual Property rights as stated by FAR and DFAR, proper markings on all publications/presentations/deliverables through contract, and fabricated equipment.</p> <p>This was initiated last year, but the objective would be to make it a more formal process. This is to ensure that all the end deliverables and objectives are met with no surprises and students understand the expectations and FAR/DFAR aspects of the project as well as the aspect of sensitivity, should any arise.</p>	<p>All senior design teams will go through a 1 hour seminar on Intellectual Property rights, deliverable markings, and related topics</p>
<p>To ensure students are gaining knowledge on SE and SE design. This will be done in a manner that translates SE principles into a set of simple, reflective questions in a language that is very practical – Selected questions are included in the attachment.</p> <p>One of the ideas of the Capstone was to expose undergraduate students to systems engineering (overview, principles, methods, processes, and tools) with the idea of enabling them to start understanding systems thinking and equip them to transition into the workforce with greater ability to impact whatever program they are designated.</p>	<p>Senior design teams will go through three 1 hour webinars on systems engineering and design. Once developed, these webinars will be posted on the SERC website as a resource for other students.</p>
<p>To have students apply what is learned. It also will provide insight to newer tools being used by undergraduate students, and help create a larger repository of impressions for analysis by the sponsors.</p>	<p>All senior design teams will be given access to a systems modeling tool and requested to develop the requirements and architecture models for their systems in a model centric environment</p>

WHY – Objectives	WHAT - Initiatives
<p>Continuously improve the Capstone Marketplace, understand the true impact SE and systems thinking had on the students, and to gauge the influence of modeling on the projects and students. This will also serve as a verification/validation on the survey results.</p>	<p>All design teams will develop a reflective paper on the influence of systems engineering and thinking on their projects; the influence of the modeling tools – and thoughts on how to improve this experience</p>
<p>To track students — the baseline, progress, final stages, and where the student is placed in the workforce. Another objective is to show continuing credibility to the foundational research that the multidisciplinary teams are beneficial to the students appreciation and use of systems thinking. Another objective is to learn from the students — to see what new, hot tools the students are using to develop their models to produce the products and deliverables. This can help sponsors stay abreast of new, upcoming tools.</p>	<p>1. Students will be given a before and after survey to assess their knowledge of systems engineering, model-centric engineering, and to gauge their methods, processes, and tools used prior and during the project. The end survey will also inquire if the student is going into government, academia, or industry.</p>
<p>Create excitement and opportunity amongst teams sponsored through the Capstone Marketplace, and the opportunity to present at NDIA which would further expose the students to key personnel Defense Industry and Defense Industrial Base.</p>	<p>Evaluate the sponsored senior design projects, help identify the winning team – this team will get a chance to present their project at the NDIA symposium the following year and be recognized in this forum.</p>
<p>To promote the Capstone marketplace to potential sponsors, universities, and ideal students.</p> <ol style="list-style-type: none"> 1. Necessary to engage outstanding students as soon as possible, and the exposure of students participating on the projects could entice more to participate. 2. This would also help usher more universities within the consortium to participate. Having the ability to show something substantial, such as a picture or interesting update, makes the projects palpable. 3. For potential sponsors, they can see how engaged the students are. 	<p>Social media outlets (Twitter, Facebook, etc.) will be made available for students to post pictures of progress, teamwork, and final projects.</p> <p>Teams will be briefed on proper markings to show sponsorship from SERC and any others (i.e., USSOCOM)</p>



How to get Involved

Growing our future SE skills, comprehension, practices.



- Sponsors propose challenging projects
 - Require systems thinking across multiple disciplines
 - Provide up to \$10K for materials and supplies
- Students volunteer to participate
 - Select their own projects
 - Teams are self-organizing
- Faculty provide guidance and academic assessment
 - Advise sponsors on expectations
 - Advise students on plans and methods
 - Assign grades to students



1. Project Proposal Solicitation (May- July)
 - Sponsors submit proposals to Marketplace (with help from Marketplace administrators)
2. Bidding by Student Teams (January – August)
 - Faculty and students browse marketplace and make bids on projects (with help from Marketplace administrators)
3. Matching of Teams to Projects (May – August)
 - Sponsors select teams (with help from Marketplace administrators)
4. Execution of Projects (September – May)
 - Student teams work on projects under supervision of faculty
 - Sponsors advise and review work
5. Feedback from Sponsors, Students and Faculty (May – June)
 - Marketplace administrators collect feedback from all participants to use in improving advice in future years

Title: Precipitation Driven Flood Forecast Model

Proposed by: Dr. Alan Blumberg

Stevens has a deal with Facebook where they will send out an ad to people in NJ/NJ warning them of an impending storm surge. Facebook will ask people to post their photos and stories of flooding to the Davidson Lab Facebook page. Davidson Lab is ready to receive the information and arrange for the database. The vision is to use the data to create maps of the flooding as it occurs in real time with minimal latency. We would blend the data with Davidson Laboratories forecasts to come up with the best estimates. Davidson Lab is about to release their precipitation driven flood forecast model for the City of Hoboken They expect the students to program the code to take the data and create the maps.

Team: computer science, computer engineering, civil, naval.

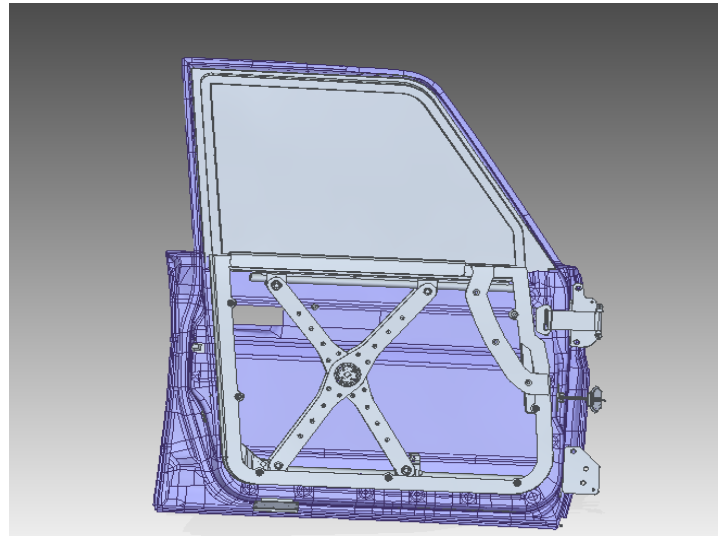


Outcomes from Capstone Marketplace

Student participation, sponsorships, faculty.

University of Alabama in Huntsville

- Students worked to redesign the window mechanism for an armored small vehicle. The team was tasked with improving the current window to allow for faster open and close times, full opening capability, and dual mode actuation to allow for manual override. Access to an actual armored vehicle, a modified Chevy Suburban, was provided. The team completed development of a full scale prototype window regulator system that incorporated the vehicle's original scissor lift mechanism.





Sustained Growth

*Moving to more universities
Greater sponsor involvement*

2019 CAPSTONE MARKETPLACE OBJECTIVE

The Capstone Marketplace has transformed how thousands of engineering students in universities worldwide conduct their capstone project, integrating systems engineering, multiple disciplines, and systems thinking into projects supported by a wide array of private and public organizations.

STRATEGIES

INITIATIVES

2019 TARGET METRICS

1. **Build brand awareness among universities and potential project sponsors**

2. **Build alliances with professional societies and accreditation organizations**

3. **Establish infrastructure and effective governance to support large-scale operation of the Capstone Marketplace**

4. **Lead by example through robust participation by SERC Collaborators**

5. **Build an active community of universities and sponsors**

Partner: Initially partner with INCOSE, NDIA SE Division, and ASEE to involve both their industrial and academic members, eventually reaching to other societies both in the US and elsewhere; establish an active Marketplace community with individual universities and sponsors

Transition: Establish shared governance between SERC and INCOSE and perhaps others to operate and manage the Capstone Marketplace for the benefit of the worldwide engineering community

Outreach: Hold informational events, publish success stories, participate in capstone and related conferences and take other steps separately and jointly with our partners to create broad awareness of the value of the Marketplace

Lead by Example: Encourage all SERC Collaborators to participate in the Capstone Marketplace and to encourage companies and government agencies in their networks to sponsor Marketplace projects

Scale Infrastructure: Scale the website and supporting infrastructure, ensure both SERC and partner funding and volunteer labor, and establish agreements to protect intellectual property

Influence Accreditation: Work with ABET and other accreditation organizations to influence requirements for capstone projects to include systems engineering, multiple disciplines and systems thinking

500 Marketplace projects sponsored by 200 organizations in 100 universities in 6 countries, all belonging to a vibrant Capstone Marketplace Community

Robust alliances between SERC, INCOSE, NDIA SE Division, ASEE, and 3 other national engineering education societies

SERC and INCOSE (and perhaps other societies) jointly govern the Marketplace

Annual presentations and informational events at each ally major conference, and an annual article in each ally's appropriate publication

At least 75 INCOSE and NDIA SE Division corporate and government members participate in the Marketplace; 80% of INCOSE Academic Council members participate in the Marketplace

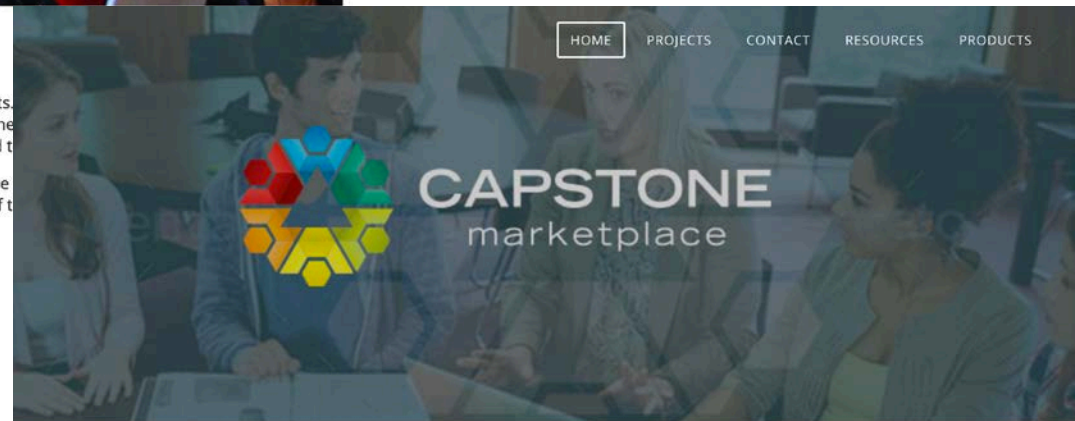
ABET and at least one other national accreditation organization incorporate systems engineering, multiple disciplines and systems thinking into their accreditation requirements for capstone projects



About the Capstone Marketplace

Our mission is to match multidisciplinary student teams with challenging engineering projects, expertise and advice, while faculty supervisors help guide the teams and grade their work. The sponsors to reach out to potential students, and it helps students find projects best matched to their interests and needs.

Previous research has demonstrated that students who worked on multidisciplinary capstone learning in basic systems engineering concepts. They also developed a better appreciation of the different engineering disciplines.



About the Capstone Marketplace

Our mission is to match multidisciplinary student teams with challenging engineering projects. Project sponsors provide domain expertise and advice, while faculty supervisors help guide the teams and grade their work. The capstone marketplace makes it easier for sponsors to reach out to potential students, and it helps students find projects best matched to their interests and needs.



Questions and Discussion