**Course Description:**

This upper division course, for students majoring in the BS-IST Software Engineering track, requires students to demonstrate their competence to analyze, design, develop, and test software systems. 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. (3-hour lecture, 2-hour lab)

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<th>Course Competency</th>
<th>Learning Outcomes</th>
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| **Competency 1:** The student will successfully formulate project requirements and a statement of work by: | • Communication  
• Critical thinking  
• Information Literacy  
• Computer / Technology Usage |
| 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, and 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 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 of 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 the system by:

1. Demonstrating that all code correctly implements all functionality from design document, meets and can be traced back to the requirements.
2. Demonstrating that the implementation is using good practices for modularity, naming convention, comments, and layout of code.
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 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 key criteria for successful unit testing is 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 which includes a complete or close to complete list of defects found by running the tests. The defects are explained well and completely. Each defect correctly indicates which unit test found the defect.

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

1. Developing 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 future evolution of project.