



POLITÉCNICA

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PR/CL/001



E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000487 - Software Quality Management

DEGREE PROGRAMME

10AM - Master Universitario En Ingenieria Del Software

ACADEMIC YEAR & SEMESTER

2021/22 - Semester 2

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1. Description

1.1. Subject details

Name of the subject	103000487 - Software Quality Management
No of credits	4 ECTS
Type	Compulsory
Academic year of the programme	First year
Semester of tuition	Semester 2
Tuition period	February-June
Tuition languages	English
Degree programme	10AM - Master Universitario en Ingenieria del Software
Centre	10 - Escuela Tecnica Superior De Ingenieros Informaticos
Academic year	2021-22

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Angelica De Antonio Jimenez (Subject coordinator)	3354	angelica.deantonio@upm.es	W - 10:30 - 14:00 Th - 09:30 - 12:00 Previous appointment should be requested at angelica.deantonio@upm.es

Jaime Ramirez Rodriguez	5112	jaime.ramirez@upm.es	M - 16:00 - 18:00 Tu - 16:00 - 18:00 Th - 16:00 - 18:00 Previous appointment is recommended
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* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

3. Skills and learning outcomes *

3.1. Skills to be learned

CE1 - Elaborar un plan de proyecto que permita coordinar y priorizar recursos y actividades para obtener los resultados esperados en los plazos, costes y calidad establecidos

CE11 - Identificar, controlar, informar y auditar la configuración de un sistema y sus cambios

CE6 - Diseñar las pruebas de los módulos y ayudar a diseñar las pruebas de integración e instalación. Realizar la integración del sistema, las pruebas de integración y la instalación.

CE7 - Elaborar un plan de verificación y validación que permita coordinar y priorizar recursos y actividades para garantizar el nivel de calidad requerido.

CG1 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio (RD)

CG12 - Comprensión amplia de las técnicas y métodos aplicables en una especialización concreta, así como de sus límites

CG18 - Capacidad de trabajar y comunicarse también en contextos internacionales

CG19 - Aproximación sistemática a la gestión de riesgos

CG2 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios (RD)

CG3 - Que los estudiantes sepan comunicar sus conclusiones y los conocimientos y razones últimas que las sustentan a públicos especializados y no especializados de un modo claro y sin ambigüedades (RD)

3.2. Learning outcomes

RA40 - Es capaz de identificar y establecer las prácticas necesarias para gestionar la configuración de un sistema software

RA42 - Comprende la interrelación entre calidad del producto y calidad del proceso

RA43 - Conoce y aplica técnicas de control de calidad de productos y procesos

RA7 - Knows and applies quality models to identify and specify the quality attributes a software system must satisfy

RA10 - Understands the mission of a quality system and knows the applicable standards and norms

RA8 - Knows and determines the most appropriate verification and validation techniques to be applied in a software development project with the aim of assuring the quality level required

RA9 - Is able to identify and determine the practices needed to manage a software system configuration

RA11 - Understands the interrelation between product quality and process quality

RA12 - Knows and applies product and process quality control techniques

RA38 - Conoce y aplica modelos de calidad para la identificación y especificación de los atributos de calidad a satisfacer por un sistema software

RA41 - Comprende la misión de un sistema de calidad y conoce los estándares y normas aplicables

RA39 - Conoce y determina las técnicas de verificación y validación más apropiadas para aplicar en un proyecto de desarrollo de software con el objetivo de garantizar el nivel de calidad requerido

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

4. Brief description of the subject and syllabus

4.1. Brief description of the subject

The goal of the Software Quality Management subject is to provide the student with a broad overview about the different aspects involved in the development of software with a required level of quality. The following questions are addressed:

- What is the meaning of quality in the software domain?
- How can we define precisely the quality required from a software system?
- How can we measure the quality of a software system?
- How can we measure the quality of a software process?
- How can we control quality during the development of a software system?
- How can we control the configuration and evolution of a software system?
- How can we build quality into the software being developed?
- How can we manage software quality from an organizational point of view?
- How can we evaluate the cost and benefits of quality?
- How can we make factual-based decisions about the quality of a software system?

4.2. Syllabus

1. Introduction to Software Quality
 - 1.1. Software Quality Definition
 - 1.2. Software Quality Models
 - 1.3. Usage of a Quality Model
 - 1.4. Defects and Defect Density
2. Software Quality Control Activities
 - 2.1. Static Controls
 - 2.2. Dynamic Controls
3. Quality Metrics
 - 3.1. Product and Process Quality Metrics
 - 3.2. Comparison of Quality Control Activities
4. Quality Management and Quality Systems
 - 4.1. Introduction to Quality Management and related standards and norms
 - 4.2. The Quality System and the Quality Manual
 - 4.3. Quality Management Tools
 - 4.4. The Cost of Quality
5. Software Quality Assurance Activities
 - 5.1. Introduction to Quality Assurance
 - 5.2. Quality Construction
 - 5.3. Quality Assurance Planning
6. Software Configuration Management
 - 6.1. Basic Concepts of Software Configuration Management
 - 6.2. Configuration Identification
 - 6.3. Configuration Change Control
 - 6.4. Configuration Status Accounting
 - 6.5. Configuration Audits
 - 6.6. Configuration Management Plan

5. Schedule

5.1. Subject schedule*

Week	Face-to-face classroom activities	Face-to-face laboratory activities	Distant / On-line	Assessment activities
1	Chapter 1.1. Software Quality Definition Duration: 02:00 Lecture			Reading 1 test Online test Continuous assessment and final examination Not Presential Duration: 03:00
2	Chapter 1.2 Software Quality Models Duration: 02:00 Lecture			
3	Chapter 1.2 Software Quality Models Chapter 1.3 Usage of a Quality Model Duration: 02:00 Lecture			Individual exercise on quality attributes Individual work Continuous assessment and final examination Not Presential Duration: 04:00
4	Chapter 1.4 Defects and Defect Density Duration: 02:00 Lecture			Reading 2 test Online test Continuous assessment and final examination Not Presential Duration: 03:00
5	Chapter 2.1 Static Controls Duration: 02:00 Lecture			Report on defect tracking tools Group work Continuous assessment and final examination Not Presential Duration: 06:00
6		Exercise on inspections Duration: 02:00 Laboratory assignments		
7		Exercise on walkthroughs Duration: 02:00 Laboratory assignments		Report about exercise on inspections Group work Continuous assessment Not Presential Duration: 02:00
8	Chapter 2.2 Dynamic Controls Duration: 02:00 Lecture			Report about exercise on walkthroughs Individual work Continuous assessment Not Presential Duration: 02:00
9	Chapter 2.2 Dynamic Controls Duration: 02:00 Lecture			Reading 3 test Online test Continuous assessment and final examination Not Presential Duration: 03:00

10	<p>Chapter 3.1 Product and Process Quality Metrics Chapter 3.2 Comparison of Quality Control Activities Duration: 01:00 Lecture</p>			<p>First Partial exam Written test Continuous assessment Presential Duration: 01:00</p>
11	<p>Chapter 4.1 Introduction to Quality Management and related standards and norms Chapter 4.2 The Quality System and the Quality Manual Duration: 02:00 Lecture</p>			
12	<p>Chapter 4.3 Quality Management Tools Chapter 4.4 The Cost of Quality Duration: 02:00 Lecture</p>			<p>Reading 4 test Online test Continuous assessment and final examination Not Presential Duration: 03:00</p>
13	<p>Chapter 5.1 Introduction to Quality Assurance Chapter 5.2 Quality Construction s Chapter 5.3 Quality Assurance Planning Duration: 01:00 Lecture</p> <p>Chapter 6.1 Basic Concepts of Software Configuration Management Chapter 6.2 Configuration Identification Duration: 01:00 Lecture</p>	<p>Group work on quality management tools Duration: 03:00 Cooperative activities</p>		
14		<p>Group work on quality management tools Duration: 03:00 Cooperative activities</p>		<p>Presentation of group work on quality management tools Group presentation Continuous assessment Presential Duration: 02:00</p>
15	<p>Chapter 6.3 Configuration Change Control Chapter 6.4 Configuration State Reports Chapter 6.5 Configuration Audits Chapter 6.6 Configuration Management Plan Duration: 02:00 Lecture</p>			<p>Reading 5 test Online test Continuous assessment and final examination Not Presential Duration: 03:00</p>
16				
17				<p>Second partial exam Written test Continuous assessment Presential Duration: 02:00</p> <p>Final exam Written test Final examination Presential Duration: 02:00</p>

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year,

especially considering the COVID19 evolution.

6. Activities and assessment criteria

6.1. Assessment activities

6.1.1. Continuous assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Reading 1 test	Online test	No Presential	03:00	3%	/ 10	CG12
3	Individual exercise on quality attributes	Individual work	No Presential	04:00	7%	/ 10	CG19
4	Reading 2 test	Online test	No Presential	03:00	3%	/ 10	CG12
5	Report on defect tracking tools	Group work	No Presential	06:00	10%	/ 10	CG12 CG18 CG1 CE11 CG2 CG3
7	Report about exercise on inspections	Group work	No Presential	02:00	10%	/ 10	CG2 CG3 CG18 CG1
8	Report about exercise on walkthroughs	Individual work	No Presential	02:00	8%	/ 10	CE7 CG12 CE1
9	Reading 3 test	Online test	No Presential	03:00	3%	/ 10	CG12 CE1
10	First Partial exam	Written test	Face-to-face	01:00	20%	4 / 10	CE6 CE7 CE1
12	Reading 4 test	Online test	No Presential	03:00	3%	/ 10	CG12 CE1
14	Presentation of group work on quality management tools	Group presentation	Face-to-face	02:00	10%	/ 10	CG3 CG18 CG19 CE1
15	Reading 5 test	Online test	No Presential	03:00	3%	/ 10	CG12
17	Second partial exam	Written test	Face-to-face	02:00	20%	4 / 10	CE6 CE7 CG12 CG1 CG19 CE1 CE11

6.1.2. Final examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
1	Reading 1 test	Online test	No Presential	03:00	3%	/ 10	CG12
3	Individual exercise on quality attributes	Individual work	No Presential	04:00	7%	/ 10	CG19
4	Reading 2 test	Online test	No Presential	03:00	3%	/ 10	CG12
5	Report on defect tracking tools	Group work	No Presential	06:00	10%	/ 10	CG12 CG18 CG1 CE11 CG2 CG3
9	Reading 3 test	Online test	No Presential	03:00	3%	/ 10	CG12 CE1
12	Reading 4 test	Online test	No Presential	03:00	3%	/ 10	CG12 CE1
15	Reading 5 test	Online test	No Presential	03:00	3%	/ 10	CG12
17	Final exam	Written test	Face-to-face	02:00	68%	5 / 10	CE6 CG2 CE7 CG3 CG12 CG1 CG19 CE1 CE11

6.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Extraordinary evaluation exam	Written test	Face-to-face	02:00	40%	4 / 10	CE6 CE7 CG12 CE1 CE11
Reading tests	Online test	Face-to-face	12:00	12%	/ 10	CG12 CG1

Individual and group exercises	Individual work	Face-to-face	00:00	48%	/ 10	CG2 CG3 CG12 CG18 CG1 CG19 CE11
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6.2. Assessment criteria

The subject is marked following continuous assessment.

The student passes the subject only if 5 or more points on 10 are obtained at the end of the course, regarding the following criteria:

FINAL GRADE = 45% Individual and group exercises in the classroom and Moodle + 15% Reading tests in Moodle + 40% Exams

The maximum grade for each of these components and the minimum mark needed to compensate non-passed parts are indicated in the following table.

	MAXIMUM GRADE (and correspondence over the final grade)	MINIMUM GRADE TO COMPENSATE NON-PASSED PARTS (and correspondence over the final grade)
Individual and group exercises in the classroom and Moodle (45%)	10 (4,5)	-
Reading tests (15%)	10 (1,5)	-
Exams (40%)	10 (4,0)	4 (1,6)
Student participation (10%)	10 (1,0)	-

When failed, the exams can be repeated in the extraordinary evaluation period, using the new marks together to the ones obtained in individual and group exercises and student participation in the previous period to calculate the final grade of the subject.

The grade for individual and group exercises, and for reading tests, if they are delivered past the established deadline, will suffer a reduction which is proportional to the delay.

7. Teaching resources

7.1. Teaching resources for the subject

Name	Type	Notes
Schulmeyer, 2007	Bibliography	Gordon Schulmeyer, G. (2007) Handbook of Software Quality Assurance, Artech House Publishers, 4th ed.
Fagan, 1976	Bibliography	M.E. Fagan, Design and Code Inspections to Reduce Errors in Program Development, IBM Systems Journal, Vol. 15, N° 3, pp. 182-210, 1976
Galín, 2003	Bibliography	D. Galín (2003) Software Quality Assurance: From Theory to Implementation, Addison-Wesley
McCall, 1977	Bibliography	J.A. McCall, P.K. Richards, G.F. Walters, Factors in Software Quality, RADC-TR-77-369, Rome Air Development Center, United States Air Force, 1977
Cianfrani, 2009	Bibliography	C.A. Cianfrani, J.J. Tsiakals, J.E. West (2009) ISO 9001:2008 Explained, ASQ Quality Press
ISO/IEC 9126-1:2001	Bibliography	ISO/IEC 9126-1:2001, Software engineering -- Product quality -- Part 1: Quality model
ISO/IEC TR 9126-2:2003	Bibliography	ISO/IEC TR 9126-2:2003, Software engineering -- Product quality -- Part 2: External metrics

ISO/IEC TR 9126-3:2003	Bibliography	ISO/IEC TR 9126-3:2003, Software engineering -- Product quality -- Part 3: Internal metrics
ISO/IEC TR 9126-4:2004	Bibliography	ISO/IEC TR 9126-4:2004, Software engineering -- Product quality -- Part 4: Quality in use metrics
IEEE 983-86	Bibliography	IEEE Guide for Software Quality Assurance Planning, ANSI/IEEE std. 983-1986, IEEE Computer Society, Software Engineering Technical Committee, Software Engineering Standards Subcommittee, 1986
IEEE 1028-2008	Bibliography	IEEE Standard for Software Reviews and Audits, ANSI/IEEE IEEE std. 1028-2008, IEEE Computer Society, Software Engineering Technical Committee, Software Engineering Standards Subcommittee, 2008
The how and why of auditing	Web resource	http://videos.asq.org/the-how-and-why-of-auditing
Guidelines for the Application of ISO 9001:2000 to Computer Software	Bibliography	IEEE Guide Adoption of ISO/IEC 90003:2004 Software Engineering -Guidelines for the Application of ISO 9001:2000 to Computer Software
Subject web site	Web resource	https://moodle.upm.es/titulaciones/oficiales/course/view.php?id=2999

8. Adendas

- Las tutorías de la profesora Angélica de Antonio serán en los siguientes tramos horarios: lunes de 10:30 a 12:00; martes de 17:00 a 18:30; jueves de 9:30 a 10:00 y de 12:00 a 14:30. Se ruega pedir cita por adelantado al correo angelica.deantonio@upm.es