Teaching Guide

Identifying Data				2023/24
Subject (*)	Software Verification and Validation		Code	614G01053
Study programme	Grao en Enxeñaría Informática			

Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Fourth	Optional	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Ciencias da Computación e Tecnoloxías da InformaciónComputación			
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General description	This subject is intended to master the current solutions in Software Engineering for the validation and verification of software. This includes: - knowledge of functional and non-functional techniques and tools for software validation at all levels (unit, integration, system); - knowledge of techniques and tools for automatic reasoning; and - knowledge of techniques and tools for formal verification.			

Study programme competences / results	
Code	Study programme competences / results
A28	Capacidade de identificar e analizar problemas, e deseñar, desenvolver, implementar, verificar e documentar solucións sóftware sobre a base dun coñecemento adecuado das teorías, modelos e técnicas actuais.
B1	Capacidade de resolución de problemas
B3	Capacidade de análise e síntese
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C3	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C7	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
C8	Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Ability to identify and analise problems, and to design, develop, implement, validate and document software solutions on the basis of an deep understanding and knowledge of modern theories, models and techniques.	A28	B1 B3	C2 C3 C6 C7 C8

Contents	
Topic	Sub-topic

Part I: Software Validation	I.1 Test specification, design and execution
	I1.1. Levels and types of tests
	I1.2. Properties and traceability of requirements
	I1.3. Automation
	I.2 Test management: planning, assessment, metrics and reviews
Part II: Formal methods and automatic reasoning	II.1 Introduction: natural deduction and calculus of sequences
	II.2 Automatic proofs using PVS
	II.3 What is a theorem prover, and what is it used for?
	II.4 PVS specification language: types, expressions, theories, subtyping
	II.5 PVS prover: tactics, recursion, ecuational reasoning
Part III: Model checking	III.1 Introduction to modal temporal logic
	III.2 Properties specification: deadlocks, safety, liveness, fairness
	III.3 How a model checker works
	III.4 Introduction to the use of a model checking tool

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	B3 C2 C7 C8	21	26.25	47.25
Laboratory practice	A28 B1 B3 C2 C3 C6	21	42	63
Objective test	B1 B3 C6	3	31.5	34.5
Personalized attention		5.25	0	5.25
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Master class where the theoretical contents of the study programme are presented.
Laboratory practice	Hands-on work sessions in the lab.
Objective test	Written test.

Personalized attention	
Methodologies	Description
Objective test Guest lecture / keynote speech Laboratory practice	Questions/answers about the theoretical/practical aspects of the subjects, during the corresponding office hours of each teacher. Part-time students should be able to follow this subject without issues, given that attendance is not mandatory nor awarded qualification. However, part-time students are responsible for keeping up-to-date with the materials posted on the Moodle platform, as well as the assignments to be handed in. When the assignments are to be handed in by means other than telematics, they will be set up between part-time students and teachers to the best both their schedules allow.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Objective test	B1 B3 C6	Written test, up to 4 points in the final score. A minimum of 2 points is required to pass.	40

Laboratory practice	A28 B1 B3 C2 C3 C6	Hand in and presentation of hands-on student assignments, up to 6 points in the final score (2 points per content topic). These are not compulsory to pass.	60

Assessment comments

In the first opportunity, students that do not reach the minimum in the objective test, will receive the mark they obtain in that objective test.

In the second opportunity, the objective test will have a weight of 80% for those students which continuous and lab evaluation sums up less than 1 point, in order to guarantee their right to pass the subject.

In compliance with the academic rules at UDC that apply to part-time students, physical presence in the classroom/laboratory will not be regarded as a qualification element. That is to say, students may officially apply to be dismissed from attending lectures and laboratory practices. All in all, part-time students will still need to comply with deadlines established for supervised projects and laboratory projects.

Likewise, as stated in the different regulations applicable to university teaching, the incorporation of the gender perspective in this subject will be enforced by using non-sexist language and encouraging the intervention, during the master sessions, of women and men in a balanced way. We will work to identify and modify prejudices and sexist attitudes, and we will influence the environment to modify them and promote values of respect and equality. Finally, if situations of gender-based discrimination are detected, actions and measures will be proposed to correct them.

Sources of information	
Basic	- Maurício Aniche (2022). Effective software testing. Manning
	- Charity Majors, Liz Fong-Jones, George Miranda (2022). Observability Engineering. O'Reilly Media, Inc.
	- Brian Okken (2022). Python testing with pytest. The Pragmetic Programmers
	- Gayathri Mohan (2022). Full Stack Testing. O'Reilly Media, Inc.
	- Fred Hébert (2019). Property-based testing with PropEr, Erlang, and Elixir : find bugs before your users do. The Pragmatic Bookshelf
	- Mordechai Ben-Ari (2012). Mathematical Logic for Computer Science. Springer
	- Crispin Lisa, Gregory Janet (2008). Agile Testing: A Practical Guide for Testers and Agile Teams. Addison-Wesley
	- Gerard J. Holzmann (2003). The SPIN model checker: primer and reference manual. Addison-Wesley
	- Kent Beck (2002). Test Driven Development (By Example). Addison-Wesley
	- Mordechai Ben-Ari (2001). Mathematical Logic for Computer Science. Springer
	- Zohar Manna and Amir Pnueli (1995). The Temporal Logic of Reactive and Concurrent Systems. Safety. Springer
	- Zohar Manna and Amir Pnueli (1991). The Temporal Logic of Reactive and Concurrent Systems. Specification. Springer
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Software Design/614G01015
Concurrency and Parallelism/614G01018
Software Process/614G01019
Software Architecture/614G01221
Requirements Engineering/614G01222
Quality Assurance/614G01223
Subjects that are recommended to be taken simultaneously
Knowledge Representation and Automatic Reasoning/614G01036
Theoretical Computer Science/614G01039
Development Methodologies/614G01051
Subjects that continue the syllabus
Software Development Projects/614G01226
Other comments