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|  | **East West University**  **Department of Computer Science and Engineering**  **Course Outline**  **Spring 2018 Semester** |  |

# Course Information

**Course: CSE430 Software Testing and Quality Assurance**

**Credit and Teaching Scheme:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Theory | Laboratory | Total |
| Credits | 3 | 0 | 3 |
| Contact Hours | 3 Hours/Week for 13 Weeks | 0 | 3 Hours/Week for 13 Weeks |

**Prerequisite:**CSE412 Software Engineering

**Instructor Information**

**Instructor**: Shakila Mahjabin Tonni

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**TA:** TBA

**Class Routine and Office Hour**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Day** | **08:00-10:00** | **10:10-11:40** | **11:50-01:20** | **01:30-03:00** | **03:10-04:40** | **04:50-06:20** |
| **Sunday** |  | Office Hour  Room:636 | Office Hour  Room:636 | CSE411(3)  Room:110 |  |  |
| **Monday** |  |  | CSE102(1)  Room:529 | Office Hour  Room:636 | CSE435(1)  Room:358 |  |
| **Tuesday** | CSE411Lab(3)  Room:533 | Office Hour  Room:636 | CSE435(2)  Room:AB2-304 | Office Hour  Room:636 | Office Hour  Room:636 |  |
| **Wednesday** |  |  | CSE102(1)  Room:338 | Office Hour  Room:636 | CSE435(1)  Room:358 |  |
| **Thursday** |  | Office Hour  Room:636 | CSE435(2)  Room:111 | CSE411(3)  Room:212 |  |  |

**Course Objective**

This course is designed to enable a clear understanding and knowledge of the software testing and quality control. It explores different SQA components, techniques, and standards practiced as a part of software project management in the industry. Beside the concepts, it will build the capacity of reviewing, planning and designing test cases based on system requirements. It will develop the ability to use different testing techniques (black box and white box) and available tools used in real life software projects.

# Course Outcomes (COs):

After completion of this course students will be able to:

|  |  |
| --- | --- |
| CO1 | **Understand** different software quality assurance and quality control activities and standards for software projects. |
| CO2 | **Formulate** appropriate test plan and test cases based on system specifications. |
| CO3 | **Understand** different testing techniques and **apply** and **identify** appropriate testing for real-life complex software projects. |
| CO4 | **Apply** and **examine** automated testing tools; **demonstrate** and **adapt** those skills; **justify** and **compare** them for optimized quality control. |

**Mapping of Course Outcomes (COs) to Program Outcomes (POs):**

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| CO1 | X |  |  |  |  |  |  |  |  |  |  |  |
| CO2 |  | X |  |  | X |  |  |  |  |  |  |  |
| CO3 |  | X |  |  |  |  |  |  |  |  |  |  |
| CO4 |  | X |  |  | X |  |  |  | X | X |  | X |

**Descriptions of Program Outcomes (POs)**

|  |  |
| --- | --- |
| PO1 | **Engineering Knowledge (Cognitive):** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. |
| PO2 | **Problem Analysis (Cognitive):** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences. |
| PO3 | **Design/Development of Solutions (Cognitive, Affective):** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns. |
| PO4 | **Investigation (Cognitive, Psychomotor):** Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions. |
| PO5 | **Modern Tool Usage (Psychomotor, Cognitive):** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| PO6 | **The Engineer and Society (Affective):** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. |
| PO7 | **Environment and Sustainability (Affective, Cognitive):** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development. |
| PO8 | **Ethics (Affective):** Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice. |
| PO9 | **Individual Work and Teamwork (Psychomotor, Affective):** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings. |
| PO10 | **Communication (Psychomotor, Affective):** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions. |
| PO11 | **Project Management and Finance (Cognitive, Psychomotor):** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work as a member or a leader of a team to manage projects in multidisciplinary environments. |
| PO12 | **Life-Long Learning (Affective, Psychomotor):** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change. |

**Complex Engineering Problems and Activities**

**Attributes of Complex Engineering Problems Involved**

|  |  |  |
| --- | --- | --- |
| CO | PO | Attributes |
| CO1 | PO1 | Depth of knowledge required |
| CO2 | PO2 | Range of conflicting requirements, Depth of analysis required, Familiarity of issues |
| CO3 | PO2 | Range of conflicting requirements, Depth of analysis required, Familiarity of issues |
| CO4 | PO2 | Range of conflicting requirements, Depth of analysis required, Familiarity of issues |

**Attributes of Complex Engineering Activities Involved**

|  |  |  |
| --- | --- | --- |
| CO | PO | Attributes |
| CO2 | PO5 | Range of resources, Familiarity |
| CO4 (Project) | PO5, PO10 | Range of resources, Level of interaction, Familiarity |

**Descriptions of Range of Complex Engineering Problem Solving**

|  |  |
| --- | --- |
| **Attribute** | **Complex Problems** |
| Range of conflicting requirements | Involve wide-ranging or conflicting technical, engineering and other issues |
| Depth of analysis required | Have no obvious solution and require abstract thinking and originality in analysis to formulate suitable models. |
| Depth of knowledge required | Requires research-based knowledge, much of which is at, or informed by, the forefront of Computer Science and Engineering and that allows a fundamental-based, first-principles analytical approach. |
| Familiarity of issues | Involve infrequently encountered issues. |
| Extent of applicable codes | Are outside problems encompassed by standards and codes of practice for professional Computer Science and Engineering. |
| Extent of stakeholder involvement and level of conflicting requirements | Involve diverse groups of stakeholders with widely varying needs. |
| Consequences | Have significant consequences in a range of contexts. |
| Interdependence | Are high-level problems that include many component parts or sub-problems. |

**Descriptions of Range of Complex Engineering Activities**

|  |  |
| --- | --- |
| **Attribute** | **Complex Problems** |
| Range of resources | Involve the use of diverse resources (for this purpose, resources include people, money, equipment, materials, information and technologies) |
| Level of interaction | Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues |
| Innovation | Involve creative use of Computer Science and Engineering principles and research-based knowledge in novel ways |
| Consequences to society and the environment | Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation |
| Familiarity | Outside problems encompassed by standards and codes of practice for professional Computer Science and Engineering |

**Course Topics, Teaching-Learning Method, and Assessment Scheme**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Topic | Teaching-Learning Method | CO | Mark of Cognitive Learning Levels | | | | | Exam  (Mark) |
|  |  |  | C2 | C4 | C5 | C6 | Total |  |
| Software Quality, Quality Assurance & Quality Control, Quality Assurance activities, Quality standards CMM & CMMI | Lecture, Class Discussion, Discussion Outside Class with Instructor/ Teaching Assistant | CO1 | 2 |  |  |  | 2 | Midterm Exam I  (15) |
| Quality factors, ISO 9126 Quality factors, McCall's quality Factors | Do | CO1 |  | 5 |  |  | 5 |
| The components of the SQA, Review and inspections, Formal technical reviews, Cost estimations of review tasks | Do | CO1 |  | 5 | 3 |  | 8 |
| Test case design, Test plan format | Do | CO2 |  |  |  | 5 | 5 | Midterm  Exam II  (20) |
| Pairwise testing: AllPair testing | Do | CO2 |  | 5 |  |  | 5 |
| Decision Table, Boundary Value Analysis | Do | CO2 |  | 5 |  |  | 5 |
| Path Testing using Cyclomatic Complexity Analysis | Do | CO2 |  | 5 |  |  | 5 |
| Software testing – strategies, objectives, Software test classifications, White box testing, Black box testing | Do | CO3 |  | 5 |  |  | 5 | Final  (25) |
| Automated testing, Unit testing: NUNIT, Selenium | Do | CO3 |  | 5 |  | 5 | 10 |
| Product metrics, Analyzing the Software Quality Activities, Evaluating cost of software quality (COQ) and quality level | Do | CO3 |  |  | 10 |  | 10 |

**Project**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Topic | Teaching-Learning Method | CO | Mark of Cognitive Learning Levels | | Mark of Psycho-motor Learning Levels | Mark of Affective Learning Levels | CO Mark | Exam (Mark) |
| C4 | C6 | P3 | A2 |
| Project with report, demonstration and presentations\* | Group-based,  moderately complex Test plan report, Test code demonstration and oral presentation on Test case optimization | CO4 | 8 | 7 | 5 | 5 | 25 | Project  (25) |

**\*Notes:**

* **Late report submissionwill suffer a penalty rate of 20% per day, up to 5 days (weekends count towards the 5 days).** Report submissions that are more than 5 days late are penalized by 100%.
* Project must be done in group of 3.
* **STRICTLY NO COPYING** from others.

**Descriptions of Cognitive Domain (Anderson and Krathwohl’s Taxonomy 2001):**

The **cognitive domain** involves the development of our mental skills and the acquisition of knowledge.

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| --- | --- | --- | --- |
| **Level** | **Category** | **Meaning** | **Keywords** |
| C1 | Remembering | Recognizing or recalling knowledge from memory. Remembering is when memory is used to produce or retrieve definitions, facts, or lists, or to recite previously learned information. | Define, describe, draw, find, identify, label, list, match, name, quote, recall, recite, tell, write |
| C2 | Understanding | Constructing meaning from different types of functions be they written or graphic messages or activities like interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining. | Classify, compare, exemplify, conclude, demonstrate, discuss, explain, identify, illustrate, interpret, paraphrase, predict, report |
| C3 | Applying | Carrying out or using a procedure through executing, or implementing. *Applying* relates to or refers to situations where learned material is used through products like models, presentations, interviews or simulations. | Apply, change, choose, compute, dramatize, implement, interview, prepare, produce, role play, select, show, transfer, use |
| C4 | Analyzing | Breaking materials or concepts into parts, determining how the parts relate to one another or how they interrelate, or how the parts relate to an overall structure or purpose. Mental actions included in this function are *differentiating, organizing, and attributing,* as well as*being able to distinguish between* the components or parts. When one is analyzing, he/she can illustrate this mental function by creating spreadsheets, surveys, charts, or diagrams, or graphic representations. | Analyze, characterize, classify, compare, contrast, debate, deconstruct, deduce, differentiate, discriminate, distinguish, examine, organize, outline, relate, research, separate, structure |
| C5 | Evaluating | Making judgments based on criteria and standards through checking and critiquing. Critiques, recommendations, and reports are some of the products that can be created to demonstrate the processes of evaluation. | Appraise, argue, assess, choose, conclude, critique, decide, evaluate, judge, justify, predict, prioritize, prove, rank, rate, select, monitor |
| C6 | Creating | Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a new way, or synthesize parts into something new and different creating a new form or product.  This process is the most difficult mental function. | Construct, design, develop, generate, hypothesize, invent, plan, produce, compose, create, make, perform, plan, produce |

**Descriptions of Psychomotor Domain (Dave’s Taxonomy 1975):**

The **psychomotor domain** includes physical movement, coordination, and use of the motor-skill areas.

|  |  |  |  |
| --- | --- | --- | --- |
| **Level** | **Category** | **Meaning** | **Keywords** |
| P1 | Imitation | Copy action of another; observe and replicate. | Relate, Repeat, Choose, Copy, Follow, Show, Identify, Isolate. |
| P2 | Manipulation | Reproduce activity from instruction or memory | Copy, response, trace, Show, Start, Perform, Execute, Recreate. |
| P3 | Precision | Execute skills reliably; independent of help. | Assemble, Implement, Organize, Calibrate, Demonstrate, Build, Perfect, Control, Complete, Measure. |
| P4 | Articulation | Adapt and integrate expertise to satisfy a non-standard objective. | Modify, Master, Develop, Adapt, Formulate, Coordinate, Combine, Solve, Integrate. |
| P5 | Naturalization | Automated, unconscious mastery of activity and related skills at strategic level. | Design, Rank, Manage, Compose, Develop, Specify, Construct, Invent. |

**Descriptions of Affective Domain (Krathwohl, Bloom, Masia’s Taxonomy 1973):**

The **affective domain** includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes.

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| --- | --- | --- | --- |
| **Level** | **Category** | **Meaning** | **Keywords** |
| A1 | Receiving | Willingness to participate in an activity to attend to a stimulus; getting and holding the attention of students. | Locate, Give, Point to, Follow, Sit erect, Hold, Name, reply, Identify, Choose |
| A2 | Responding | Actively participates; demonstrates interest in an object, activity or phenomena; seeks or pursues this object, activity or phenomena. | Label, Answer, Perform, Write, Conform, Assist, Recite, Report, Read, Greet, Help, Present, Compile. |
| A3 | Valuing | Value or worth attached to an object, activity or phenomena; varies from simple acceptance to commitment. | Work, Form, Follow, Join, Invite, Justify, Study, Explain, Share, Propose, Select, Complete, Describe, read, report, Differentiate, Initiate. |
| A4 | Organizing | Compare and contrast, and resolve conflict to build a consistent value system; emphasis on comparing and synthesizing values. | Relate, Synthesize, Identify, Prepare, Defend, Generalize, Modify, Integrate, Order, Compare, Complete, Organize, Adhere, Arrange, Combine, Explain, Alter. |
| A5 | Internalizing | Adopt a value system for a length of time that contributes to a particular “lifestyle” (i.e. directs behavior). | Influence, Propose, Use, Quality, Revise, Serve, Solve, Modify, Display, Practice, Listen, Question, Perform, Act, Discriminate, Verify |

# Overall Assessment Scheme:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Assessment Area** | **CO** | | | | **Assessment Area Mark** |
| **CO1** | **CO2** | **CO3** | **CO4** |  |
| Class Participation | 1.25 | 1.25 | 1.25 | 1.25 | 5 |
| Class Test/Quiz | 2.5 | 2.5 | 2.5 | 2.5 | 10 |
| Midterm Exam - I | 15 | 0 | 0 | 0 | 15 |
| Midterm Exam -II | 0 | 20 | 0 | 0 | 20 |
| Final Exam | 0 | 0 | 25 | 0 | 25 |
| Project/Assignment | 0 | 0 | 0 | 25 | 25 |
| **Total Mark** | **20** | **25** | **30** | **25** | **100** |

**Teaching Materials/Equipment**

**Text book:**

Galin, Daniel. *Software quality assurance: from theory to implementation*. Pearson Education India, 2004.

**Assignment:**

Assignment description will be provided.

**Grading System**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Marks (%)** | **Letter Grade** | **Grade Point** | **Marks (%)** | **Letter Grade** | **Grade Point** |
| 97-100 | A+ | 4.00 | 73-76 | C+ | 2.30 |
| 90-96 | A | 4.00 | 70-72 | C | 2.00 |
| 87-89 | A- | 3.70 | 67-69 | C- | 1.70 |
| 83-86 | B+ | 3.30 | 63-66 | D+ | 1.30 |
| 80-82 | B | 3.00 | 60-62 | D | 1.00 |
| 77-79 | B- | 2.70 | Below 60 | F | 0.00 |

**Exam Dates**

|  |  |  |  |
| --- | --- | --- | --- |
| **Section** | **Term I** | **Term II** | **Final** |
| 1 | 07.02.2018 | 07.03.2018 | 11.04.2018 |
| 2 | 06.02.2018 | 06.03.2018 | 17.04.2018 |

**Academic Code of Conduct**

**Academic Integrity:**

Any form of cheating, plagiarism, personification, falsification of a document as well as any other form of dishonest behavior related to obtaining academic gain or the avoidance of evaluative exercises committed by a student is an academic offence under the Academic Code of Conduct and **may lead to severe penalties as decided by the Disciplinary Committee of the university.**

**Special Instructions:**

* Students are expected to attend all classes and examinations. A student MUST have at least 80% class attendance to sit for the final exam.
* Students will not be allowed to enter into the classroom after 20 minutes of the starting time.
* For plagiarism, the grade will automatically become zero for that exam/assignment.
* Normally there will be **NO make-up exam**. However, in case of **severe illness, death of any family member, any family emergency, or any humanitarian ground**, if a student miss any exam, the student MUST get approval of makeup exam by written application to the Chairperson through the Course Instructor **within 48 hours** of the exam time. Proper supporting documents in favor of the reason of missing the exam have to be presented with the application.
* For **final exam**, there will be NO makeup exam. However, in case of **severe illness, death of any family member, any family emergency, or any humanitarian ground**, if a student miss the final exam, the student MUST get approval of **Incomplete Grade** by written application to the Chairperson through the Course Instructor **within 48 hours** of the final exam time. Proper supporting documents in favor of the reason of missing the final exam have to be presented with the application. **It is the responsibility of the student to arrange an Incomplete Exam within the deadline mentioned in the Academic Calendar in consultation with the Course Instructor**.
* All mobile phones MUST be turned to silent mode during class and exam period.
* There is **zero tolerance for cheating** in exam. Students caught with cheat sheets in their possession, whether used or not; writing on the palm of hand, back of calculators, chairs or nearby walls; copying from cheat sheets or other cheat sources; copying from other examinee, etc. would be treated as cheating in the exam hall. The only penalty for cheating is **expulsion for several semesters as decided by the Disciplinary Committee of the university**.