Course Code	Course Title	Credits	Lectures /Week
USCS5032	**Software Testing & Quality Assurance**	**2**	**3**

About the Course: This course provides an in-depth understanding of software testing principles, techniques, and quality assurance practices. Students will learn the concepts and methodologies required to ensure the quality and reliability of software systems. The course covers various aspects of software testing, including test case design, verification and validation, defect management, software quality assurance, and quality improvement techniques. Students will gain hands-on experience with industry-standard tools and techniques used in software testing and quality assurance.

Course Objectives:
- Understand the significance of software testing in ensuring software quality and reliability.
- Familiarize with the fundamental concepts and principles of software quality assurance.
- Learn different software testing techniques and methodologies for effective test case design.
- Explore the role of verification and validation in software development and testing processes.
- Gain practical experience in using software testing tools and frameworks for automated testing.

Learning Outcomes:
After successful completion of this course, students would be able to
- Explain the importance of software testing and its impact on software quality.
- Apply appropriate software testing techniques to identify and mitigate software defects.
- Design and execute test cases to verify the functionality and performance of software systems.
- Understand the principles of verification and validation and their application in software testing.
- Utilize software testing tools and frameworks to automate testing processes and improve efficiency.

Unit	Topics	No of Lectures
I	**Introduction to Software Testing and Quality Assurance** **Introduction to Software Testing:** Nature of errors and the need for testing **Definition of Quality and Quality Assurance:** Understanding quality in software development, Distinction between Quality Assurance (QA), Quality Control (QC), Quality Management (QM), and Software Quality Assurance (SQA) **Software Development Life Cycle (SDLC):** Overview of SDLC phases and their relationship to testing, Role of testing in each phase, Software quality factors and their impact on testing **Verification and Validation (V&V):** Definition of V&V and its significance in software development, Different types of V&V mechanisms, Concepts of Software Reviews, Inspection, and Walkthrough	**15**

	Software Testing Techniques and Strategies	
II	**Testing Fundamentals**: Basics of software testing process, Test case design principles and techniques, Test execution, reporting, and documentation **White Box Testing and Black Box Testing:** Functional/Specification based Testing as Black Box, Black box: Equivalence Partitioning, Boundary Value Analysis, Decision Table Testing, State Transition Testing. Structural Testing as White Box, White Box: Statement testing, Branch testing. Experience-based: Error guessing, Exploratory testing, Checklist-based testing. **Software Testing Strategies:** Strategic approach to software testing Unit Testing: purpose, techniques, and best practices, Integration Testing: approaches and challenges, Validation Testing: ensuring adherence to user requirements, System Testing: comprehensive end-to-end testing **Software Metrics:** Concept of software metrics and their importance, Developing and utilizing different types of metrics, Complexity metrics and their significance in testing	15
III	**Defect Management and Software Quality Assurance** **Defect Management:** Definition of defects and their lifecycle, Defect management process, including defect reporting and tracking, Metrics related to defects and their utilization for process improvement **Software Quality Assurance:** Understanding quality concepts and the Quality Movement: Background issues and challenges in SQA, Activities and approaches in Software Quality Assurance, Software Reviews: Formal Technical Reviews and their benefits, Statistical Quality Assurance and Software Reliability **Statistical process control techniques for quality assurance:** Software reliability measurement and improvement, The ISO 9000 Quality Standards and their application in software development **Quality Improvement Techniques:** Introduction to quality improvement methodologies, Utilizing quality costs for decision-making, Introduction to quality improvement tools: Pareto Diagrams, Cause-effect Diagrams, Scatter Diagrams, Run charts	15

Textbook(s):
1. Software Engineering for Students, A Programming Approach, Douglas Bell, 4th Edition,, Pearson Education, 2005
2. Software Engineering – A Practitioners Approach, Roger S. Pressman, 7th Edition, Tata McGraw Hill

Additional Reference(s):
1. Quality Management, Donna C. S. Summers, 5th Edition, Prentice-Hall.
2. Software Testing and Quality Assurance Theory and Practice, Kshirsagar Naik, Priyadarshi Tripathy , John Wiley & Sons, Inc. , Publication.