NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF SCIENCES

COMPUTER SCIENCE PROGRAM

CC056 – SOFTWARE QUALITY

I. GENERAL INFORMATION

CODE	: CC056 Software Quality
SEMESTER	: 9-10
CREDITS	: 4
HOURS PER WEEK	: 6 (Theory, Practice)
PREREQUISITES	: C472 Software Engineering I
CONDITION	: Elective

II. COURSE DESCRIPTION

The course prepares students for understanding and applying the methods and techniques for assuring the quality of software projects and products throughout the different stages of their life-cycle. Both software functional quality and software structural quality methods are analyzed including software quality attributes such as reliability, efficiency, security, maintainability, among other attributes. Aspects of quality management, quality metrics, as well as quality processes and methods are analyzed. Capability Maturity Model Integration CMMI, Testing Maturity Model Integration TMMI, Information Technology Infrastructure Library ITIL processes are presented and applied. The course takes place in a lecture-workshop scheme. Along the course, students compete a software quality evaluation and assurance project.

III. COURSE OUTCOMES

At the end of the course students:

1. Understand the concepts, tools and methods related to quality assurance throughout the life-cycle of software development.
2. Properly apply the methods and techniques for ensuring and measuring the quality of software products along their development life-cycle.
3. Work in teams for developing software projects assuming different roles and applying appropriate procedures according to recognize national and international good practices of software development.
4. Assess the quality of software projects and products with performance and sustainability criteria.

IV. LEARNING UNITS

1. SOFTWARE QUALITY FUNDAMENTALS

Introduction to quality. Software quality. Software engineering and quality. Standards and evaluation models. Software process improvements. Total quality. Software flaws costs. Software quality environment.

2. SOFTWARE PROCESS MODELS

Quality management.

Management processes: planning, organization, personnel management, leadership, control. Risk management: definition, identification, analysis, planning, monitoring. Software project management: monitoring and control, measurement, estimation, pre and post analysis, verification, validation, configuration management, metrics, analysis, design. Software development planning: process

modeling, effort estimation, project planning, process monitoring and following, SMP demonstration, conclusions.

Software quality process and methods.

Factors affecting software quality. Software industry present state, Standards and models for evaluating and improving software processes. ISO 9000. ISO 9126:2001. Software quality models (internal and external). ISO/IEC15504 (SPICE): components, dimensions, attributes evaluation, certification.

Software quality metrics.

Measurement theory and ontology. Methodologies and standards. Definition methods. Software metrics. Personal software process PSP. PSP panning. PSP metrics.

Software configuration.

Product line. Technical maturation. Software engineering. Technical management. Business management. Software configuration management SCM. SCM planning.

Security

Security assessment. Best practices and technical attributes: application architecture practices, multi-layer design compliance, security best practices (input validation, SQL injection, cross-site scripting), programming practices (code level), error & exception handling, security best practices (system functions access, access control to programs)

3. SOFTWARE QUALITY ASSURANCE

Software quality assurance SQA.

Introduction. Organization. Activities. SQA planning. SQA implementation.

Capability Maturity Model Integration CMMI.

What is CMMI?. What is not CMMI. CMMI model. How to use CMMI. Key concepts: capacity, performance. Maturity. Institutionalization. CMMI implementation. Costs and benefits analysis. Process areas. Goals and objectives. Verification and quality. CMMI levels.

Security.

Security management. Security by design with CMMI for development. PSD Organizational Preparedness for Secure Development. SMP Secure Management in Projects. SRTS Security Requirements and Technical Solution. SVV Security Verification and Validation Report in appraisal results.

Testing Maturity Model Integration TMMI

Test process. Test process improvement TPI. TMMI levels. Process improvement models. Priorities. TMMI Foundation.

Information Technology Infrastructure Library ITIL

Characteristics and objectives. Key areas. Continuous improvement. Aligning IT services with business needs. Practices for IT services management. ITIL implementation. Relation with other methodologies.

4. INFORMATION QUALITY

Introduction. Quality approximation. Model measurement. Data quality. Management issues. Analysis of practical cases.

5. SOFTWARE STANDARDS AND NORMS

Quality models. ISO/IEC 12207. Software lifecycle processes: main processes, support processes, management processes. Implementation strategies. Software quality planning. Quality model ISO/IEC 15504. Software evaluation and continuous improvement. Analysis of practical cases.

V. METHODOLOGY

Classroom learning with instructor presenting the concepts, methods and techniques, tools, best practices, complemented by: analysis of real cases on software and information quality, student teams for solving problems, research on related bibliography, academic tutoring along the semester. Student active participation is promoted. At the end of the semester, student teams present and defend the final project report.

VI. EVALUATION FORMULA

The final grade PF is calculated as follows:

$$PF = 0.20\ EP + 0.3\ EF + 0.20\ PR + 0.30\ TF$$

where:

PF: Final grade EP: Mid-term exam EF: Final exam
PR: Practice work: TF: Final project report and defense

VII. BIBLIOGRAPHY

1. Software Engineering
   Ian Sommerville
   X Edition, Addison Wesley, 2016.
2. Quality of Information Systems
   Miguel Plattini
   II Edition, Madrid Editions, 2017
3. Software Engineering Institute, Carnegie Melon University CMU SEI
   Capability Maturity Model Integration CMMI.
   https://www.sei.cmu.edu/
4. TMMI Foundation
   Test Maturity Model Integration
   https://www.tmmi.org/