Computer Science & Engineering (CSE)
Innovation Lab Senior Design Capstone Projects
http://cse.unl.edu/InnovationLab

The CSE Innovation Lab is home for the capstone educational experience of Computer Science & Engineering students. Students are organized into teams and partner with sponsoring businesses and government agencies, under the supervision of CSE faculty, to develop innovative software or hardware/software based solutions tailored to the client's needs. At the same time, students gain communication, project management, teamwork, and leadership skills critical to success in today's rapidly changing, technology-driven world.

The Student Experience
The CSE Innovation Lab allows students to:

(1) Create innovative software and hardware-integrated solutions to challenges faced by future employers;

(2) Work on a significant project in a realistic team-based design and development environment that requires innovative design, rigorous planning and scheduling, teamwork, written and oral communications, and the integration and application of technical and analytical aspects of computer science, software engineering, and computer engineering;

(3) Gain professional practice with current tools, resources, and technologies used in the industry; and

(4) Experience professional standards, ethics, and oral and written report styles common in the computer science and computer engineering fields.

Students are organized into teams to undertake a substantial project supervised by a CSE faculty member. All teams are given a broadly defined design problem containing aspects of software, and often hardware, design. Projects are of sufficient complexity as to require team members to partition and coordinate their efforts for successful completion. Written technical reports and oral presentations to clients are essential parts of the CSE Innovation Lab experience.

Each team of students must conceive, design and build an innovative hardware/software device of sufficient complexity so as to require effective teamwork. To achieve this goal, they must follow the critical steps involved in computer-system prototyping:

(1) Integrate knowledge ranging from theoretical to practical, acquired during students' studies, to address a wide range of design issues and challenges from software to hardware (broad knowledge),
(2) Design, plan, and execute with technical proficiency in searching and identifying suitable software libraries, and computer and hardware parts when appropriate, implementing the system, testing, evaluation, and refinement (appropriate technical proficiency),
(3) Perform technical and literature reviews of existing technologies for feasibility and comparative analyses of the design choices (information collection),
(4) Synthesize technical data and specifications such that the final prototype meets design constraints, requiring discussions, insights, empirical tests, and trade-off analysis (synthesis),
(5) Interpret and present results in terms of system performance, requirements, and costs, involving unit testing of individual modules as well as final product testing (interpretation and presentation), and
(6) Conduct system evaluation and teamwork in terms of lessons learned throughout the design and development process, highlighting paths that led to dead-ends, breakthroughs, and "engineering tweaking" that get the product to work, in both oral presentation and written report forms (reflection).

A CSE faculty member meets with each team on a weekly basis to discuss their progress throughout the entire semester. The instructor helps students brainstorm, critiques their designs, monitors and supports their teamwork, and challenges them to come up with better solutions. The students also meet regularly with their project partner to make progress updates, to receive feedback, and for technical assistance when appropriate for the project.

Private Sector and Government Project Partners
The CSE Innovation Lab welcomes participation from private sector and government partners for a nominal fee of $5,000 for projects involving about 3 students (larger projects can be negotiated). Participation in a CSE Innovation Lab project is a great way for companies to recruit and evaluate prospective employees or interns. CSE Innovation

Lab projects are focused on either: (1) the student–corporate sponsor connection or (2) on integrating University of Nebraska research with corporate sponsors and promoting student involvement in a Masters Pursuit, or (3) both (1) and (2).

The following guidelines explain the project proposal process and assist private sector and government partners in determining whether their project is appropriately scoped for the CSE Innovation Lab.

(1) Proposals must be submitted to the Innovation Labs Director as outlined in the Request for Proposal (RFP) for Sponsored Senior Design Capstone Projects available on the Innovation Lab's website, http://cse.unl.edu/InnovationLab

(2) Project proposals will be evaluated by the student teams and the CSE Faculty member teaching the two-semester capstone sequence, which consists of Professional Development (2 credit hours) and Senior Design Project (3 credit hours). Students interested in participating on sponsored projects will sign an NDA/IPA agreement. Responses will be sent to proposers within 6 weeks of the start of a semester.

(3) Accepted projects will require a $5,000 payment and a Memorandum of Understanding to be executed before a project kick-off meeting can be held.

(4) Partners are expected to commit to meetings with the project development team as needed. At least three meetings are needed face-to-face with student teams: an initial kick-off meeting, an evaluation meeting at the end the first semester design phase, and an end-of-the project demonstration meeting.

(5) Most of the project design and development activities occur in the second semester of the two-course sequence, with the first semester being devoted to project selection, professional development, and initial project design, prototyping and scoping activities.

(6) Most projects will follow a spiral, agile development process that allows dynamic scoping and requirements changes to accommodate uncertain and unexpected situations that invariably arise when each student is working on real-world projects.

(7) Projects proposed by partners and undertaken by students should be of sufficient complexity and scope that a team of three to four undergraduate students can complete the project within two semesters, working approximately 9 hours per week.

(8) Proposed projects should not be mission-critical, and failure to complete the project must be an acceptable, albeit less than desirable, outcome for the project partner. Partners should expect prototype-quality products to be delivered. Conversion to a robust, commercial product will normally require more time, effort, and expenses.

(9) The CSE Innovation Lab will provide non-specialized computing and laboratory space and hardware for students working on projects. Partners are welcome to supplement resources provide by the Innovation Lab, when appropriate for their specific project. Examples might include providing working space near full-time engineers at the Partner's facility, if it is conveniently located for students, or providing specialized hardware or software that might be needed to complete the project.

(10) Projects can begin in either the fall or spring semester, concluding in the subsequent semester. Thus, it is possible for a project to begin in the spring, followed by a summer hiatus and conclusion the Fall semester. This has both advantages and disadvantages, and we would happy to discuss those with you.

The CSE Innovation Lab looks forward to working with private sector and government partners in defining appropriate projects, and we are happy to assist in proper scoping of the projects. More information is available by contacting the Innovation Lab's Director:

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