Software Testing & Test Management
Training Course Offered by The Westfall Team

Software Testing & Test Management is a 5-day course designed to provide an excellent knowledge base and practical skills for anyone interested in improving Software Testing and Test Management techniques and practices in their organization. This course starts with an overview of software testing basics, including discussions of the importance of software testing, the different levels of testing and basic testing principles. Basic testing terminology is defined. Techniques for ensure test coverage of requirements, different types of testing documentation and various test activities are discussed.

Course attendees will learn how to utilize various techniques for performing systematic structural testing, including decision/condition coverage, loop testing and basis path testing. Strategies for performing software and system integration testing are also covered.

Course attendees will explore various techniques for performing functional testing of individual functions, user scenarios and of the operational profile. This course will also explore various issues involved in testing the software's nonfunctional requirements. This course also teaches the basics of software regression test analysis.

The overview of test planning and management includes a discussion of how basic project management techniques apply to testing. Methods for performing test planning and risk management are explored. The discussion on test management includes an overview of reviews and metrics for monitoring the testing activities and product quality. This course ends with an overview of the elements involved in documenting the testing process and metrics to measure the success of those processes.

Method of Instruction: This course is taught through lecture and interactive discussion. Actual examples from the software industry are utilized to make the information relevant. Throughout this course, learned skills are practiced using team exercises. The emphasis of this course is on techniques that allow the attendees to transition the skills learned in this course to their own work environments.

Target Audience: Software testers, quality engineering, developer, project managers, functional managers and other software project stakeholders involved in test design, execution, planning and management, and who are interested in improving software testing practices in their organization.

Course Objectives: Upon successful completion of this course attendees will be able to:

- Understand the basic concepts of software testing
- Perform effective and efficient structural testing of your software
- Integrate and test the various units and components of your software system
- Perform effective and efficient functional testing of software
- Select the appropriate tests to regression test your software after changes have been made
- Plan, track and control the software testing effort

Detailed Outline:

I: Software Testing – The Basics

1. Why, When, What, & How of Testing
   a. Why Test?
      - Testing Defined
      - Testing Software Products
      - Why is Testing Important?
      - Conformance to Requirements
      - Testing Finds Defects
      - Assess Quality & Reliability
      - Defect Prevention & Process Improvement
      - Common-Defect Checklists
   b. When to Test?
      - Levels of Testing
      - Testing Activities
      - Increasing Cost of Fixing Issues
   c. What to Test?
   d. How to Test?
      - Testing Principles
      - Factors Affecting Quality of Testing
2. Testing Terminology
      - Standardizing Testing Terminology
      - Mistakes, Faults & Failures
      - Testing, Debugging & Root Cause Analysis
      - Verification & Validation Defined
      - Software Verification & Validation
      - V&V Techniques – Static Analysis
      - V&V Techniques – Dynamic Analysis
      - Types of Testing
      - Test Bed
3. Test Coverage of Requirements
      - Where to Find Requirements
      - Traceability
      - Testability
      - Attributes of Testable Requirements
      - Test Matrix
4. Test Documentation
      - Benefits of Formal Test Documentation
      - Types of Testing Documentation
5. Test Activities
   a. Test Activities

b. Participate in Peer Reviews
c. Test Planning & Design
   - Test Case Specification
   - Test Procedure Specification
d. Test Execution
   - Test Log
   - Test Incident Report
   - Test Summary Report

6. Standards & Models Related to Testing
   - Why Standards are Important
   - IEEE Standards Related to Testing
   - ISO 12207 & IEEE/EIA 12207on Testing
   - ISO 9001:2008 on Testing
   - SEI CMMI[SM] on Testing

II: Structural (White Box) Testing

1. What is Structural Testing?
   - Structural Testing Defined
   - Strengths of Structural Testing
   - Focus of Structural Testing
   - Benefit of Structural Testing
   - Weaknesses of Structural Testing
   - The Challenge of Structural Testing
   - Structural Testing Techniques
2. Condition/Decision Testing
   - Types of Condition/Decision Testing
   - Statement Coverage
   - Decision Coverage
   - Condition Coverage
   - Condition/Decision Coverage
   - Multiple Condition Coverage
   - Exercise – Condition/Decision Testing
3. Loop Testing
   - Testing Different Classes of Loops
   - Common Loop Defects
   - Exercise – Testing Loops
4. Basis Path Testing
   - Independent Path Coverage
   - Step 1: Draw a Control Flow Graph
   - Step 2: Calculate Cyclomatic Complexity
   - Uses of Cyclomatic Complexity
   - Step 3: Choose a Basis Set of Paths
   - Step 4: Generate Test Cases
   - Exercise – Basis Path Testing
5. Testing Exception Handling

III: Integration (Grey Box) Testing

1. What is Integration Testing?
   - Incremental Integration
   - Interfaces
   - External Interfaces
   - Internal Interfaces
   - Cross-Reference Tools
   - Coupling
   - Component Level Structural Complexity
2. Unit / Component Integration Testing
   a. Top-Down Integration & Testing
      - Stubs
      - When to Choose Top-Down
   b. Bottom-Up Integration & Testing
      - Drivers
      - When to Choose Bottom-Up
   c. Basis Path Testing
      - Basis Path Testing During Integration
      - Exercise - Basis Path Testing During Integration
3. System Integration
   - Hardware/Software Integration Testing
   - Data Flow Testing
   - Common Data Flow Defects

IV: Functional (Black Box) Testing

1. What is Functional Testing?
   - Functional Testing Defined
   - Strengths of Functional Testing
   - Weaknesses of Functional Testing
   - Types & Levels of Requirements
2. Testing the Functional Requirements
   a. Testing Each Function
      - Create a Function List
      - Function List - Exercise
      - Function's Environment & Capability
      - Function's Environment
      - Understanding the Function's Capability
      - Environment & Capability - Example
      - Environment & Capability - Exercise
      - Input Testing
      - Equivalence Class Partitioning
      - Boundary Value Testing
      - Human/Hardware – Input Testing Checklist
      - Testing Outputs
      - Human/Hardware – Output Testing Checklist
      - Input & Output Testing - Exercise
      - Example Solution – Input & Output Testing Exercise
      - Forms for Input & Output Testing Exercise
      - Data Testing
      - Data Testing Checklist
      - Data Testing - Example
      - Computation Testing
      - Computation Testing Checklist

- File System Interface Checklist
- Software/OS Interface Testing
- Testing for Memory Faults Checklist
- Testing for Network Faults Checklist

b. Usage Scenario Testing
- Steps to Defining Use Cases
- Develop a Use Case for Each Interaction
- Use Case - Example
- Turning Use Cases into Test Scripts
- Creating Tests from Use Cases – Exercise

c. Operational Profile Testing
- Operational Profile - Example
- Threads
- Testing to the Operational Profile

3. Testing Non-Functional Requirements
   a. Usability Testing
      - Usability Characteristics
      - Usability Testing - Exercise
   b. Software Reliability
   c. Performance Testing
      - Race Conditions & Time Dependencies
      - Resource Utilization Testing
      - Normal Load, Volume & Stress Testing Compared
      - Load – Volume Testing
      - Load – Stress Testing
      - Performance Testing - Exercise
   d. Safety Testing
      - Hazard Analysis
   e. Security Testing
      - Security Testing - Exercise
   f. Configuration Testing
      - Configuration Testing Matrix
      - Client/Server Architecture Testing
   g. Localization Testing
      - Localization Checklist
4. Functional Test Case Design
   a. Cause & Effect Graphing
      - Step 1 – Break Down the Specification
      - Step 2 – Identify Causes & Effects
      - Step 3 – Create Cause-Effect Graphs
      - Step 4 – Annotate Graphs with Constraints
      - Step 5 – Convert Graphs into Limited-Entry Decision Table
      - Step 6 – Convert Decision Table into Test Cases
   b. State Transition Testing
      - State Transition Diagram – Examples
      - State Transition Testing
      - Event/Response Table – Example
      - Event/Response Table – Exercise
   c. Exploratory Testing
5. Functional Test Execution
   a. Unit/Component Functional Testing
   b. Testing Third Party Software
      - Commercial Off The Shelf (COTS) Software
      - Advantages & Disadvantages of COTS
      - COTS Usage
      - COTS Testing
      - Vendor Supplied Software
   c. System Testing
   d. Alpha Testing
   e. Beta Testing
   f. Acceptance Testing
   g. Installation Testing
      - Compatibility & Conversion Testing

V: Regression Testing

1. Regression Analysis & Testing
   a. Regression Analysis Defined
   b. Determining Impacts & Possible Side Effects
   c. Regression During Development
   d. Regression for Releases Systems
   e. Regression Testing Step 1 – Test What Changed
   f. Regression Testing Step 2 – Test What Was Affected
   g. Regression Testing Step 3 – Execute the Regression Test Suite
2. Maintenance Testing
   a. Software Maintenance
   b. Maintenance Testing
   c. Patching Issues
   d. Testing Patches
   e. Maintenance Release Testing
   f. Testing Ported Software
3. Test Automation
   - Regression Test Library
4. Regression Test Execution

VI: Test Planning & Management

1. Project Management – The Basics
   - Project Defined
   - Software Project Management Process
   - Goals of Software Project Planning
   - Goals of Software Project Management
   - Cost/Schedule/Product Trilogy
   - Successful Projects
   - Test Planning & Management
   - Test Manager

2. Test Planning
   a. V&V Plan
   b. Test Plans
   c. Test Design Specification
   d. Work Breakdown Structure
      - Product Type Work Breakdown Structure
      - Process Type Work Breakdown Structure
      - Hybrid Type Work Breakdown Structure
      - Long-term & Near-term Planning
      - How Far to Break It Down
      - Testing WBS – Exercise
      - Test Deliverables
   e. Test Estimation
      - Estimating Size
      - Estimating Effort & Cost
      - Test Productivity Metrics
      - Include Everything
      - Test Schedule & Resources
      - Activity Network
      - Schedule Duration
   f. Test Staffing & Training
      - Approaches to Organizing the Test Function
      - Staff & Resource Allocation
      - Qualities Beneficial to a Tester
      - Skill Gap Analysis
   g. Test Environment
      - Test Tools
3. Risk Management
   - Risk Defined
   - Risk/Reward Balance
   - Types of Risk
   - Risk Management Process
   - Risk Identification Techniques
   - Techniques for Handling Risks
   - Exercise – Risk Management
   - Risk Based Testing
4. Test Management
   a. Test Implementation
      - Freezing Baselines
   b. Test Tracking
      - Evaluating the Testing Effort
      - Technical Peer Reviews
      - Managerial Reviews
      - Managerial Reviews - Test Team Status Reviews
      - Managerial Reviews - Senior Management Reviews
      - Managerial Reviews - Phase Transition/Milestone Reviews
      - Post Project Reviews
      - Audits
      - Test Management Metrics
      - Test Management Metrics – Schedule Tracking
      - Test Management Metrics – Staff & Resource Tracking
      - Test Management Metrics – Requirements Churn Metric
      - Test Completeness Metrics
      - Defect Tracking Metrics
      - Defect Tracking Metrics – Defect Arrival Rare
      - Defect Tracking Metrics – Cumulative Defects by Status
      - Defect Tracking Metrics – Defect Closure Rate
      - Defect Tracking Metrics – Defect Backlog by Severity
      - Defect Tracking Metrics – Reliability Predictions
      - Cost of Quality Metrics
   c. Test Control
      - Corrective Action
      - Minimizing Testing Costs
      - Ship Still Happens – More Tradeoffs
      - Test Sufficiency
5. Test Processes
   a. Test Process Definition
      - Process Architecture
      - Test Process Definition
      - System Test Process - Example
   b. Test Process Metrics
      - Test Optimization Metrics
      - Test Optimization Metrics – Test Effectiveness
      - Test Optimization Metrics - Escapes
      - Test Optimization Metrics – Phase Containment
      - Test Optimization Metrics – Defect Detection Efficiency
      - Test Process Effectiveness Metrics
      - Test Process Effectiveness Metrics – Defect Arrival Rate
      - Test Process Effectiveness Metrics – Defect Density
      - Test Process Effectiveness Metrics – Reliability Actuals

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Other Software Testing Courses Include:

Software Structural Testing: a 2-day course consisting of chapters 1-3 from our standard Software Testing and Test Management course.

Software Functional Testing: a 2-day course consisting of chapters 1, 4 and 5 from our standard Software Testing and Test Management course.

Software Functional Testing & Test Management: a 3-day course consisting of chapters 1, 4, 5 and 6 from our standard Software Testing and Test Management course.

Software Test Planning & Management: a 1-day course consisting of chapter 6 from our standard Software Testing and Test Management course.

Customized Software Testing Courses: Our software testing courses are modularized so that they can be easily customized for in-house course offerings that focus on the specific content and topics needed to meet your organization's exact training requirements. For in-house courses, class exercises can also be tailored to include actual examples from your organization in order to make the training even more relevant to your environment.

For more information about these and other course offered by The Westfall Team:

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