CSE4041/CSE6021: Functional and Non-Functional Testing

Programme: B.Tech (CSE)   **Year :** Final   **Semester :** Eighth
Course: Program Elective   **Credits :** 4   **Hours :** 40 hours Theory

Course Context and Overview (100 words):

Industry demands efficient software coders and testers as well. Software is needed to be verified and validated. This course will cover majority of software testing techniques and a mini project to get the actual feel of the same.

Prerequisites Courses: Software Engineering

Course outcomes(COs):

The Outcomes of this Course are	Correlates to Program outcomes
CO1: To understand **v**arious test processes and continuous quality improvement	PO2, PO5, PO7
CO2: To identify Types of errors and fault	PO 1, PO3, PO4, PO7
CO3: Combinatorial test generation	PO1
CO4: The use of various test tools	PO2, PO11, PO4, PO12
CO5: Application of software testing techniques in commercial environments	PO3, PO4, PO6, PO8

Course Topics

Contents	Lecture Hours	
UNIT – 1 **Introduction**		7
1.1 Software Development Life Cycle Models	1	
1.2 Software Quality	1	

1.3	Requirements	2	
1.4	Behaviours and correctness	1	
1.5	Principles of Testing	1	
1.6	Verification vs Validation; Testing and Debugging	1	
UNIT –2 **Types of Testing**			13
2.1	White Box Testing – Unit, Interface and Integration Testing	6	
2.2	Black Box Testing -- System Level Functional Testing; User Acceptance Testing; Performance Testing; Regression Testing; Internationalization Testing; Security Testing; Ad hoc Testing;	7	
3 **UNIT-3** 4 **Test Management and Automation**			
3.1	Test planning; Test Management; Test Process; Test Reporting	2	
3.2	Test Automation; Need for Automation; Selecting a Test Tool; Requirements for Test Tool;	3	5
UNIT-4 **Test Generation**			
4.1	Manual Software Test Case and Test Data and Test Bed Generation Strategies; Structures for Testing Teams;	3	6
4.2	Automated tools for test coverage, test case and test data generation	3	
4 **UNIT-5** **Test Metrics**			
5.1	Software Test Coverage Metrics	3	
5.2	Reliability Metrics; Project Metrics; Progress Metrics; Productivity Metrics	2	9
5.3	Testing Web-based Software Applications; Testing Embedded Software Applications	2	
5.4	Software Test Effort Estimation Techniques: FTP based techniques;	2	

Selected subset of Program Outcomes for this Course and its relevance with COs:

	Program Outcome
1	**An ability to apply knowledge of mathematics, sciences and engineering in addressing business, scientific and social problems of the society**
Knowledge of basic mathematics, computers and science help students in solving and analyzing the given testing problem.	
2	**An ability to analyze a problem, and identify and define the computing requirements appropriate to its solution.**
This course includes project where students identify a problem and provide solution for the same.	
3	**An ability to design, implement, experiment, and evaluate a computer-based system, process, component, or program to meet desired needs**
Test beds are designed, analyzed and implemented using tools and various scripting languages by the students	
4	**An ability to identify, formulate, and solve engineering problems**
Some of the real world problems are based on engineering applications	
5	**An ability to apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices**
Complexity of a code and algorithm implemented by the code to be tested	
6	**An ability to analyze the local and global impact of computing on individuals, organizations, and society**
Students analyze the issues of a bug carrying software and its impact on society or the end users.	
7	**An ability to use current techniques, skills, and engineering tools necessary for computing practice**
The course teaches the ;attest tools and techniques for testing softwares	
8	**An understanding of professional, ethical, financial, and social issues and responsibilities**
This course does not deal with the above issues	
9	**An ability to function effectively, as a member or leader, in multidisciplinary teams to accomplish a common goal**
This course has a project component where a group works for a common goal.	

10	An ability to communicate effectively by oral, written, and graphical means with a range of audiences

This course does not deal with the above issues

11	An ability to independently acquire and apply required information, and an appreciation of the associated process of life-long learning

This course does not deal with the above issues

12	A knowledge of contemporary issues of computing and engineering

This course includes the developments in testing which are the demand of real world.

Course Outcomes, PO Levels, Instructional Methods, Knowledge Categories:

Instructional Methods:

M1 - Lecture interspersed with discussions   M2 - Lecture with a quiz
M3 - Tutorial   M4 - Laboratory
M5 - Group Discussion   M6 - Group Assignment
M7 - Group Project   M8 - Term Paper/Report
Innovative Delivery Methods/ Technologies
 M9 - Promote Active Learning   M10 – Course/ Learning Management System
M11 - Video Lectures (NPTEL, SONET, MIT etc)   M12 - ICT tools

	CO/ Competency	POs - Levels	Instructional Methods
CO1	To understand various test processes and continuous quality improvement	12:4	M2
CO2	To identify Types of errors and fault	1:3 2:3 8:4	M2, M3
CO3	Combinatorial test generation	1:3 2:4 3:2 6:3	M7, M8
CO4	The use of various test tools	7:4	M1
CO5	Application of software testing techniques in commercial environments	4:5	M12

CO/ Competency – PO Matrix:
Relationship of Course Learning Outcomes to Computer Science & Engineering Program outcomes

Comp.	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO 1												4
CO 2	3	3						4				
CO 3	3	4	2			3						
CO 4							4					4
CO 5				5								

Textbook references (IEEE format):
Text Book:

1.   Patton and Patel, *"Software Testing"*, Pearson Education
2.   Ron Patton, "*Software Testing",* Pearson Education
3.   Aditya P. Mathur, "*Foundations of Software Testing",* Pearson Education

Reference books:

1.   M G Limaye, "*Software Testing",* Tata McGraw-Hill
2.   Roger S. Pressman, "*Software Engineering" – A practitioner's approach,* 5th Edition, McGraw Hill

Evaluation Methods: Evaluation criteria will be shared by the concerned course instructor.

Attainment of COs: Evaluation Template
Questions are designed to evaluate the attainment of each course outcome.
Table below maps marks of questions asked with COs for the course.