ANEXO I

Escuela Técnica Superior de Ingeniería

GENERAL SPECIFICATIONS

COURSE 24/25

Subject Data

Name:
CALIDAD, MEDICIÓN Y ESTIMACIÓN DE PRODUCTOS Y PROCESOS SOFTWARE
English name:
Quality, Measurement and Estimation of Software Products and Processes

Code:	**Type:**
606010222	Compulsory

Hours:

	Total	**In class**	**Out class**
Time distribution	150	60	90

ECTS:

Standard group	**Small groups**			
	Classroom	**Lab**	**Practices**	**Computer classroom**
4	0	2	0	0

Departments:	**Knowledge areas:**
TECNOLOGIAS DE LA INFORMACION	LENGUAJES Y SISTEMA INFORMATICOS
Year:	**Semester**
4	1

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TEACHING STAFF

Name:	E-mail:	Telephone
Manuel De La Villa Cordero	manuel.villa@dti.uhu.es	959217639
Fernandez De Viana Gonzalez, Inaki Josep	i.fviana@dti.uhu.es	959217378

Others Data (Tutoring, schedule...)

Teacher's office: ETSI building, 1st floor, num. 131

Student office hours: https://guiadocente.uhu.es/tutoria/titulacion

Schedule: http://www.uhu.es/etsi/informacion-academica/informacion-comun-todos-los-titulos/horarios-2/

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SPECIFIC INFORMATION OF THE COURSE

1. Contents description:

1.1 In English:

In order to ensure that a process (or a product) has a certain degree of quality and to improve it, it is necessary to have and apply a set of quantitative and qualitative indicators. Software measurement allows us to control what happens in projects and predict their effort and duration; as well as improve the quality of software products.

Measurement has a long tradition and constitutes a fundamental discipline in any engineering, and Software Engineering should not be an exception, although the peculiarities that differentiate software from other products must always be kept in mind. The importance of a quantitative approach in phase planning, organization, and testing will be addressed.

Agile methodologies, which are increasingly widespread, also need specific productivity and project progress indicators and metrics that will be conveniently addressed. Last but not least, we will also try to address the use of frameworks as a practice for clean code and architecture.

1.2 In Spanish:

Para poder asegurar que un proceso (o un producto) presentan un determinado grado de calidad ymejorarlo es necesario disponer y aplicar un conjunto de indicadores cuantitativos y cualitativos. La medición del software nos permite controlar qué es lo que ocurre en los proyectos y predecir su esfuerzo y duración; así como mejorar la calidad de los productos software.

La medición cuenta con una larga tradición y constituye una disciplina fundamental en cualquier ingeniería, y la Ingeniería del Software no debe ser una excepción, si bien hay que tener siempre presente las peculiaridades que diferencian al software de otros productos. Se abordará la importancia de un enfoque cuantitativo en la planificación de las fases, la organización y las pruebas.

También las metodologías Ágiles, de creciente difusión, necesitan de indicadores y métricas de productividad y progreso del proyecto específicos que se abordarán convenientemente. Por último, pero no menos importante, también se intentará abordar el uso de frameworks como práctica para un código y arquitectura limpia.

2. Background:

2.1 Situation within the Degree:

Once the student has received basic training in Software Engineering as a discipline, especially the importance of the process model followed in a previous subject (PFSE, 2nd. Grade), emphasis will now be placed on the importance of predictability, of being able to estimate and predict costs, duration and quality of both the development process and the software product produced, as well as establishing tools that characterize and control a project.

2.2 Recommendations

It is more than necessary to have acquired the skills and abilities imparted in the subject of 'Principles and Fundamentals of Software Engineering'.

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3. Objectives (as result of teaching):

We can consider the following general objectives:

- Introduce the student to the knowledge of metrics
- Understand its importance within an engineering
- Measure the capacity of a company's development processes
- Estimate costs, durations and efforts reliably in specific projects
- Measure objectively the quality of the products generated.
- Define improvement processes based on indicators

4. Skills to be acquired

4.1 Specific Skills:

CE3-IS: Ability to solve integration problems based on available strategies, standards and technologies.
CE5-IS: Ability to identify, evaluate and manage the associated potential risks that may arise.
CE6-IS: Ability to design appropriate solutions in one or more application domains using software engineering methods that integrate ethical, social, legal and economic aspects.

4.2 General, Basic or Transversal Skills:

CB2: That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study.
CG0: Capacity for analysis and synthesis: Find, analyze, criticize (critical reasoning), relate, structure and synthesize information from various sources, as well as integrate ideas and knowledge.
CG03: Ability to solve problems.
CG04: Ability to make decisions based on objective criteria (experimental, scientific or simulation data available) as well as the ability to argue and logically justify said decisions, knowing how to accept other points of view.
CG05: Capacity for teamwork.
CG07: Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
CT2: Development of a critical attitude in relation to the capacity for analysis and synthesis.
CT4: Ability to use Computer and Information Competences (CI2) in professional practice.
CT3: Development of an attitude of inquiry that allows the revision and permanent advancement of knowledge.

5. Training Activities and Teaching Methods

5.1 Training Activities:

- Theory sessions on the contents of the Program
- Problem solving sessions
- Practical Sessions in specialized laboratories or in computer classrooms
- Activities academically directed by the Faculty: seminars, conferences, development of works, debates, collective tutorials, evaluation and self-assessment activities...
- Individual/Autonomous student work.

5.2 Teaching Methods::

- Development of practices in specialized laboratories or computer classrooms in small groups
- Participatory master class
- Problem solving and practical exercises
- Individual or collective tutoring. Direct teacher-student interaction
- Approach, realization, tutoring and presentation of works.
- Assessments and exams

5.3 Development and Justification:

Participatory master class.
They consist of master classes where the theoretical basis of the subject will be taught and explanatory examples of it will be presented to the group. The sessions will last one hour and will be interspersed with the academic problem sessions throughout the course.

The methodology used to impart the theory and the explanatory examples will be the presentation through transparencies on a digital whiteboard and the use of a blackboard. The teacher may request
active participation of the student through quick questions, taking into account the students who participate the most when evaluating.
Transparencies and other reference materials necessary to follow the sessions will be found on the web page of the subject.

Problem solving and practical exercises.
Group resolution of problems and practical cases in which the originality of the solution, the quality and the urgency in the solution will be valued expressly.

Development of Practices in Specialized Laboratories or Computer Classrooms in small groups.
They consist of the study and application of measurement tools in the development of software systems. Students will have in advance the problem to be solved and the work methodology. The work can be done individually or in groups. Attendance at laboratory sessions is mandatory.

Approach, Realization, Tutoring and Presentation of Works.
Throughout the course, various activities will be proposed that will encourage the student's autonomous work as well as their ability to take measures and make decisions based on these measures. In an extraordinary way, conferences and extracurricular activities may be organized.

6. Detailed Contents

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Part 1. Tools.

Topic 1. Version management

- Previous concepts and definitions.
- Structure and operation of a CVS
- Introduction to Git.

Topic 2. Quality assurance. Tests.

- Introduction
- Definitions
- The quality in the software
- Tests
- Defect testing strategies:
    - Black Box Testing: Equivalent Partitioning and Boundary Value Analysis
    - White box tests: cyclomatic complexity and independent paths
- Low level tests (Unit, integration, regression)
- High level tests (Stress, Acceptance)
- Unit tests with JUnitTDD in brief

Topic 3. Patterns and Frameworks.

- "Clean code".
- Hexagonal architecture.
- Java frameworks: Spring Boot.
- ORM frameworks: Hibernate.

Topic 4. Agile project management.

- User stories. Estimate.
- Scrum, Lean and Kanban
- Metrics and indicators for monitoring agile projects

Part 2. Methodologies.

Topic 5. Methodologies and measurement standards.

- Goal-Question Metric (GQM)
- Practical Software Measurement (PSM)
- IEEE 1061-1998 and ISO 15939 standards

Topic 6. Software metrics in the process, project and product.

- Process measurement. Maturity.
- 'Classic' software metrics
- Metrics for OO systems

Topic 7. Estimation based on size and function.

- heuristic methods. parametric methods
- Estimation with LOC (Lines of Code)
- Estimation with Point-Function. FP Lite.

7. Bibliography

7.1 Basic Bibliography:

MEDICIÓN Y ESTIMACIÓN DEL SOFTWARE: TÉCNICAS Y MÉTODOS PARA MEJORAR LA CALIDAD Y LA PRODUCTIVIDAD (In spanish)
Piattini Velthuis, Mario G., (aut.)
Ra-Ma Editorial, S.A.

ESTIMATING SOFTWARE COSTS: BRINGING REALISM TO ESTIMATING.
Jones, Capers.
McGraw-Hill

7.2 Additional Bibliography:

SOFTWARE METRICS: A RIGUROUS & PRACTICAL APPROACH.
Fenton NE and Pfleeger SL, (2nd Edn),
PWS, 1998

GESTIÓN ÁGIL DE PROYECTOS SOFTWARE
Garzás J. y otros
Kybele Consulting

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8. Systems and Assessment Criteria

8.1 System for Assessment:

- Theory/Problems Exam
- Practice Defense
- Defense of Papers and Written Reports
- Individual Student Monitoring

8.2 Assessment Criteria and Marks:

8.2.1 Examinations Convocatory I

The evaluation principles of the subject follow preferably continuous evaluation criteria, understanding as such the diversified evaluation that is carried out at different times of the current academic year. For this reason, class attendance is mandatory (it is considered satisfied this requirement with attendance at 80% of the sessions). This evaluation is carried out, for ordinary calls I and II, using different instruments and weights, selected according to the competence to be evaluated:

A) Theory exam/problems.
In this section, the theoretical foundations are evaluated through the objective theoretical exam together with the realization of cases and practical assumptions. With this activity the competences CE6-IS, CB2, CG0, CG7 are evaluated. (50% of the total grade)
B) Practice Defense.
Students will carry out, in small groups or individually, exercises planning, estimation, measurement and development of a practical assumption, following a methodology. These exercises will be explained, supervised and work will begin in the classes intended for it. Attendance at the sessions of the application exercises will be mandatory. Students will carry out a set of guided practices, in order to assimilate concepts seen in the theoretical-practical classes. With this activity the competences T01, CB2, CG3, CG4, CG5, CE3-IS are evaluated and CE5-IS. (35% of the total grade)

C) Defense of Papers and Written Reports. (15% of the total grade) Autonomous work activities that may consist of:

- Exhibition and debate activity. It will consist of the accomplishment of a work on the part of the students that will have to expose and debate in class.
- Individual Student Monitoring Activities. It will consist of small questionnaires and exercises that the student performs autonomously to check the degree of assimilation of content.
- Resolution of practical activities. They will consist of the realization and delivery of practical exercises, in which the originality of the solution, the quality and the urgency in the solution will be valued expressly, these exercises will be corrected and exposed in class by the teacher.
- Attendance at conferences. Attendance at the conferences planned during the course and the completion of a memory of the same will be valued, according to the criteria previously set by the teacher. With this activity the competences T02 are evaluated.

To pass the subject in these calls it is necessary to pass A and B separately and add 5 points between the 3 grades. If the subject is passed, the final grade in these calls will be obtained by adding the results obtained in the three evaluation instruments.
The note in the student's record will be obtained in the following way, taking into account that the evaluations of theoretical knowledge (Part A), practical knowledge (Part B) and of the works will be carried out on 10:

If score_Part_A >= 5 and score_Part_B >= 5 Then Final_score = Score_Part_A x 0.5 + Score_Part_B x 0.3 + Score_work x 0.2
Otherwise Final_score = Minimum(Score_Part_A, Score_Part_B)

So the subject will be passed only if the Final_score is >= 5.

Students who do not pass the grade in the subject will keep the score of Part_A, Part_B until the last annual call, as long as their score in the same is >= 5 and the result of the works.

Both sections A and B must be passed (score> 5 out of 10) individually. Result will be reserved for subsequent calls.

CRITERIA ON WITH HONORS.
In the case that there are more candidates than possibilities for honors degrees per number of students in the subject, and with the aim of discriminating situations of equity in the final grade, the following criteria will be followed: theory exam score (A or TEST 1, depending on the evaluation method) and, in the event of a tie, score for the laboratory practices (B or TEST 2, depending on the evaluation method).

8.2.2 Examinations Convocatory II

In the same way as in call I.

8.2.3 Examinations Convocatory III

For ordinary call III, the following instruments and weights will be used:

A) Theory exam/problems.
In this section, the theoretical foundations are evaluated through the objective theoretical exam together with the realization of cases and practical assumptions. With this activity the competences CE6-IS, CB2, CG0, CG7 are evaluated. (50% of the total grade).

B) Practice Defense.
The students will carry out, in small groups or individually, exercises of planning, estimation, measurement and development of a practical assumption, following a methodology. These exercises will be explained, supervised and work will begin in the classes designed for it. Attendance at the sessions of the application exercises will be mandatory.
Students will carry out a set of guided practices, in order to assimilate concepts seen in the theoretical-practical classes. With this activity the competences T01, CB2, CG3, CG4, CG5, CE3-IS and CE5-IS are evaluated. (50% of the total grade).

To pass the subject in this call it is necessary to pass A and B separately and add 5 points between the 2 scores. If the subject is passed, the final score in this call will be obtained by adding the results obtained in the two evaluation instruments.

The score in the student's record will be obtained as follows, taking into account that the evaluations of theoretical knowledge (Part A), practical knowledge (Part B) will be made out of 10:

If Score_Part_ A >= 5 and Score_Part_ B >= 5 Then Final_Score = Score_Part_A x 0.5 + Score_Part_B x 0.5

Otherwise Final_Score = Minimum(Score_Part_A, Score_Part_B)

So the subject will be passed only if the Final_Score is >= 5.

Students who do not pass the score in the subject will keep the result of Part_A, Part_B until the last annual call, as long as their score in the same is >= 5.
Both sections A and B must be passed (score> 5 out of 10) individually. The result of the sections passed will be reserved for later calls.

8.2.4 Extraordinary Convocatory

In the same way as in call III.

8.3 Single Final Evaluation:

Students can take advantage of a single final evaluation. In this case, you must submit a request by email (with acknowledgment of receipt) to the course coordinator, which will be valid after the response confirming receipt by the teacher.

The single final evaluation will consist, for all calls, of a single academic act that will be composed of the following tests:

Test 1. 50% of the score. This test covers the evaluation systems Examination of Theory/Problems (50%), Defense of Works and Written Reports (0%) and Individual Follow-up of the Student (0%). It will consist of a theoretical exam with questions to develop. The acquisition of the competence CE6-IS, CB2, CG0, CG7 is evaluated.

Test 2. 50% of the score. This test covers the Practice Defense evaluation systems (50%). It will consist of a practical exam in a computer class. No teaching material may be used except that provided by the teacher.The acquisition of the competence T01, CB2, CG3, CG4, CG5, CE3-IS and CE5-IS is evaluated.
The total duration of both tests will be a maximum of 4 hours.

To pass the subject through the single final evaluation, it will be necessary to pass both tests separately and add 5 points between the 2 grades. If the subject is passed, the final grade in this call will be obtained by adding the results obtained in the two tests.