

Computer Science Honors Capstone Program

198:495 – Fall 2023

198:496 – Spring 2024

Coordinator: Sesh Venugopal

Course Description

This course is a capstone program for our undergraduate honors seniors. The program will run through the academic year, with one course each in the fall and spring semesters.

Credits: 495 + 496 together will get a student 3 elective credits toward the CS major, with the credits technically awarded to 496. The 495+496 sequence may also be used towards the [CS Honors graduation requirements](#). 495 alone (if the student does not continue into 496) will get 3 general (not CS) credits towards graduation.

Students will work on research projects that are proposed by faculty in the department, who will be their faculty mentor for the project. A project could forge a new direction that is outside the scope of our course offerings, with a software component to test ideas. Alternatively, a project could be a theoretical research investigation without any software component. Whatever the structure of a project, the emphasis will be on a strong investigative aspect.

Students can work individually or in groups. Having students work in groups of 2-3 is appropriate for projects that involve building proof-of-concept application software, and allows us to scale to a larger cohort of interested students.

The final project report, submitted at the end of the spring semester, may be considered for the Henry Rutgers Scholar Award for outstanding thesis for the academic year.

[Registration](#) is by special permission only.

Learning Objectives

Project Definition

Students can define their project topic, scope, directions, goals, and result. They can place their problem in the context of state of the research or practice in the field. Students can work backward from the result to establish periodic milestones and timelines toward the result.

Project Exposition

Students can identify and survey literature that is most closely related to their area of work, and extract canonical results, knowledge, or state of practice from the survey.

Students can write about their project at various levels: summarize the project in a “one-sheet”; describe the functional scope of their work linking all components together and their relation to existing work in the area; detail their approach to exploring each component. They can write a complete technical paper that narrates their work from start to end.

Students can put together an oral presentation of their work at the functional level of scope, components, and their relation to existing work in the area, as well as describe in detail their approach to any component of their project. For projects that build software, student can do a live demo of their application.

Students can critique the verbal and written exposition or demo of their own or other projects.

Project Evaluation

Students can define metrics for the evaluation of project completion milestones for each component of their project in relation to the pre-established goals including scope and functionality of each component. If they are building an application, they can build a suite of test cases that establish the correctness of their implementation.

Students can assess whether their results meet the goals they have established and can explain any shortcomings in terms of needs for additional resources, time, or technical development.

Collaborative Work

Students can apportion work with collaborators based on equity of division, personal interest in one or more aspects of the work, and agreement of everyone in the group on the work split.

Students can determine how their share of the work links to that of the collaborators, and how to integrate individually developed work components into the whole.

Students can adapt to differences in work schedules between collaborators.

Students can engage in constructive discussion with collaborators on shortcomings in each other's work that may jeopardize the project as a whole, and find ways to work through such issues.

Syllabus/Coursework Requirements

Fall Semester

Students will meet at least once a week with the coordinator to get instructions and direction on getting their projects underway and maintaining progress toward writing and presenting a full project proposal.

Students will be required to have their full project proposal ready in early December. The full proposal will consist of the following components: why this project, what are the objectives, what is the approach, what is the work done so far, and what is the timeline for achieving the objectives through the spring semester. One or more class meetings will be used for students to present their proposals.

The student's faculty mentor will evaluate the final proposal and determine whether the project is feasible to be continued into the spring semester. Once greenlighted, the student can continue working on accepted project.

Grading

Work done through the semester: 40%

Development of project overview: 5%
Review of literature for project proposal: 10%
Description of project method: 10%
Draft of project proposal: 10%
Class presentations on above: 5%

One-sheet Project Summary - Topic, Context, Directions, and Goals: 5%

Oral Presentation of Final Project Proposal: 5%

Final Project Proposal Report: 50%

Spring semester

Students will work actively on their primary research project, as well on other mini projects that will train them in investigating and reporting on computing topics.

At meetings with the coordinator in class at least once a week, as well as outside, students will get direction from the coordinator in making progress with their work, assessing the need for and setting up meetings with their mentors, and specific guidance and support on the usage of computing and other resources.

In the second half of April, over multiple class meetings students will orally present their finished project. If their faculty mentor determines that their project report will be submitted for the Henry Rutgers Scholar Award, then the report must be finished by April 7. Otherwise, the report may be submitted by April 15.

Grading

Written reports and oral presentations through the semester: 40%

Investigation, presentation, and writeup on technical topic of choice: 25%

Investigation and presentation of generative AI for research, software development, and teaching/learning: 5%

Midterm progress report: 5%

Mock oral project presentation of finished project: 5%

Oral Presentation of Finished Project: 10%

Final Project Report (Individual Submission): 50%

A departmental committee will make decisions to place projects in one of the following ranks: honors, high honors, or highest honors. The committee will also consider recommending outstanding project work for the Henry Rutgers Scholar Award.