

# OU School of Computer Science

## Software Engineering Capstone Projects

The capstone educational experience of Computer Science students is built upon a two course sequence: CS 4263 (Software Engineering I) and CS 4273 (Software Engineering II). Students enrolled in these courses are organized into small (two or three person) teams. Teams partner with sponsoring businesses, government agencies, and academic groups. Under the supervision of course instructor(s) and other CS faculty, teams develop innovative software-based solutions tailored to the needs of their partners. Sponsors interact with teams to guide development. Students experience an authentic development process firsthand and gain practical skills in big software and data design, project management, teamwork and leadership, and multifaceted communication critical to success in the software engineering world today and in the future.

### The Experience

In their capstone projects, Computer Science students:

- work as a team on a significant project following realistic design and development processes;
- address existing and emerging technological challenges faced by potential future employers;
- create innovative software solutions (involving off-the-shelf hardware where appropriate);
- engage in innovative design, formal planning and scheduling, careful integration and documentation, rigorous testing and usability evaluation, and realistic application;
- learn and apply best practices surrounding the methods, models, techniques, and tools currently used in the software engineering industry; and
- experience standards, ethics, and communication styles of professional software engineering.

Early in the first capstone course, students identify projects of interest and organize into teams under the guidance of the course instructor(s). Eligible projects are those in the pool of topics proposed by project sponsors. Projects must also be of suitable complexity and scope, requiring teams to engage in all of the activities in the list above to be successful. To complete its project successfully, a team will need to:

- synthesize the theoretical and practical knowledge that team members have acquired leading up to the capstone, to address a wide variety of complex software design issues;
- perform literature reviews and assess feasibility of existing technologies for potential adoption;
- organize and execute thorough discovery to identify and organize specific tools and methods for development, including software libraries and off-the-shelf hardware components;
- implement, test, and evaluate software components and integrated systems, including unit testing of individual software modules;
- plan, execute, and document necessary and appropriately opportunistic iterative refinement of components and systems, both as a key part of the initial project plan and in response to emerging circumstances and requirements;
- collect technical data, interpret it, and analyze it relative to the project plan and product specifications, to determine and describe whether project products (software prototypes, evaluation conclusions, design recommendations) meet plan and sponsor objectives; and
- analyze, document, and present project products in terms of system performance, stakeholder effectiveness and efficiency, and deployment/utilization requirements and costs.

Instructors help students organize into teams and match their interests and skills to particular projects. Each team is supervised by a CS faculty member who meets with them on a regular basis throughout the project to brainstorm development approaches, formulate project plans, discuss progress, and identify emergent opportunities. Teams also meet regularly with their project sponsor to report progress, receive feedback, and elicit appropriate technical assistance. Teams write reports, present orally, and participate in end-of-semester poster-demonstration events with partners, supervisors, and members of the CS community in attendance.

## The Partners

The School of Computer Science invites participation of project partners from local, regional, and national industry and government agencies. We also welcome participation from research groups within the OU academic community, including the OU Health Sciences Center. We would request a nominal fee for this partnership. Sponsoring an OU CS capstone project offers an excellent opportunity to meet, evaluate, and recruit potential future employees. The project proposal process is as follows:

- Proposals must be submitted to the Director of the School of Computer Science, as outlined in the Request for Proposal (RFP) for Sponsored Capstone Projects.
- Project proposals will be evaluated by the Director and the instructor(s) teaching the capstone sequence. Students interested in participating on sponsored projects will sign an NDA/IPA. Responses will be sent to proposers within 6 weeks of the start of the first semester.
- Accepted projects will require the nominal payment and a Memorandum of Understanding to be executed before a project kick-off meeting can be held.
- Partners are expected to commit to meeting with the project teams as needed. It is highly recommended there is a designated partner champion who will be available for at least three face-to-face meetings with student teams as needed: a kick-off meeting, a mid-project evaluation meeting at the end of the first semester, and an end-of-project demonstration meeting at the end of the second semester.
- The School of Computer Science will provide non-specialized laboratory space and computing hardware for students working on projects. Partners are welcome to provide supplemental resources as 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 software or hardware that might be needed to complete the project.

The following guidelines are suggested for determining whether a potential project is appropriately scoped:

- Projects proposed by partners and undertaken by students should be of complexity and scope that a team of two to three undergraduate students can complete the project in two semesters, with each student working approximately 9 hours per week.
- The first semester is devoted to project selection, discovery, planning, initial design and prototyping, and professional development. Most project development activities occur in the second semester.
- Most projects will follow a spiral, agile development process that allows dynamic changes in scope and requirements to accommodate uncertainty and unexpected situations that invariably arise when students work on real-world projects.
- Proposed projects should not be mission-critical. 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. Robust, commercial products normally require more time, effort, and expense.

## The Contacts

The School of Computer Science welcomes the participation of a broad diversity of industry, government, and academic partners. We look forward to working with partners to identify and define projects that are appropriate and mutually beneficial in topic and scope. More information is available by contacting the Director of Computer Science or the lead instructor of the capstone course sequence at [sridhar@ou.edu](mailto:sridhar@ou.edu) or [weaver@cs.ou.edu](mailto:weaver@cs.ou.edu).

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