

Course Description**CEN4090C | Software Engineering Capstone | 4.00 credits**

This upper division course, for students majoring in the BS-IST Software Engineering concentration, requires students to demonstrate their competence to analyze, design, develop, and test a software system. Student(s) will create, implement, and present a software project plan that includes the following work products: software requirements specification, design specification document, code, unit tests and project system test plan to create an operational system. This course should be taken during the last semester before graduation and with a departmental permission. Prerequisite(s): Student must be classified as a Senior and have completed at least 3 of the 5 concentration courses to obtain departmental approval.

Course Competencies:

Competency 1: The student will successfully formulate project requirements and a statement of work by:

1. Defining the project purpose and the scope of work to be conducted
2. Planning the project deliverable items and the respective timeline with milestones
3. Estimating cost and effort/time by using function points, size, process tasks, or use cases
4. Designing a final report about the project, including the project plan and all deliverable items, including:
 - a. work breakdown structure
 - b. project schedules
 - c. software requirements specification
 - d. software design specification
 - e. unit and system test plan
 - f. risk management plan
 - g. configuration management.

Competency 2: The student will demonstrate the ability to formalize system requirements by:

1. Generating a software development specification document that includes all the specified requirements correctly written using the specified template, and the requirements are consistent across all functional areas
2. Breaking down the problem description into logical components
3. Describing all appropriate non-functional requirements which are measurable

Competency 3: The student will demonstrate the ability to research a viable and complete solution by:

1. Considering two or more process and design methodologies and justifying the process and design approach selected
2. Generating a trade-off study that shows careful analysis of system and resource requirements, and the resulting trade-offs performed

Competency 4: The student will demonstrate the ability to generate a design for the system by:

1. Developing a software design specification that includes a high-level architecture diagram of the system and appropriate component breakdown
2. Providing detailed function descriptions and indications of all function interactions
3. Describing all complex data structures that will be used
4. Providing a clear description of the system architecture to be employed
5. Listing the details of all the algorithm(s) employed
6. Providing details of the analysis of program efficiency to be performed

Competency 5: The student will demonstrate the ability to implement/develop a working system by:

1. Demonstrating that all code correctly implements all functionality from the design document, meets and can be traced back to the requirements

2. Demonstrating that the implementation uses good practices for modularity, naming convention, comments, and code layout
3. Writing functions are clean (cohesive, loosely coupled, etc.) and pass/return appropriate values
4. Demonstrating that the code is accounting for error paths and the user doing something unexpected

Competency 6: The student will demonstrate the ability to test and deliver a defect-free system by:

1. Developing a validation and verification procedure/documentation that contains a thorough, clear, and complete description of how unit tests were developed and critical criteria for successful unit testing provided
2. Generating a test specification that has a complete or close to complete list of needed unit test cases. Test cases should account for 100% code and data coverage. The test specification document shall list all test cases along with expected and actual results
3. Generating a test report that includes a complete or close to complete list of defects found by running the tests. The defects are explained well and thoroughly. Each defect correctly indicates which unit test found the defect

Competency 7: The student will demonstrate the ability to effectively communicate and present the results of the project by:

1. Develop presentations that are detailed, informative, and engaging
2. Demonstrating that all work products provided the right level and type of detail
3. Satisfactorily answering questions ranging from implementation detail to test methodology to the project's future evolution

Learning Outcomes:

- Communicate effectively using listening, speaking, reading, and writing skills
- Solve problems using critical and creative thinking and scientific reasoning
- Formulate strategies to locate, evaluate, and apply information
- Use computer and emerging technologies effectively