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| UNITED INTERNATIONAL UNIVERSITY Department of Computer Science and Engineering (CSE) Course Syllabus | | |
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| **Part A: Introduction** | | |
| **1** | **Course Title** | Software Testing and Quality Assurance |
| **2** | **Course Code** | CSE 4495 |
| **3** | **Pre-requisites** | N/A |
| **4** | **Course Type** | Elective Course |
| **5** | **Credit Hours** | 3.00 |
| **6** | **Contact Hours** | 3 Hours/Week |
| **7** | **Semester** | 8th |
| **8** | **Total Marks** | 100 |
| **9** | **Course Instructor’s Information** | Md. Mohaiminul Islam  Office – Room #636  Email- [mohaiminul@cse.uiu.ac.bd](mailto:mohaiminul@cse.uiu.ac.bd)  Phone - 01843707534 |
| **10** | **Course Rationale** | This course is intended to give students a theoretical and a practical understanding of Quality Assurance in the context of Software Development and Engineering.  Structured into three sections, the course will first present concepts and theory, progress through a practical introduction to modern best practices with a high-level introduction to automation and other tools that students may encounter in a professional context. |
| **11** | **Course Objectives** | The goal for this course is to:   * To introduce Unit Testing via JUnit and other environments. * To familiarize white box testing techniques, including coverage metrics. * To familiarize testing of web-based applications via Selenium. * To introduce system, and deployment testing. * Demonstrate mastery of test-driven development. |
| **Part B: Content of the Course** | | |
| **12** | **Course Contents (approved by UGC)** | Introduction and Fundamentals of Testing and Analysis, Functional and Combinatorial Testing, Test Case Adequacy/Control Flow Testing, Data Flow Testing, Testing Object-Oriented Software, Model-Based Testing, Finite State Verification, Proofs and Analysis, Execution and Automation, End-of-Testing Activities and Assessing Reliability |
| **13** | **Course**  **Outcomes (COs)** | |  |  | | --- | --- | | **COs** | **Description** | | CO1 | **Explain** the process of applying tests to software and the fundamental components of a test case | | CO2 | **Derive** test cases from software requirement specifications - including being able to partition input and output domains, form test specifications, and identify valid combinations of input. | | CO3 | **Analyze** and distinguish between methods of judging test case adequacy and design tests that will accomplish the obligations of such methods. | | CO4 | **Describe** models of system behavior & make logical arguments that prove the correctness of program implementations. | | CO5 | **Design** Automated test execution units and explain methods of measuring software reliability | |
| **14** | **Mapping of COs and Program outcomes** | |
|  | |  |  |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **COs** | **Program Outcomes(POs)** | | | | | | | | | | | | | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | | **CO1** | C |  |  |  |  |  |  |  |  |  |  |  | | **CO2** |  |  | C |  |  |  |  |  |  |  |  |  | | **CO3** |  | C |  |  |  |  |  |  |  |  |  |  | | **CO4** |  |  |  | C |  |  |  |  |  |  |  |  | | **CO5** |  |  |  |  | C |  |  |  |  |  |  |  | | |
| **15** | **Mapping COs with Teaching-Learning and Assessment Strategy** | |
|  | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Class/Week** | **Topics/Assignments** | **Course Outcomes**  **(COs)** | **Reading Reference** | **Teaching-Learning Strategies** | **Assessment Strategies** | | 1 | Course Overview: Verification & Validation | CO1 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 2 | Testing Fundamentals | CO1 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 3 | Modeling Software Behavior | CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 4 | Functional Testing | CO2,CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 5 | Review and First Class Test |  |  | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 6 | Combinatorial Testing | CO2,CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 7 | Introduction to Structural Testing, Structural Testing: Path-Based Metrics | CO2,CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 8 | Masking and Introduction to Data Flow Analysis | CO2,CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 9 | Data Flow Analysis, Data Flow Testing | CO2, CO3, CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 10 | Model-Based Testing: Finite State Machines | CO3, CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 11 | Model-Based Testing: Decision Structures and Grammars (Contd.) | CO3, CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 12 | Review and Second Class Test |  |  | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | |  |  | | | |  | | 13 | Test Oracles | CO2,CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 14 | Fault-Based Testing | CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 15 | Test Execution and Automation, Introduction to JUnit | CO5 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 16 | Testing Object-Oriented Systems | CO2,CO5 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 17 | Testing Object-Oriented Systems(Contd.) | CO2,CO5 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 18 | Review and Third Class Test |  |  | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 19 | Finite State Verification | CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 20 | Finite State Verification  (Contd.) | CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 21 | Symbolic Execution and Proof of Properties | CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 22 | Program Analysis | CO4 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 23 | Automated Test Case Generation: ART and DSE | CO5,CO3 | Lecture Slides and Text/ Ref. Book/ Online Materials | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 24 | Automated Test Case Generation: Metaheuristic Search (Contd.) | CO5,CO3 | Lecture Slides and Text/ Ref. Book/ Online Materials | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 25 | Release and Post-Release Testing: : System Acceptance and Regression Testing | CO5,CO3 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 26 | Dependability and Statistical Testing | CO5 | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 27 | Review and Fourth Class Test |  | Lecture Slides and Text/ Ref. Book | Lecture/Group Discussion/  Exercise | Class Tests/Assignments/Quizzes/Exam | | 28 | **FINAL EXAM** | | | |  | | |

**Part C: Assessment and Evaluation Methods**

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| **Assessment Strategy** | **Assessment Types** | **Marks** |
| Formative Assessment | Attendance | 5% |
| Assignments | 10% |
| Class Tests | 20% |
| Summative Assessment | Mid Term | 25% |
| Final Exam | 40% |

**Grading System**

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| **Letter Grade** | **Marks %** | **Grade Point** | **Letter Grade** | **Marks%** | **Grade Point** |
| A (Plain) | 90-100 | 4.00 | C+ (Plus) | 70-73 | 2.33 |
| A- (Minus) | 86-89 | 3.67 | C (Plain) | 66-69 | 2.00 |
| B+ (Plus) | 82-85 | 3.33 | C- (Minus) | 62-65 | 1.67 |
| B (Plain) | 78-81 | 3.00 | D+ (Plus) | 58-61 | 1.33 |
| B- (Minus) | 74-77 | 2.67 | D (Plain) | 55-57 | 1.00 |
|  |  |  | F (Fail) | <55 | 0.00 |

**Part D: Learning Resources**

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| **Text Book** | Software Testing and Analysis. Mauro Pezze and Michal Young. Wiley, 2008 |
| **Reference books** | 1. *Software Testing: A Craftsman’s Approach,* Fourth Edition - Paul C. Jorgensen. 2. *The Art of Software Testing,* 3rd Edition - Glenford J. Myers. |
| **LMS URL** | <http://lms.uiu.ac.bd/course/view.php?id=3241> |

**Appendix-1: Program outcomes**

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| **POs** | **Program Outcomes** |
| **PO1** | An ability to apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. |
| **PO2** | Identify, formulate, research and analyze complex engineering problems and reach substantiated conclusions using the principles of mathematics, the natural sciences and the engineering sciences. |
| **PO3** | An ability to 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 and of cultural, societal and environmental concerns. |
| **PO4** | An ability to conduct investigations of complex problems, considering experimental design, data analysis and interpretation and information synthesis to provide valid conclusions. |
| **PO5** | An ability to 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 their limitations |
| **PO6** | An ability toapply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. |
| **PO7** | An ability tounderstand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development. |
| **PO8** | An ability toapply ethical principles and commit to the professional ethics, responsibilities and the norms of the engineering practice. |
| **PO9** | An ability tofunction effectively as an individual and as a member or leader of diverse teams and in multidisciplinary settings. |
| **PO10** | An ability tocommunicate 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** | An ability todemonstrate knowledge and understanding of engineering and management principles and apply these to one’s work as a team member or a leader to manage projects in multidisciplinary environments. |
| **PO12** | An ability torecognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change. |