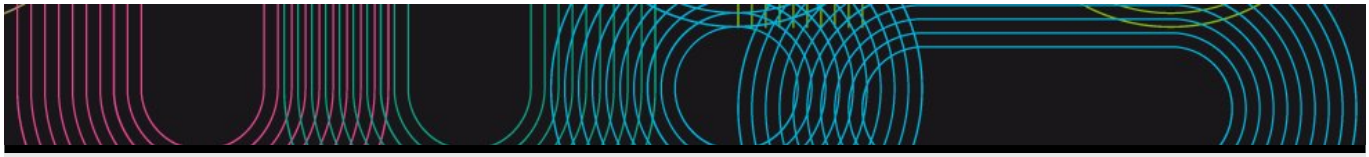

IDENTIFYING DATA				
Advanced software engineering methods				
Subject	Advanced software engineering methods			
Code	O06G150V01949			
Study programme	(*)Grao en Enxeñaría Informática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Gómez Rodríguez, Alma María			
Lecturers	Borrajo Diz, María Lourdes Gómez Rodríguez, Alma María Rodríguez Martínez, Francisco Javier			
E-mail	alma@uvigo.es			
Web	http://faitic.uvigo.es			
General description	The subject has character of introduction and deepening in the utilization of mathematical based methods for the definition and construction of software systems. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English. Na materia tratarase de coñecer os principais métodos formais de definición e refinamiento de programas. As prácticas da materia impartiranse en inglés, quedando o castelán e galego reservados para o ámbito teórico.			

Competencies	
Code	
A2	Students will be able to apply their knowledge and skills in their professional practice or vocation and they will show they have the required expertise through the construction and discussion of arguments and the resolution of problems within the relevant area of study.
A4	Students will be able to present information, ideas, problems and solutions both to specialist and non-specialist audiences.
B2	Ability to manage the project□s activities from the computing field in accordance with the acquired knowledge and training.
B10	Ability to carry out measurements, calculus, assessments, valuations, expert□s reports, studies, reports, task planning and other analogous computing jobs, according to the knowledge and training acquired.
C5	Knowledge of the structure, organization, functioning and interconnection of computing systems, the foundations of their programming, and their application to the resolution of specific problems in engineering.
C8	Ability to plan, conceive, implement and manage computing projects, services and systems in every area, monitoring their implementation and their continuing improvement and assessing their economic and social impact.
C12	Knowledge and application of basic algorithmic procedures of computer technologies to design solutions to problems, analyzing the appropriacy and complexity of the proposed algorithms.
C13	Knowledge, design and efficient use of the most appropriate data structures and types for the resolution of a problem.
C26	Ability to assess clients□ needs and determine the software requirements to satisfy these needs, reconciling conflicting goals through attempts to reach acceptable compromises within the limits imposed by costs, available times, existing developed systems and organizations themselves.
C29	Ability to identify, assess and deal with associated risks that could potentially arise.
C32	Ability to select, design, implement, integrate, assess, build, manage, exploit and maintain hardware, software and network technologies, within the appropriate costs and quality requirements.
C35	Ability to select, design, implement, integrate and manage information systems that meet the needs of organizations, once the costs and quality criteria have been identified.

C36	Ability to design systems, applications and services based on network technologies, including the Internet, web, e-commerce, multimedia, interactive services and mobile computing.
D1	I1: Analysis, synthesis and assessment skills.
D3	I3: Oral and written communication skills in one's native language.
D5	I5: Abstraction skills: ability to create and use models that reflect real situations.
D7	I7: Ability to search for, establish links and organize information coming from different sources and to integrate ideas, knowledge and skills.
D9	I9: Ability to make decisions.
D10	I10: Ability to present arguments and justify one's decisions and opinions in logical terms.
D15	P5: Interpersonal relations skills.
D16	S1: Critical-thinking skills.
D18	S3: Independent-learning skills.
D19	S4: Ability to adapt to new situations.
D20	S5: Creativity.
D22	S7: Ability to take the initiative and be determined.

Learning outcomes

Expected results from this subject	Training and Learning Results			
New	A4	B10	C8 C12 C26 C35	D3 D9 D15
New	A2		C29 C32 C35	D1 D3 D16
New		B2 B10	C5 C13 C26 C29 C35 C36	D5 D9 D10
New		B10	C29 C35	D1 D5 D10 D18 D19
New	A2	B2	C5 C8 C13 C35 C36	D1 D5 D16 D20 D22
New		B10	C29	D7 D16
New		B10	C12 C29	D9 D16

Contents

Topic	
INTRODUCTION	Deficiencies of less formal approaches. Concepts of formal methods. Formal methods commandments.
SOFTWARE FORMAL MODELING.	Basic concepts. Logical bases. Languages for formal specification: Z, VDM... The language of specification: Z. Formal definitions in Z. Basic Types. Diagrams. Sets. Relations. Functions. Sequences. Bags. Operations. Formal proof: Initialition theorem and Preconditions.

FORMAL VERIFICATION	Code and Specification Application to the life-cycle.
DEVELOPMENT PROCESS WITH FORMAL TECHNIQUES	Changes in the cycle of life owed to the utilization of formal methods Applications of formal techniques. Clean Room software engineering.

Planning

	Class hours	Hours outside the classroom	Total hours
Problem solving	15	30	45
Mentored work	5	15	20
Presentation	6	12	18
Lecturing	22	33	55
Objective questions exam	1.5	4.5	6
Essay questions exam	1.5	4.5	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Problem solving	(*)Aplicación dos contidos teóricos a exercicios prácticos semellantes aos que se atoparían no traballo profesional.
Mentored work	(*)Para promover a aprendizaxe autónoma dos estudantes, baixo a tutela do profesor en escenarios variados (académicos e profesionais). Está referida prioritariamente a aprendizaxe de □como facer as cousas□. Constitúe unha opción baseada na asunción polos estudantes da responsabilidade pola súa propia aprendizaxe. Baséase na aprendizaxe independente dos estudantes e o seguimento desa aprendizaxe polo profesor-titor.
Presentation	(*)Técnica de traballo en grupo coa finalidade do estudo intensivo dun tema. O resultado final deberá ser un documento no que se plasmen as conclusións ás que se chegou. A continuación o alumnado realizará unha exposición verbal en preséntana cuestións, traballos, conceptos, feitos ou principios de forma dinámica; sometido ás preguntas dos compañeiros e do profesor.
Lecturing	(*)Aprendizaxe dos contidos teóricos mediante o emprego da lousa, medios audiovisuais, etc.

Personalized assistance

Methodologies	Description
Mentored work	The student will be provided with followup to carry out the tasks entrusted.

Assessment

	Description	Qualification	Training and Learning Results			
Mentored work	It will consist of the development of a practical project of autonomous form, and the defense before the professor of the student. This assessment method is associated with learning outcomes: RA3 and RA5.	20	A2	B10	C5 C8 C12 C13 C26 C35 C36	D1 D3 D5 D9 D16 D18 D20 D22
Presentation	It will be carried out in workgroups. This method of evaluation is associated with learning outcomes: RA1, RA2, RA4.	30	A4		C8	D1 D3 D7 D15 D16 D20 D22
Objective questions exam	It will consist of several tests throughout the course, which will also allow monitoring of the student's evolution. This method of evaluation is associated with the learning outcomes: RA1, RA2, RA6, RA7.	25	A2	B2	C12 C32	D7 D9 D18
Essay questions exam	The proof will consist of theoretical questions and exercises that the student has to develop to demonstrate the acquired knowledge. This method of evaluation is associated with the learning outcomes: RA1, RA2, RA3, RA5, RA6, RA7.	25	A4	B10	C5 C29 C32	D1 D3 D10 D16 D18 D19

Other comments on the Evaluation

EVALUATION CRITERIA FOR ASSISTANTS 1st EDITION OF ACTS

All students who attend any of the tests are considered to be in attendance and therefore must follow the evaluation procedure previously described.

EVALUATION CRITERIA FOR NOT ASSISTANTS OR FOR THE 2nd AND FOLLOWING EDITIONS OF ACTS

For students who do not attend the classes, and in the second and following editions of acts, the examination will consist on a written exam where all the competences of the subject will be evaluated.

PROCESS FOR THE CALIFICATION OF ACTS

The grade for assistants will be based on the previously described teaching methodologies. In any case, a minimum of 4 is required in each of the methodologies to pass the subject. In the event that this minimum rating is not achieved, the grade contained in the acts will be the lower of these two values:

- The obtained by the application of the weighting of the evaluation methods.

- The fixed value of 4.

EVALUATION DATES

The assessment dates will be those approved by the ESEI and published on the official website. The examination calendar officially approved by the ESEI is published on the website http://www.esei.uvigo.es/index.php?id=29

Sources of information

Basic Bibliography

Pressman, Roger S., **Ingeniería del Software: Un enfoque práctico**, 7, McGraw-Hill, 2010

Spivey, J.M, **Understanding Z : a specification language and its formal semantics**, 1, Prentice-Hall, 1988

Woodcock, Jim, **Using Z [Recurso de Internet] : specifcation, refinement, and proof**, 1, 1996

Complementary Bibliography

Rosalind Barden, Susan Stepney, and David Coope, **Z in Practice**, 1, Prentice-Hall, 1994

John J. Marciniak, **Encyclopedia of software engineering**, 1, John Wiley & Sons, 1994

Guttagg & Horning, **Larch: Languages and tools for Formal Specification**, 1, Springer-Verlag, 1993

http://vl.fmnet.info/, **Páxina de métodos formais.**,

http://vl.zuser.org/, **Páxina de Z**,

Recommendations

Subjects that it is recommended to have taken before

Software engineering I/O06G150V01304

Software engineering 2/O06G150V01403