

CSC 521 Computer Science Capstone Project

3 cr. W-III

Instructor: TBA
email: TBA@salemstate.edu

Office: location
Office Hours: days and times

Phone: (978) 542-extension

Section	Time	Room	Final Exam
nn	days and times	location	date and time

Catalog description:

A substantial project involving system design and implementation is carried out on an individual or group basis under the supervision of a faculty member. The specification for the project must have been completed in the prerequisite course CSC 520. A presentation of the completed project will be made to Computer Science faculty and students; writing experiences will be used to develop skills in analysis and rhetoric. The course involves periodic meetings, group discussions (if appropriate), and individual conferences. Open only to Computer Science majors.

Prerequisites: CSC 520 and permission of the Department Chairperson.

Course Goals:

The purpose of this course is implementing a proposal for a project in Computer Science. The goals of this course are:

- CG01: to develop an appreciation for the process of formulating a project for implementation;
- CG02: to further develop the skills and knowledge necessary to propose, analyze, design system or software projects;
- CG03: to develop students' writing skills in the context of all aspects of the software engineering process;
- CG04: to use written assignments and class discussion to teach students to write effectively for various purposes and audiences;
- CG05: to have students experience writing as a process;
- CG06: to give students experience in making and critiquing presentations.

Upon completion of the course, a student will have demonstrated the ability to perform the activities and techniques necessary to have selected a project design / architecture, selected the tools utilized during implementation, and have implemented, verified and evaluated a solution.

Course Outcomes (Objectives):

Upon successful completion of the course sequence, students will have:

- CO01: demonstrated knowledge of the phases and workflows of the project development life cycle;
- CO02: demonstrated knowledge of the major process models used in the development of large-scale systems;
- CO03: demonstrated knowledge of the tools and techniques appropriate for implementation of the project, specifically including design/diagramming tools as appropriate for the project;
- CO04: carried out an implementation plan, recording any deviations from the plan along with rationale and ramifications;
- CO05: demonstrated the ability to critically analyze materials ranging from project proposals to technical specifications to scholarly research and to express this analysis clearly in both spoken and written form for a variety of appropriate audiences;
- CO06: presented and defended a demonstration and analysis of a completed project to the Computer Science faculty and students;
- CO07: demonstrated an understanding of writing as a process by giving and responding to feedback and reflecting on his/her own writing processes.

Course Narrative:

The Computer Science capstone project involves two courses: in CSC 520 Computer Science Capstone Project Specification students work with a project supervisor to select a project focus/topic, and then develop a formal project proposal that specifies: intended functionality of the project; student objectives; technical aspects of designing and implementing the project; project schedule and evaluation criteria; and a list of deliverables that will be produced at the end of CSC 521 Computer Science Capstone Project. In CSC 521, students implement the project proposed in CSC 520, following the requirements and schedule as specified and producing a journal of implementation activities along with a finished product.

The overarching goal of the CSC 520 / CSC 521 sequence is for students to experience all aspects of the development process from initial conception of intended functionality through to project completion. This experience ties together in one extended activity the research, procedural, and technical aspects of the Computer Science major, simulating the environment that students will be expected to be able to function in upon graduation. The procedural and research aspects are the focus of CSC 520, wherein a project is proposed, defined, and planned for; the technical aspects of implementing a project are experienced in CSC 521. Additional research may be required in CSC 521 as a result of roadblocks detected during implementation, which may in turn require refinement of specified procedural aspects of the project.

Students are required to engage in writing activities throughout the course sequence. Student activities relating to Written Communication - Level III criteria are found throughout the course sequence of CSC520/521 and are intimately integrated into the learning process. In CSC521, supervisor / student meetings provide multiple opportunities for students and the supervisor to review work and to discuss the principles underlying their writing efforts. Project implementation components include a wide assortment of activities designed to assist students in how the project is implemented.

The final grade for CSC 521 is determined by the evaluation schema defined in the CSC 520 proposal and always includes a significant percentage determined by the project journal, project documentation, and the materials produced in support of the completed project presentation.

Student Outcome vs. Course Objectives matrix

Student Outcome (condensed form)	CO1	CO2	CO3	CO4	CO5	CO6	CO7
SO-1	✓	✓	✓	✓	✓	✓	✓
SO-2	✓	✓	✓	✓	✓	✓	✓
SO-3					✓	✓	✓
SO-4		✓	✓	✓	✓	✓	✓
SO-5							✓
SO-6	✓	✓	✓	✓	✓	✓	✓

Note:

SO-1 Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

SO-2 Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

SO-3 Communicate effectively in a variety of professional contexts.

SO-4 Recognize professional responsibilities and make informed judgements in computing practice based on legal and ethical principles.

SO-5 Function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.

SO-6 Apply computer science theory and software development fundamentals to produce computing-based solutions.

Also Note: All projects are expected and required to relate to the specific Student Outcome as indicated above. In addition, a specific project may relate to Student Outcome 5 depending on whether the project involves team work of multiple students.

Topics:

- review and refine of the proposal completed in CSC 520 SE4(1,1,0)
 - investigation of general needs
 - analysis of existing functionalities
 - proposal of a set of new/modified functionalities
- review and refine of the systems development process SE1(0,1,0)
 - basic principles
 - the development life cycle
- review, as necessary, of systems analysis techniques SE7(0,3,0)
 - information gathering
 - team communication
 - feasibility studies
- review of data analysis and modeling techniques SE5(1,1,1)
 - projects, primary focus on system block diagrams, system circuit diagrams and wiring diagrams
- review of general implementation issues SE6(0,5,1), SE7(0,3,1)
 - reliability
 - testing
 - verification
 - maintenance (including modifiability)
 - evolution
- design, analysis, and documentation of: SE3(0,3,1), SE5(2,2,1), SE6(4,0,0), SE8(0,2,0)
 - project requirements
 - selection of project planning and management strategies
 - assessment of code quality: selection of and evaluation against appropriate style rules for code and documentation
 - test cases as use case diagrams and/or scenarios and/or stories and/or automated test cases

Student Experiences:

The primary goal of CSC 520 is to guide students through the process of designing a detailed proposal for a software- or hardware-system project and specifying its implementation requirements at a level appropriate to the proposed project. Students will choose an application arena of sufficient complexity so as to necessitate a non-trivial solution to the problem of designing and implementing a solution for the project. The selected topic area will then be studied through research and discussion. After a thorough analysis of the functionalities required by the proposed project, students will develop and present to the project supervisor various data modeling and system architecture possibilities: the possibilities will be iteratively discussed with and evaluated by the faculty supervisor, leading to a final document that:

- describes the functionalities of the proposed system in clear, concise and non-technical terms;
- specifies the tools necessary to implement a solution;
- defines a high-level design architecture for a solution;
- specifies important developer-designed objects required to represent the application area;
- describes the implementation techniques that are appropriate for manipulating the objects;
- presents an implementation schedule;
- presents a mechanism for determination of the final grade for CSC 520.

The finished CSC 520 proposal will be presented to department faculty and to the department at large at the end of the semester (typically on Reading Day).

The (pass/fail) grade for CSC 520 will be based on the final proposal document (in particular on the analysis of the required functionalities, the scope of the project, and on the appropriateness of any proposed design(s)) and the quality of the presentation and defense of the proposal. The finalized document will act as the contract document for the project that is to be implemented in CSC 521.

In CSC 521, students will implement the project as specified by the proposal created in CSC 520 by following the specific project plan and schedule. **Any changes to the CSC 520 proposal document must be documented, in writing, by the student and approved by the supervising faculty member and the department Chairperson and must be**

accompanied by a detailed explanation of the rationale for the changes and an assessment of the impact on the project.

The final grade for CSC 521 is determined by the evaluation mechanism specified in the CSC 520 proposal

Course Sequence Objective / Assessment Mechanism matrix

	Completed Project				
	Specification Component(s)	Implementation Component(s)	Result Analysis Component(s)	Documentation Component(s)	Presentation
CO01	✓	✓	✓	✓	✓
CO02	✓	✓	✓	✓	✓
CO03	✓	✓	✓	✓	✓
CO04	✓	✓	✓	✓	✓
CO05		✓	✓	✓	✓
CO06		✓	✓		✓
CO07	✓	✓	✓	✓	✓

Bibliography: Highly variable, dependent upon application area selected by student.

CSC 521 Computer Science Capstone Project

Requirements for the Implementation of the Capstone Project

Students must have completed CSC 520 and must fill out a Directed Study Registration form in order to register for CSC 521. Note that since completion of CSC 520 does not take place until the end of the semester (after the formal presentation of the proposal), CSC 521 *cannot* be registered for during regular advising / pre-registration. **Registration for CSC 521 *must* take place through the Registrar's Office (Navigator cannot be used to register for directed study courses).** Note that the signatures required include those of the supervising faculty member and the department chairperson.

Once work has begun on a project, modifications to the original proposal may be found necessary. ***Any such modifications must be justified and submitted, in writing, to the faculty supervisor, and subsequently approved by the faculty supervisor before being implemented.***

Establishment of the timetable for the project and agreement on a reasonable rate of progress *was* established in CSC 520 when the project proposal was formalized. During CSC 521 it *is* (note the use of present tense!) the responsibility of the *student(s)* to maintain this rate of progress and meet the agreed-upon deadlines. Direct supervision of the project by the faculty supervisor is minimal - there are no regularly-scheduled lectures as in most academic courses. Students may consult with the supervisor for suggestions as to how to approach an unexpected problem or where to go to find technical support; students should *not* expect the faculty supervisor to assist *directly* in debugging code or to provide detailed technical assistance. Inadequate progress on the part of any student may, at the discretion of the supervisor, result in a failing grade for that student.

One week ***before*** the last day of classes for the semester the student(s) must submit to the faculty supervisor all required deliverables for review:

- the original proposal, as approved by the Directed Study Committee;
- any modifications or extensions to the original proposal as approved by the faculty supervisor and the Directed Study Committee;

- a narrative of the progress of the project, in clear, concise English, including any problems encountered and how said problems were addressed;
- required deliverables (deliverable components as specified in the final approved proposal from CSC 520)
- **in particular, the PowerPoint presentation of the completed project (PowerPoint format) must be provided to the supervisor for review *well before Presentation Day***
- a summary of what was learned from the project and (based on that experience) discussion of how various aspects of the project might have been approached differently;
- a list of what areas of the proposal (if any) were not completed, and why.

Once the deliverables have been approved by the supervisor, all deliverables must be submitted, with two (2) copies submitted to the supervisor on Presentation Day. In addition, printed copies of the project presentation (including screen shots) must be made available to all department faculty members attending Presentation Day.

Student Experiences by Course Outcome (Objective) matrix:

student outcome / experience (e.g. presentations, tests, lab reports, writing projects, discussions, performances, etc.)	CO1	CO2	CO3	CO4	CO5	CO6	CO7
initial project research	✓	✓			✓	✓	✓
functional requirements specification	✓	✓			✓	✓	✓
potential solution research, analysis, selection	✓	✓	✓	✓	✓	✓	✓
development of project schedule, benchmarks, and evaluation criteria	✓	✓	✓		✓	✓	✓
project implementation	✓	✓	✓	✓	✓	✓	✓
project journal	✓	✓		✓	✓	✓	✓
project <i>post mortem</i>	✓	✓	✓	✓	✓	✓	✓
proposal and project presentations	✓	✓	✓		✓	✓	✓