

Software Engineering Quality Management Curriculum

Course Outlines

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Transition Partner for CMMI[®] SCAMPISM Appraisal Service
Carnegie Mellon University Software Engineering Institute

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1. Quality Assurance Institute

The Quality Assurance Institute was founded in 1980 in the United States of America. QAI's founding objective was and remains to provide leadership in improving quality, productivity, and effective solutions for process management in the information services profession. It is a worldwide membership organization serving over 1000 corporate members, organized to share state-of-the-art methods, tools, and techniques. The combined experience of QAI experts and of our member companies provides an impressive body of knowledge, a reservoir for our members to share. QAI has transformed this knowledge and experience into a "how-to" approach that is being taught worldwide.

1.1 Quality Assurance Institute Middle East and Africa (QAI MEA)

The QAI MEA was established in January 2001 to serve primarily the Middle East and African countries. It is an independent organization with a full partnership and access to all resources and services of the QAI global organization. Although the mission, objectives and approach are shared with the global organization, the QAI MEA has tailored and adapted its services to the local environment and culture to better serve our customers.

We take pride in being one of the first professional organizations to recognize the need for quality assurance and to have the vision to be exclusively devoted to the information technology profession. QAI provides leadership and state-of-the-art solutions in the form of consulting, education and training services, and assessments.

1.2 Our Approach

QAI takes a business-oriented approach to Managing Quality. It recognizes the close working relationship that must exist between information technology services and their internal and external customers. The approach shows methods for improving the processes within information technology organizations, leading to improved products and services.

Our approach takes into account the need of many organizations to re-establish credibility with their customers due to the past performance. It guides these organizations in building an environment where high quality products are completed on time and within budget. Our assessment and certification programs can also attest and provide evidence that their organization is operating effectively and efficiently.

1.3 QAI MEA Services

QAI MEA focuses on three major service channels, corresponding to the key quality components of any IT installation:

- Quality assurance
- Project management
- IT Service Management
- IT Security

Within each service channel, QAI MEA provides distinct levels of service:

- Appraisals, assessment, and reviews against the major standards and models,
- Education and training through formal courses, e-Learning, workshops and seminars,
- On-site Consulting to assist clients in reaching their goals and objectives expediently and economically.

QAI MEA engages only highly qualified and skilled staff in order to ensure the highest quality service expected by our customers. We have on our staff certified assessors, project managers, and trainers with proven records of accomplishment with our extensive client base. We are proud to participate and lead in the community functions of the region. We are active participants in Dubai Quality Group and Dubai Quality Award activities.

1.4 Individual Certifications

1.4.1 Certified Software Quality Analyst (CSQA)

Acquiring the designation of Certified Software Quality Analyst (CSQA) indicates a professional level of competence in the principles and practices of quality assurance in the IT profession. CSQA certification is a highly respected attestation of skills in this critical area of information technology.

1.4.2 Certified Software Test Engineer (CSTE)

The Certified Software Test Engineer (CSTE) Program is intended to establish standards for initial qualification and provide direction for the testing function through an aggressive educational program.

1.4.3 Certified Software Project Manager (CSPM)

The Certified Software Project Manager program is intended to establish standards for initial qualification, and continuing improvement of professional competence. This certification program helps to:

- Define the tasks (skill domains) associated with software project management activities in order to evaluate mastery of these activities.
 - Demonstrate an individual's willingness to improve professionally.
 - Acknowledge attainment of an acceptable standard of professional competency.
 - Aid organizations in selecting and promoting qualified individuals.
 - Motivate personnel having software project management responsibilities to maintain their professional competency.
6. Assist individuals in improving and enhancing their organization's software project management programs (i.e., provide a mechanism to lead a professional).

1.4.4 Examination

Candidates for certification must pass a four-part written examination in order to obtain certification. The examination tests the candidate's knowledge and practice of the skill areas defined in the respective [CSQA Body of Knowledge](#) or [CSTE Body of Knowledge](#). There are three certification centers in the Middle East:

- [Etisalat Academy](#), Dubai, United Arab Emirates
- [Takniat Training and Technology Transfer](#), Riyadh, Saudi Arabia
- [International Information & Communication Technology Center](#), Cairo, Egypt

Please refer to <http://www.softwarecertifications.com> for more information

1.5 Corporate Appraisal

QAI MEA is a Transition Partner for the Capability Maturity Model[®] Integration (CMMI[®]) for the Standard CMMI[®] Appraisal Method for Process Improvement (SCAMPISM). The SCAMPISM method is a diagnostic tool that supports, enables, and encourages an organization's commitment to process improvement. The method helps an organization gain insight into process capability or organizational maturity by identifying process strengths and weaknesses relative to one or more of the [CMMI[®] models](#).

1.6 Knowledge Transfer Partners:

- [Carnegie Mellon University Software Engineering Institute](#) USA
- [Etisalat Academy](#), Dubai, United Arab Emirates
- [Takniat Training and Technology Transfer](#), Riyadh, Saudi Arabia
- [International Information & Communication Technology Center](#), Cairo, Egypt
- [Quality Assurance Institute](#), USA
- [Quality Assurance Institute](#), India

2. Quality Management Fundamentals

2.1 Prerequisite Knowledge

Participants in this course should have a degree in computer science/engineering or three to five years equivalent work experience.

2.2 Course Objectives

You will learn about:

- IT quality concepts and terminology
- How to apply quality concepts across the spectrum of IT related activities and artifacts
- Obtain common understanding and agreement to quality processes that support specific business objectives
- How to identify best practices for managing quality
- How to implement a software process improvement initiative in your organization

2.3 Course Description

This course establishes the baseline for other foundation courses. Probably the most important aspect is that each participant will develop a personal quality attitude. Or stated differently, “What’s in it for me and why now”? Every individual will develop a deep understanding of how good quality processes can contribute to their personal well being (satisfaction in a job well done) and how the adoption of “Best Practices” can directly contribute to the bottom line improvement of their organizations.

2.4 Course Organization

- The course consists of four modules, each three hours in duration
- Modules will be taught over two days
- The course modules will be supplemented by one to two hours of class exercises / discussions

2.5 Course Topics

1. Quality Principles
2. Quality Management Frameworks – Business Focus
3. Quality Management Frameworks – IT Focus
4. Continuous Process Improvement Program
5. Quality Tools
6. Measurements and Metrics
7. Ethics
8. Summary

3. Software Engineering Measurement and Analysis

3.1 Prerequisite knowledge

- Participants in this course should have a degree in computer science/engineering or equivalent work experience.
- Participants will have successfully completed predecessor Fundamentals Courses

3.2 Course objectives

You will learn:

- Measurement concepts and terminology
- How to apply measurements across the spectrum of IT related activities and artifacts
- Obtain common understanding and agreement to the need for process improvements
- Identify best practices for managing quality and processes
- Implement a measurement software process improvement initiative in your organization

3.3 Course Description

This course describes many useful processes and measures, as well as fully worked out examples of how to use measurement data. The emphasis is on process control methods to understand process behavior, and to bring stability, predictability, and improvement to software processes.

3.4 Course organization

- The course consists of four modules, each three hours in duration
- Modules will be taught over two days
- The course modules will be supplemented by one to two hours of class exercises / discussions

3.5 Course Topics

1. International Standards and Practices
2. Software Engineering Measurement
 - 2.1. Software Measurement Models
3. Process/Project Management Measurement Sources
4. Organizational Management Measurements
5. Introduction to Statistical Process Control
6. Summary

4. IT Project and Risk Management

4.1 Prerequisite Knowledge

Participants in this course should have a degree in computer science/engineering or three to five years equivalent work experience. They should have attended the Quality Management Fundamentals course and have a basic knowledge of project lifecycle methods and techniques.

4.2 Course Objectives

You will learn to:

- Identify and define projects with their specific characteristics
- Apply fundamental project management skills, concepts and techniques
- Initiate a project with appropriate management and user support
- Build cohesive and effective project team
- Develop a focused project plan to manage the IT project
- Estimate IT project costs and schedules using simple techniques
- Establish a dependable project control and tracking system
- Control the project scope, schedule and resource allocation
- Evaluate, control and respond to the project risks
- Implement quality concepts at the process and project levels

4.3 Course Description

To lead and operate an organization successfully, it is necessary to direct and control it in a systematic and transparent manner. Management of an IT projects encompasses quality management and application of general project management principles to the particular needs of IT organizations.

This course addresses the core areas of IT project management from project identification and initiation to project planning and execution. In addition, the specific topics of project management concerns, such as estimating and risk management, are explored in detail. The course also extends into the area of quality management, standards and capability maturity levels.

Designed for both new and experienced project managers, this course introduces application of traditional project management concepts into the IT arena. You'll gain understanding of how to successfully build, implement and maintain IT systems with improved performance and quality, while addressing the needs of all interested parties.

4.4 Course Organization

- The course consists of six modules, each three hours in duration
- Modules will be taught over three days
- The course modules will be supplemented by one to two hours of class exercises / discussions

4.5 Course Topics

1. International Standards and Practices
2. Quality overview
3. IT projects
4. Project management
5. Project management processes
6. Project integration management
7. Project scope management
8. Project time management
9. Project cost management
10. Project quality management
11. Project human resource management
12. Project communications management
13. Project risk management
14. Project procurement management
15. Summary

5. Requirements Development and Management

5.1 Prerequisite Knowledge

Participants in this course should have a degree in computer science/engineering or three to five years equivalent work experience. They should have attended the Quality Management Fundamentals course and have a basic knowledge of project lifecycle methods and techniques.

5.2 Course Objectives

You will learn to:

- Effectively elicit requirements from the business community
- Apply quality management process to requirements gathering
- Obtain common understanding and agreement that requirements meet specific business objectives
- Identify best methods for management of requirements
- Implement a change management process to control scope creep

5.3 Course Description

Requirements represent the communication of needs from the business community to the IT organization. It is one of the tenets of good software engineering. Any misunderstanding at this level will propagate itself into the entire project and the final deliverables. It is the single most common reason for project defects and in many cases outright failures.

The issue can not be attributed to one source nor is there a simple answer. Often there are disagreements within the business community itself on what the real requirements are. More often there are a numerous changes to the requirements well past the start of the system design phase. What should the project manager do to eliminate the issues of 'scope creep' and dissatisfaction with the delivered product?

The focus of the Requirements Development and Management course will be the requirements engineering and management techniques for the experienced software engineers and project managers. The relationship management between the user community and the IT organization will also be the key topic covered by this course. Participants will learn 'best practices' for requirements gathering, confirmation and change management. In addition to the techniques of eliciting the requirements from the users, you will learn how to verify and confirm these requirements early in the project development to avoid changes and rework later in the project.

5.4 Course Organization

- The course consists of four modules, each three hours in duration
- Modules will be taught over two days
- The course modules will be supplemented by one to two hours of class exercises / discussions

5.5 Course Topics

1. International Standards and Practices
2. Introduction to Requirements Engineering
3. The Requirements Engineering Process
4. Requirements Properties
5. Requirements Elicitation
6. Requirements Analysis
7. Requirements Specification
8. Requirements Validation
9. Requirements Management
10. Summary

6. Configuration and Change Management

6.1 Prerequisite knowledge

Participants in this course should have a prior basic knowledge of project lifecycle methods and techniques.

Students attending the IT Quality management Diploma program should have completed the Quality Assurance Concepts and Quality Management Fundamentals courses prior to attending this course.

6.2 Course objectives

You will learn to:

- Recognize the importance and the role of configuration management (CM) plan,
- Understand the kind of culture that exists within the organization and finding a CM solution that matches that culture,
- Determine what products and parts of products will be placed under CM control and what pieces actually make up the product,
- Describe the actual CM process and what level of control will be enforced when the CM process is implemented, such as the actual steps involved in doing the CM,
- Identify the roles, responsibilities and tasks that various people play during the implementation of the CM process,
- Control the CM process and authorize the change requests

6.3 Course Description

Software CM is a discipline for controlling the evolution of software systems. The goals of using CM are to ensure the integrity of a product and to make its evolution more manageable. Although there is overhead involved in using CM, it is generally agreed that the consequences of not using CM can lead to many problems and inefficiencies. The overhead of using CM relates to time, resources, and the effects on other aspects of the software lifecycle.

The focus of the Configuration Management course will be the preparation and implementation of the CM plan based on the organizational culture and requirements. Participants will learn how to identify the items to be placed under the control of CM. In addition, they will learn to balance the needs of development and user communities with the rigor of CM procedures towards the successful software operation and maintenance.

The course will finish with the workshop style discussion of the real, common situations in the industry. Participants will also get opportunity to bring issues from their own experience and address them as a group discussion.

6.4 Course organization

- The course consists of four modules, each three hours in duration
- Modules will be taught over two days

- The course modules will be supplemented by one to two hours of class exercises / discussions

6.5 Course Topics

1. Introduction of the SCM Knowledge Area
2. SCM Process Management
3. Software Configuration Identification
4. Software Configuration Control
5. Software Configuration Status Accounting
6. Software Configuration Auditing
7. Software Releases
8. Summary

7. Software Inspections

7.1 Prerequisite knowledge

Participants in this course should have a degree in computer science/engineering or equivalent work experience.

7.2 Course objectives

You will learn:

- What is an inspection
- Why inspections are so important
- The Inspection Process Model
- Understand the differences among Inspections, Peer Reviews, and Audits
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7.3 Course Description

We need Inspections to remove software defects to reduce costs, minimize the quality gap, and improve time to market. Inspection enables the removal of defects early in the software life cycle. In the CMMISM model, Inspections supports the achievement of the Verification and Validation Process Areas requirements for a Level 2 assessment. This course will address IEEE standards and use the CMMISM as a source for best practices.

7.4 Course organization

- The course consists of four modules, each three hours in duration
- Modules will be taught over two days
- The course modules will be supplemented by one to two hours of class exercises / discussions
- An examination will be given at the conclusion of the class

7.5 Course Topics

1. Introduction
2. What are Inspections
3. Inspection Process
4. Roles and Responsibilities
5. Inspection Measurement and Analysis
6. Causal Analysis
7. Managing Inspections
8. Summary

8. Software Testing Fundamentals

8.1 Prerequisite knowledge

Participants in this course should have a degree in computer science/engineering or equivalent work experience.

As this is a Fundamentals Course, there are no other prerequisites.

8.2 Course objectives

You will learn:

- IT testing concepts and terminology
- How to apply quality concepts across the spectrum of IT related testing activities and artifacts
- Obtain common understanding and agreement to quality processes that support specific testing objectives
- Identify best practices for managing the testing process
- Improve the software testing process in your organization

8.3 Course Description

Testing is an important, mandatory part of software development; it is a technique for evaluating product quality and also for indirectly improving it, by identifying defects and problems. The right attitude towards quality is one of prevention; it is obviously much better to avoid problems, rather than repairing them. Testing must be seen primarily as means for checking whether the prevention has been effective, but also for the identifying anomalies in those cases in which, for some reason, it has been not. In this course, you will learn how the plan, do, check, act, within process of testing.

8.4 Course organization

- The course consists of four modules, each three hours in duration
- Modules will be taught over two days
- The course modules will be supplemented by one to two hours of class exercises / discussions
- An examination will be given at the conclusion of the class

8.5 Course Topics

1. Concepts and Definitions
2. Managing the Testing Process
3. Testing Techniques
4. Testing Metrics
5. Summary

9. Supplier Management

9.1 Prerequisite Knowledge

Participants in this course should have a degree in computer science/engineering or three to five years equivalent work experience. They should have attended the Quality Management Fundamentals and Project Management Fundamentals courses.

9.2 Course Objectives

You will learn to:

- Identify products to be acquired
- Define and manage the work performed by suppliers
- Select suppliers
- Establish and maintain agreements with suppliers
- Oversee supplier performance
- Accept delivery of products
- Arrange for maintenance of products
- Establish a shared vision by and for the project
- Establish a structure of integrated teams
- Ensure the coordinated effort of all stakeholders

9.3 Course Description

Increasing number of organizations find the acquisition more economical and effective way of obtaining software and related services than in-house development. This brings the organizations closer to the legal issues of contracts, control of external resources, integration of teams and other non-traditional domains of IT.

A formal agreement between the organization (representing the project) and the supplier must be created in a form of a contract, a license, or a memorandum of agreement. The acquired product is delivered by supplier to the project and becomes part of the products delivered to the end customer. The acquired product may be a product component in the overall product under development.

The course in Supplier Management addresses the need of the project to effectively select and manage those portions of work that are produced by suppliers. The supplier is either an internal or external organization that develops, manufactures, or supports products being developed or maintained that will be delivered to the customer.

9.4 Course Organization

- The course consists of two modules, three hours in duration
- Modules will be taught over one day
- The course modules will be supplemented by one hour of class exercises / discussions

9.5 Course Topics

1. Introduction to Supplier Management
2. Establishing Supplier Agreements
3. Satisfying Supplier Agreements
4. Analyzing and Selecting Sources of Products
5. Coordinating Work with Suppliers
6. Summary