CSE3192: Software Architecture & Quality Engineering

Programme: B. Tech. (CSE) Year: III Semester: 6
Course: Program Elective Credits: 3 Hours: 40

Course Context and Overview (100 words):

This course introduces concepts, metrics, and Architectures for Software Application. The course covers components of software quality assurance systems before, during, and after software development. It presents a framework for software quality assurance and discuss individual components in the framework such as planning, reviews, testing, configuration management, and so on. It also discusses metrics and models for software quality as a product, in process, and in maintenance.

Prerequisites Courses: Software Engineering

Course outcomes (COs):

On completion of this course, the students will have the ability to:
CO1: Evaluate the role of software quality assurance.
CO2: Analyze and manage software architecture and architecture patterns.
CO3: Apply software processes, functional elements, and project planning and management techniques for software quality
CO4: Define the skills and knowledge necessary to perform software quality engineering tasks

Course Topics:

Topics	Lecture Hours
UNIT – I Architecture and Architectural Design Patterns **Software Architecture:** Introduction to Software Architecture, Architecture in the life cycle, Enterprise Level Software, Solution Architecture, 4+ 1 view Architecture, Architecture Vs Design, Architecture Patterns, Documenting Architecture. **Architectural Design Patterns:** Broker, MVC, Pipe and Filter, Client-Server, Peer-to-Peer, Service-Oriented, Publish-Subscribe, Shared-data, Layered pattern, Map-reduce, Multi tier.	8

UNIT II – Introduction to Software Quality Defining Software Quality, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.	8
UNIT – III Software Quality Metrics Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.	5
UNIT-IV: Software Quality Management and Models Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.	6
UNIT – V Software Quality Assurance Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.	8
UNIT-VI Software Verification, Validation: Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness.	5

Textbook references:

Text Book:

1. Jeff Tian, *"Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement",* Wiley-Interscience, 2005
2. Stephen H. Kan. 2002., *"Metrics and Models in Software Quality Engineering"* (2nd ed.)., Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA.

Reference Books:

1. S. Desikan and G. Ramesh, *"Software Testing: Principles and Practices"*, Pearson Education. 2.
2. Len Bass (Author), Paul Clements (Author), Rick Kazman (Author)., *"Software Architecture in Practice"* 3rd Edition, SEI Series in Software Engineering.

Additional Resources (NPTEL Video Lectures, Web resources etc.)

Evaluation Methods:

Item	**Weightage (%)**
Quizzes	10
Assignments	10
Midterm	30
Endterm	50

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