# Universida<sub>de</sub>Vigo

Educational guide 2023 / 2024



## Master Universitario en Dirección TIC para la defensa

### Subjects

Year 1st				
Code	Name	Quadmester	Total Cr.	
P52M182V01101	Government, management and ITC management	1st	3	
P52M182V01102	IT process management and continuous improvement	1st	4	
P52M182V01103	Service management and service quality	1st	4	
P52M182V01104	Networks and telecommunication systems	1st	3	
P52M182V01105	Information systems	1st	3	
P52M182V01106	Security of the information	1st	3	
P52M182V01107	Security management and risk analysis	1st	4	
P52M182V01201	Systems engineering and ICT project management	2nd	4	
P52M182V01202	Design of ICT architectures	2nd	3	
P52M182V01203	Planning and management of ICT infrastructures	2nd	4	
P52M182V01204	Satellite communication systems, positioning, remote sensing and radionavigation	2nd	3	
P52M182V01205	Security in telecommunications systems	2nd	4	
P52M182V01206	Services and software applications	2nd	3	
P52M182V01207	Security in information systems	2nd	4	

management and ITC management           Code         P52M182V01101           Study         Master           programme         Universitario en Dirección TIC para la defensa           Descriptors         ECTS Credits         Choose         Year         Quadmester           3         Mandatory         1st         1st           Teaching         Spanish         Ist         Ist           Oprodicional Rodríguez Rodríguez, Francisco Javier         Coordinator         Codríguez Rodríguez, Francisco Javier           Lecturers         Merino Gil, Miguel Angel Manuel Rodríguez Rodríguez Qued.uvigo.es         Http://campus.defensa.gob.es   https://moovi.uvigo.gal           General         The course aims to provide an overview of the strategic direction of the company and the strategic alignment of ICT. Following the planning process. ICT governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at th base of the organisational structure, human resource management will be discussed.           Code         Cd6 - Possess and understand knowledge that provides a basis or opportunity to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.           A8         CB6 - Possess and understand knowledge that provides a basis or opportunity to solve problems in new or poorly understood environments within broader (or unplidis plinary) contexts related to their area of study	IDENTIFYIN	G DATA			
management         Code       P52M132V0101         Study       Master         programme       Universitatio en         Descriptors       ECTS Credits       Choose         Year       Quadmester         Teaching       Spanish         anguage       Ectriptors       ECTS Credits         Coordinator       Rodriguez Rodriguez, Francisco Javier         Ecturers       Merino Gil, Miguel Angel Manuel         Rodriguez Rodriguez, Francisco Javier       Ecturers         Ecturers       Merino Gil, Miguel Angel Manuel         Rodriguez Rodriguez, Francisco Javier       Ecturers         Ecturers       Merino Gil, Miguel Angel Manuel         Rodriguez Rodriguez, Francisco Javier       Ecturers         Eenail       Taviercodriguez@cud uvigo ca         Web       http://campus.defras.gob.es.]. https://moovi.uvigo.gal         General       The course aims to provide an overview of the strategic direction of the company and the strategic alignment description         CDET - Folowing the planning process. (FG operance and nanagement, balanced scorecads and CT         Performance indicators will be explained. As an indisensable part of an organistation's performance, and at the base of the organisational structure, human resource management will be discussed.         Code       AC       CB - That students t	Governmen	t, management and ITC management			
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3         Mandatory         1st         1st           Teaching         Spanish           Jorganish         Spanish           Department         Coordinator         Rodriguez, Rodriguez, Francisco Javier           Coordinator         Rodriguez, Rodriguez, Francisco Javier         Rodriguez, Rodriguez, Francisco Javier           Email         Tjavierrodriguez/Geud.uvigo.es         Web         http://campus.defensa.gob.es [https://moovi.uvigo.gal           General         The course aims to provide an overview of the strategic direction of the company and the strategic alignment description         of CT. Following the planning process, ICT governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation sperformance, and at th base of the organisational structure, human resource management will be discussed.           Training and Learning Results         Code           Code         CB6 - Possess and understand knowledge that provides a basis or opportunity to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.           Code         CB6 - Possess and understand knowledge that provides a basis or opportunity to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.           Code         CB6 - That students know how to apply the acquired knowledge and face the complexity of formulating judgments based on information of the knowledge and judgm		la defensa			
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Teaching       Spanish         anguage       Department         Coordinator       Rodriguez Rodriguez, Francisco Javier         Excturers       Merino Gil, Miguel Angel Manuel         Rodriguez, Rodriguez, Francisco Javier       Enail         Finali       fjavierodriguez@cud.uvigo.es         Web       http://campus.defensa.gob.es         Web       ntp://campus.defensa.gob.es         General       The course aims to provide an overview of the strategic direction of the company and the strategic alignment         description       of CT. Following the planning process, ICT governance and related standards will be discussed. ISO 38.500 an         CDBT 5. In order to evaluate the performance of governance and management, balanced scorecards and ICT         performance indicators will be explained.As an indispensable part of an organisation's performance, and at th         base of the organisational structure, human resource management will be discussed.         Training and Learning Results         Code         Code         CB2 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / application of ideas, often in a research context.         CB2 - That students know how to applicate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and ju	•	3	Mandatory	1st	
Imagging           Department           Coordinator         Rodríguez, Rodríguez, Francisco Javier           Ecturers         Merino Gil, Miguel Angel Manuel           Rodríguez, Rodríguez, Francisco Javier           E-mail         fjavierrodríguez@cut.virgo.es           Beneral         The course aims to provide an overview of the strategic direction of the company and the strategic alignment description           General         The course aims to provide an overview of the strategic direction of the company and the strategic alignment description           OBIT 5. In order to evaluate the performance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at the base of the organisational structure, human resource management will be discussed.           Training and Learning Results           Code           A6         CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / application of ideas. often in a research context.           A7         CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.           A8         CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and thical responsibilities linked to thapplication of their knowledg	Teaching	Spanish	<b>_</b>		
Department Coordinator Rodríguez Rodríguez, Francisco Javier Lecturers Merino Gil, Miguel Angel Manuel Rodríguez Rodríguez, Francisco Javier Rodríguez Rodríguez, Francisco Javier Rodríguez Rodríguez, Francisco Javier Finail fjavierodríguez@cdu.Uvigo.es Web http://campus.defensa.gob.es ] https://movi.uvigo.gal General The course aims to provide an overview of the strategic direction of the company and the strategic alignment description of ICT. Following the planning process, ICT governance and related standards will be discussed: ISO 38.500 an COBIT 5. In order to evaluate the performance of governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at th base of the organisational structure, human resource management will be discussed. Training and Learning Results Code A6 CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / application of ideas, often in a research context. A7 CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study. A8 CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments. A9 CB9 - That students know how to communicate their conclusions and the knowledge and well-founded understandin of the theoretical and practical aspectialized public in a clear and unambiguous way. A10 CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self- directed or autonnowus. C1 CE1 - Acquire knowledge and skills to develop effective leadership for the digital transformation of an organization. C2 CE2 - Have capac	-	1			
Coordinator: Rodriguez Rodriguez, Francisco Javier Lecturers: Merino Gil, Miguel Angel Manuel Rodriguez Rodriguez, Francisco Javier F-mail fjavierrodriguez@cud.uvigo.es Web http://campus.defensa.gob.es   https://moovi.uvigo.gal General The course aims to provide an overview of the strategic direction of the company and the strategic alignment description of CT. Following the planning process. ICT governance and related standards will be discussed: ISO 38.500 an COBIT 5. In order to evaluate the performance of governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at th base of the organisational structure, human resource management will be discussed. Training and Learning Results Code AG CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / ( application of ideas, orien in a research context. AT CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study. AB CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments. AB CB9 - That students know how to communicate their conclusions and the knowledge and will be largely self- directed or autonomous. B1 CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understandi of the theoretical and practilaze public in a clear and unambiguous way. CG2 - Nas stadies and scills to develop effective leadership for the digital transformation of an organization. CG2 - Rave capacities and signify specialized knowledge and demonstrate a detailed and well-founded understandi of the theoretical and pra					
<ul> <li>Lectures Merino Gil, Miguel Angel Manuel Rodríguez Rodríguez, Francisco Javier</li> <li>F-mail fjavierrodriguez@cud.uvigo.es</li> <li>http://campus.defensa.gob.es   https://movi.uvigo.gal</li> <li>General The course aims to provide an overview of the strategic direction of the company and the strategic alignment description of ICT. Following the planning process, ICT governance and related standards will be discussed: ISO 38.500 an COBIT 5. In order to evaluate the performance of governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at th base of the organisational structure, human resource management will be discussed.</li> <li>Training and Learning Results</li> <li>Code</li> <li>C66 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / o application of ideas, often in a research context.</li> <li>C767 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.</li> <li>C88 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.</li> <li>C610 - That students know how to communicate their conclusions and the knowledge and well-founded understandin of the theoretical and practical aspecialized knowledge and demonstrate a detailed and well-founded understandin of the theoretical and practical aspecialized knowledge and demonstrate a detailed and well-founded understandin of the theoretical and practical aspecialized knowledge and farce the digital transformation of an organization.</li> <li>CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understandin of the theoretical</li></ul>	•	Rodríguez Rodríguez, Francisco Javier			
<ul> <li>Rodriguez Rodriguez, Trancisco Javier</li> <li>Finali Fiavierrodriguez@cud.uvigo.es</li> <li>Http://campus.defensa.gob.es   https://moovi.uvigo.gal</li> <li>The course aims to provide an overview of the strategic direction of the company and the strategic alignment description of ICT. Following the planning process, ICT governance and related standards will be discussed: ISO 38.500 an COBIT 5. In order to evaluate the performance of governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at the base of the organisational structure, human resource management will be discussed.</li> <li>Training and Learning Results</li> <li>Code</li> <li>Code</li> <li>CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / application of ideas, orben in a research context.</li> <li>CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.</li> <li>CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information of their knowledge and judgments.</li> <li>CB9 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.</li> <li>CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understandin of the theoretical and practical aspects dealt with in the different areas of study.</li> <li>CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.</li> <li>CG6 - Be able to make decisions in environments characterized by</li></ul>					
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<ul> <li>General The course aims to provide an overview of the strategic direction of the company and the strategic alignment description of ICT. Following the planning process, ICT governance and related standards will be discussed: ISO 38.500 an COBIT 5. In order to evaluate the performance of governance and management, balanced scorecards and ICT performance indicators will be explained. As an indispensable part of an organisation's performance, and at the base of the organisational structure, human resource management will be discussed.</li> <li>Training and Learning Results</li> <li>Code</li> <li>Code</li> <li>CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / application of ideas, often in a research context.</li> <li>CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.</li> <li>CB8 - That students know how to apply the acquired knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.</li> <li>CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that suppor them to a specialized and unspecialized public in a clear and unambiguous way.</li> <li>CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understandin of the theoretical and practical aspects dealt with in the different areas of study.</li> <li>CG3 - Bable to make decisions in environments characterized by complexity and uncertainty, evaluating the differen existing alternatives in order to select the one with the more favorable expected result, approritately managing the ris associated with the decision.</li></ul>			n dal		
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# **Expected results from this subject** Expected results from this subject

Training and Learning Results

LO1: Know a complete vision of the strategic management of the company.	A10
	B1
	B3
	B6
	C1
	D1
	D3
LO2: Understand the concept of ICT strategic alignment.	A10
Loz. Onderstand the concept of fer strategic anglinent.	B1
	B3
	B5 B6
	C1
	C2
	C4
	D1
	D3
LO3: ICT governance and related standards: ISO 38.500, COBIT 5.	A6
	A7
	A10
	B1
	B3
	B6
	C4
	D1
	D3
LO4: Understand the functioning of the value chain and its generation and the use of technology to	A7
support processes.	A10
	B1
	B3
	B6
	C1
	C3
	D1
	D3
LO5: Understand the use of balanced scorecards and ICT performance indicators.	A7
	A9
	A10
	B1
	B3
	B5 B6
	C1
	C2
	D1
	DI D3
LO6: Understand how human resource management contributes to strategic objectives.	A7
LOO. ONDERSTAND NOW NUMBER RESOURCE MANAGEMENT CONTINUTES TO STRATEGIC ODJECTIVES.	A7 A8
	A10
	B1
	B3
	B6
	C1
	D1
	D3

Contents	
Торіс	
Topic 1. Introduction to strategic business	1.1. Introduction. Basic management functions.
planning	1.2. The strategic management process.
	1.3. Strategic conceptualisation: vision, philosophy, mission.
	1.4. Strategic analysis.
	1.5. Organisational culture and goal-setting process.
	1.6. Strategy selection.

Topic 2. ICT governance, management and management: ISO/IEC 38500 standard and COBI 5	<ul> <li>2.1. ICT Governance.</li> <li>T 2.2. Implementation of ICT Governance.</li> <li>2.3. Reference frameworks for governance and management of ICT.</li> <li>2.4. ISO/IEC 38500. Introduction.</li> <li>2.5. ISO/IEC 38500. Main objectives and basic principles.</li> <li>2.6. ISO/IEC 38500. Implementation objectives.</li> <li>2.7. COBIT, Control Objectives for Information and Related Technologies: Introduction.</li> <li>2.8. COBIT. Reference Framework.</li> <li>2.9. COBIT. Principles.</li> <li>2.10. COBIT. Enabling Processes</li> <li>2.11. COBIT. Product family.</li> <li>2.12. COBIT 5 and other standards and frameworks.</li> <li>2.13. Ministry of Defence STIC policy.</li> <li>2.14. Supplementary information.</li> </ul>
Topic 3. Vision and mission of the ICT manager	<ul> <li>3.1. Introduction.</li> <li>3.2. CIO competencies.</li> <li>3.3. Key relationships of the CIO.</li> <li>3.4. Director of CISTIC and CIO of the Ministry of Defence.</li> <li>3.5. Further reading and activities</li> </ul>
Topic 4. Value generation and performance management	<ul> <li>4.1. Introduction.</li> <li>4.2. The Value of an Exercise Machine.</li> <li>4.3. Value of IT in the context of Business.</li> <li>4.4. How to communicate value.</li> <li>4.5. New ways to create value. The 4-source model of value creation from IT.</li> <li>4.6. Value analysis in different IT scenarios, frameworks, methodologies and new IT trends.</li> <li>4.7. References.</li> </ul>
Topic 5. Balanced Scorecards and Performance Management	<ul> <li>5.1. The Balanced Scorecard. Introduction and concepts.</li> <li>5.2. Perspectives of the BSC and objectives.</li> <li>5.3. Strategy maps.</li> <li>5.4. Key performance indicators, KPIs.</li> <li>5.5. Strategic initiatives</li> <li>5.6. BSC applied to ICT</li> <li>5.7. KPI indicators, application to ICT.</li> <li>5.8. Complementary information. Links.</li> </ul>
Topic 6. Human and material resources management	<ul> <li>6.1. Theoretical-technical elements of management and strategic change:</li> <li>From human resources to talent-based people management (TPD).</li> <li>6.2. Managing people and talent as a strategic factor.</li> <li>6.3. Motivational and creative approach to human behaviour.</li> </ul>

			<b>T</b> 1 11
	Class hours	Hours outside the	Total hours
		classroom	
Autonomous problem solving	0	6	6
Previous studies	0	35	35
Lecturing	5	5	10
Problem solving	3	3	6
Practices through ICT	4	0	4
Seminars	2	0	2
Discussion Forum	0	3	3
Presentation	3	6	9

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject independently.
Previous studies	Research, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to classes, laboratory practicals and/or assessment tests.
Lecturing	Presentation by a lecturer of the contents of the subject being studied, theoretical bases and/or guidelines for a project or exercise to be carried out by the student.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop appropriate and correct solutions by exercising routines, applying formulas or algorithms, applying procedures for transforming the available information and interpreting the results.

Practices through ICT	Activities involving the application of knowledge in a given context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated.

Personalized assistance			
Methodologies	Description		
Lecturing	Given the blended nature of the course, we will distinguish between two cases: (1) Attention in the distance phase: this will be carried out using telematic means. Students who wish to do so may ask the lecturers questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face-to-face tutoring mechanisms (individual and/or group) will also be used.		
Problem solving	Given the blended nature of the course, we will distinguish between two cases: (1) Attention in the distance phase: this will be carried out using telematic means. Students who wish to do so may ask the lecturers questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face-to-face tutoring mechanisms (individual and/or group) will also be used.		
Practices through ICT	Given the blended nature of the course, we will distinguish between two cases: (1) Attention in the distance phase: this will be carried out using telematic means. Students who wish to do so may ask the lecturers questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face-to-face tutoring mechanisms (individual and/or group) will also be used.		
Seminars	Given the blended nature of the course, we will distinguish between two cases: (1) Attention in the distance phase: this will be carried out using telematic means. Students who wish to do so may ask the lecturers questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face-to-face tutoring mechanisms (individual and/or group) will also be used.		

Assessment	Description	Qualification		aining	and
	Description	Qualification			Results
	A shi this in the section the section of the substants is a sectific contact and the	C7 F			
Practices	Activities involving the application of knowledge in a specific context and the	67.5	A7		C1 D1
through ICT	acquisition of basic and procedural skills in relation to the subject, through the		A8		2 D3
	use of ICT. They allow the student's knowledge and skills to be assessed. They		A9		
	will be assessed by means of deliverables. There will be 6 deliverables in the		A10	C	24
	distance phase (the statements will be uploaded to the platform by the teacher				
	and the student must upload the resolution) belonging to the following topics:				
	<ul> <li>E1: exercise on the application of Porter's 5 forces (topic 1) (10%),</li> </ul>				
	- E2: activities 1, 2 and 3 (topic 2) (15%),				
	- E3: exercise (topic 3) (5%),				
	- E4: activities 1, 2 and 3 (topic 4) (15%),				
	- E5: exercise (topic 5) (12.5%) and				
	- E6: questionnaire of questions on HR-talent management (topic 6) (10%).				
Presentation	Presentation by the students, individually or in groups, of a topic related to the	32.5	A7	B1 C	C1 D1
	contents of the subject or the results of a project, exercise, project, etc.		A8	B3 C	C3 D3
	Knowledge, skills and attitudes can be assessed through the presentation. The		A9	B6	
	following exercises will be presented by the student in the classroom phase		A10		
	(belonging to topic 5):				
	- P1: exercise 1 presented by groups "CIO debate" (10%),				
	- P2: exercise 2 presented by groups "Strategic map" (10%) and				
	- P3: final work in face-to-face and individual phase "Qlik Sense" (12.5%).				

We call the average continuous assessment mark MED\_CON, which is calculated as:

MED\_CON = 0.1 \* E1 + 0.15 \* E2 + 0.05 \* E3 + 0.15 \* E4 + 0.125\*E5 +0.1\*E6 + 0.1\*P1 + 0.1\*P2 + 0.125\*P3

It will be necessary to obtain at least 50% of the grade to pass the subject.

In the event that the student does not manage to pass the subject in the ordinary call, he/she will have the right to a second opportunity for assessment (extraordinary call) on the dates established for this purpose by the Master's Academic Committee. The evaluation in this extraordinary call will consist of a single written test, which will be carried out in the distance mode, which will account for 100% of the grade, being necessary to obtain at least 50% to pass the subject.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

Sources of information

Basic Bibliography

**Complementary Bibliography** 

J. A. O Brien, G. M. Marakas, Sistemas de información gerencial, 7, McGraw-Hill, 2006

International Organization for Standardization, ISO/IEC 38500:2015 Information technology -- Governance of IT for the organization, 2015

J.R. Rodríguez, **Planificación y dirección estratégica de sistemas de información**, Editorial UOC, 2015

C. M. Fernández Sánchez, M. Piattini Velthuis, **Modelo para el gobierno de las TIC basado en las normas ISO**, AENOR, 2012

Karl D. Schubert, CIO Survival Guide, the Roles and Responsibilities of the Chief Information Officer, Wiley, 2004

### Recommendations

Subjects that are recommended to be taken simultaneously

IT process management and continuous improvement/P52M182V01102

	G DATA management and continuous improve	ment		
Subject	IT process			
<b>,</b>	management and			
	continuous			
	improvement			
Code	P52M182V01102			
Study	Master			
orogramme	Universitario en			
	Dirección TIC para			
	la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	1st
Feaching	Spanish			
anguage				
Department				
Coordinator	. 5			
_ecturers	Ares Tarrío, Miguel Ángel			
	Fernández Gavilanes, Milagros			
	Pérez Ribas, Francisco Manuel			
E-mail	mfgavilanes@cud.uvigo.es			
Neb	http://campus.defensa.gob.es   https://mo	oovi.uvigo.gal		
General	ICT processes' Management and Continue			
description	organizations, according to the philosoph			
	The objective is to provide the student wi			
	notably increasing their capacity in the de	esign, analysis and diagnosis c	of processes, fo	cused on their
	continuous improvement			
	continuous improvement.			
	An overview of the CMMI reference mode			
	An overview of the CMMI reference mode practices and that is currently a reference	e framework in the software in	dustry and that	generates value in the
	An overview of the CMMI reference mode practices and that is currently a reference prioritization of actions in the improveme	e framework in the software in ent of processes of IT companie	dustry and that s; also allowing	generates value in the to emphasize the
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Code	An overview of the CMMI reference mode practices and that is currently a reference prioritization of actions in the improveme alignment of processes in accordance wit d Learning Results	e framework in the software in ent of processes of IT companie th the objectives defined withir	dustry and that es; also allowing in the strategic p	generates value in the to emphasize the olan of the organization.
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- C2 CE2 Have capacities in relation to the ICT Government and the Management, Operation and Maintenance Services of Information and Communication Systems and Technologies and Information Security.
- C3 CE3 Define, implement, direct and manage the organizational, operational and support processes in obtaining ICT resources and for the management and quality of the service; with a guarantee of safety for people and goods, the final quality of the products and their homologation.
- C5 CE5 Define and implement standard models, establishment of standards and reference methodologies and taxonomy of ICT services and information security.
- D5 CT5 Autonomous learning and work.

### Expected results from this subject

Expected results from this subject

Training and Learning Results

101 Understand what RDM process management is and learn to identify and document them	B1
LO1. Understand what BPM process management is and learn to identify and document them.	
	C1
	C3
LO2. Understand the organization of processes at different levels of the organization, process maps.	A9
	B1
	B4
	C5
LO3. Identification of critical processes and definition of process improvements.	A6
	A7
	B1
	B4
	C1
	D5
LO4. Understand Process Management as a basis for improvement models and tools such as ISO	A6
9000-PECAL21XX, EFQM.	A8
	A10
	B1
	B3
	C1
	C2
	C3
	C5
	D5
LO5. Know the maturity models, CMM.	B1
	C1
	C2
	C3
	C5

Contents	
Торіс	
Topic 1. Process management, BPM.	- Management by functions
	<ul> <li>From functional management to process management.</li> </ul>
	- Elements of a process.
	- Organization by processes.
	- BPM. What is and evolution.
Topic 2. Process design and reengineering.	- Process design
	- Flow diagram.
	- Processes modeler.
	- Simulation and analysis of processes with computer tools.
Topic 3. Continuous improvement of processes,	<ul> <li>Excellence models (TQM- Deming Model, NIST, EFQM)</li> </ul>
TQM and EFQM excellence models.	- Continuous improvement models and practices (TPS-JIT, Lean Philosophy,
	Six Sigma)
	- Application of continuous improvement in Defense.
Topic 4. Quality Management and Assurance	<ul> <li>ISO 9000:2015 standard. Basics and vocabulary</li> </ul>
Systems, ISO9000-PECAL.	<ul> <li>UNE-EN ISO 9001:201 standard. Quality management system.</li> </ul>
	Requirements.
	- PECALP/AQAP Ministry of Defense.
Topic 5. Maturity models, CMM.	- CMM model.
	- CMMI model.
	- CMMI-DEV model.
	- CMMI-SVC model. ITIL/ISO20000.
	- ISO 15504. COBIT process capability model.
	- Models of immaturity.
	- CMMI® Maturity Profile Report, Dec 2017.

Planning				
	Class hours	Hours outside the classroom	Total hours	
Autonomous problem solving	0	11	11	
Previous studies	0	33	33	
Lecturing	6	6	12	
Problem solving	4	4	8	
Practices through ICT	7	15	22	
Seminars	2	0	2	
Discussion Forum	0	3	3	
Self-assessment	0	6	6	

 Presentation
 3
 0
 3

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

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyze and solve problems and/or exercises related to the subject autonomously.
Previous studies	Presentation by a lecturer of the contents of the subject of study, theoretical bases and/or guidelines of a work or exercise that the student has to develop.
Lecturing	Exhibition by part of a lecturer of the contents of the matter object of study, theoretical bases and/or guidelines of a work or exercise that the/the student has to develop.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the appropriate and correct solutions through the exercise of routines, application of formulas or algorithms, application of transformation procedures of the available information and interpretation of the results.
Practices through ICT	Activities for the application of knowledge in a given context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.
Discussion Forum	Activity carried out in a virtual environment in which diverse and current topics related to the academic and/or professional field are debated.

Methodologies	Description
Lecturing	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face- to-face tutoring mechanisms will also be used.
Problem solving	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face- to-face tutoring mechanisms will also be used.
Practices through ICT	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face- to-face tutoring mechanisms will also be used.
Seminars	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face- to-face tutoring mechanisms will also be used.

	Description	Qualificatio		aining and Learning
				Results
Practices through ICT	Activities of application of knowledge in a given context and acquisition of basic and procedural skills in relation to the subject, through the use of ICT. They allow the evaluation of the student's knowledge and skills. They will be evaluated by means of deliverables. There will be three deliverable activities (AO1, AO2 and AP3). AO1 and AO2 will be assessed during the distance phase and will cover topics 2 and 3, and will have a weighting of 9% and 6% of the mark, respectively. AP3 will be assessed during the face-to-face phase and will have a weighting of 25% of the mark.	c 40	A8	B1 C2 B3 C3 B4 C5

Discussion Forum	Activity carried out in a virtual environment in which diverse and current topics related to the academic and/or professional field are debated. It allows evaluating the skills, knowledge and, to a lesser extent, the attitudes of the student. There will be three discussion or debate activities (D1, D2 and D3) which will be assessed during the distance phase: D1 and D2 will cover topic 1, and will have a weighting of 1.5% and 4.5% of the mark, respectively; and D3 will cover topic 3 and will have a weighting of 9% of the mark.	15		B1 C1 D5 ) B4
Self-assessment	Mechanism in which, by means of a series of questions or activities, it is possible for the student to evaluate in an autonomous way his/her degree of acquisition of knowledge and skills on the subject, allowing a self-regulation of the personal learning process. There will be five self-assessment activities (A1, A2, A3, A4 and A5) which will be assessed during the distance phase: A1, A2 and A3 will cover topic 1, 2 and 3, respectively and will all have a weighting of 6.25%; A4 will cover topic 4 and will have a weighting of 1.25%; and A5 will cover topic 5 and will have a weighting of 5%.	25	A6 A7	B1 C1 D5 B4 C3
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc. Knowledge, skills and attitudes can be evaluated through the presentation. The presentation (P) will be assessed during the face-to-face phase.	20	A9	B1 C1 B3 B4

If we call the average continuous assessment mark MED\_CON, which is calculated as:

MED\_CON = 0.09\* A01 + 0.06\*A02+ 0.25\*AP3 + 0.015\* D1 + 0.045\*D2 + 0.09\*D3 + 0.0625\*A1+ 0.0625\*A2 + 0.0625\*A3 + 0.0125\*A4 + 0.05\*A5 + 0.2\*P

It will be necessary to obtain at least 50% of the grade to pass the course.

In case the student fails to pass the course in the ordinary call, he/she will have the right to a second evaluation opportunity (extraordinary call) on the dates established for this purpose by the Master's Academic Committee. This evaluation will be carried out in distance mode, and will consist of a single test that will account for 100% of the grade, being necessary to obtain at least 50% to pass the course.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

### Sources of information

Basic Bibliography

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Mary Beth Chrissis, Mike Konrad, Sandy Shrum, CMMI for Development: Guidelines for Process Integration and Product Improvement (SEI Series in Software Engineering), Addison-Wesley, 2011

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Gerardus Blokdyk, CMMI A Complete Guide - 2020 Edition, 5STARCooks, 2019

Francisco Alfonso Lanza Rodriguez, Metodología para la implementación de procesos de calidad: en la fábrica de software basados en la integración de CMMI-DEV, PMBOK, y SCRUM, Editorial Académica Española, 2020

Alejandro Vázquez Chávez y Yohannia López Vargas, Alineación de estándares para la gestión de proyectos de servicios TI, 978-620-2-10578, KS OmniScriptum Publishing,

BPM 2021 International Workshops, Rome, Italy, September 6[10, 2021, Revised Selected Papers, **Business Process** Management Workshops, 9783030943424, Springer International Publishing, 2021

Daniel Plung, Connie Krull, **Process Improvement to Company Enrichment. An Integrated Strategy**, 9781637424261, Business Expert Press, 2022

### Recommendations

### Subjects that are recommended to be taken simultaneously

Government, management and ITC management/P52M182V01101

### Other comments

Bizagi Modeler software will be used for the practical sessions:

https://www.bizagi.com/es/productos/bpm-suite/modeler.

IDENTIFYIN	G DATA			
Service ma	nagement and service quality			
Subject	Service			
-	management and			
	service quality			
Code	P52M182V01103			
Study	Master			
programme	Universitario en			
	Dirección TIC para			
	la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	1st
Feaching	Spanish	Handatory		
anguage	Spanish			
Department				
	Fornándoz Cavilanos Milagros			
	Fernández Gavilanes, Milagros			
ecturers	Ares Tarrío, Miguel Ángel			
	Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es			
Veb	http://campus.defensa.gob.es   https://moovi.uvigo.ga			
General	The subject Service Management and Service Quality			
description	world of Service Management. The ITIL methodology i			
	framework. The aim is not to prepare for an ITIL certif			
	a better understanding. The objective is to understand			
	achieve a theoretical basis for practical application ar			
	necessary resources. It will be reinforced by analysis	of historical use ca	ases and manag	ement models from
	different service companies and organisations.			
Training ar	d Learning Results			
Code				
	ossess and understand knowledge that provides a basi	s or opportunity to	he original in t	he development and / c
	tion of ideas, often in a research context.			ne development und / e
	hat students know how to apply the acquired knowledge	o and thoir ability	to solvo problo	me in now or noorly
	ood environments within broader (or multidisciplinary)			
	hat students are able to integrate knowledge and face			
	tion that, being incomplete or limited, includes reflecti	ons on the social	and ethical resp	onsidilities linked to the
	tion of their knowledge and judgments.			
	hat students know how to communicate their conclusio			te reasons that support
	a specialized and unspecialized public in a clear and u			
	That students possess the learning skills that allow the	m to continue stu	dying in a way t	hat will be largely self-
	d or autonomous.			
B3 CG3 - D	irect, plan, coordinate, organize and/or supervise task	s, projects and/or	human groups. '	Work cooperatively in
	sciplinary teams acting, where appropriate, as an integ			ork.
	eing a professional committed to quality, deadlines an	d the adequacy of	the set of the second second second	
34 CG <u>4 -</u> E	cing a professional committeed to quality) acadimes an	u the adequacy of	' solutions, not d	
				nly in the exercise of
the pro	fession but also in the social field, including a commitn			nly in the exercise of
the pro sustain	fession but also in the social field, including a commitn ability.	ent to economic,	ethical and env	nly in the exercise of ronmental
the pro sustain C2 CE2 - H	fession but also in the social field, including a commitn ability. ave capacities in relation to the ICT Government and t	hent to economic, ne Management, (	ethical and env	nly in the exercise of ronmental
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the pro sustain C2 CE2 - H Informa C5 CE5 - D of ICT s O4 CT4 - O	fession but also in the social field, including a commitn ability. ave capacities in relation to the ICT Government and t tion and Communication Systems and Technologies ar efine and implement standard models, establishment of ervices and information security. ral and written communication skills.	nent to economic, ne Management, ( nd Information Sec	ethical and env Operation and M curity.	nly in the exercise of ronmental aintenance Services of
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the pro sustain C2 CE2 - H Informa C5 CE5 - D of ICT s D4 CT4 - O	fession but also in the social field, including a commitn ability. ave capacities in relation to the ICT Government and t tion and Communication Systems and Technologies ar efine and implement standard models, establishment of ervices and information security. ral and written communication skills.	nent to economic, ne Management, ( nd Information Sec	ethical and env Operation and M curity.	nly in the exercise of ronmental aintenance Services of dologies and taxonomy Training and
the pro sustain C2 CE2 - H Informa C5 CE5 - D of ICT s D4 CT4 - O Expected res	fession but also in the social field, including a commitmability. ave capacities in relation to the ICT Government and the iton and Communication Systems and Technologies are fine and implement standard models, establishment of ervices and information security. ral and written communication skills.	nent to economic, ne Management, ( nd Information Sec of standards and r	ethical and env Operation and M curity. eference metho	nly in the exercise of ronmental aintenance Services of dologies and taxonomy Training and Learning Results
the pro sustain C2 CE2 - H Informa C5 CE5 - D of ICT s D4 CT4 - O Expected res	fession but also in the social field, including a commitmability. ave capacities in relation to the ICT Government and to tion and Communication Systems and Technologies ar efine and implement standard models, establishment of ervices and information security. ral and written communication skills.	nent to economic, ne Management, ( nd Information Sec of standards and r	ethical and env Operation and M curity. eference metho	nly in the exercise of ronmental aintenance Services of dologies and taxonomy

A6	
A7	
A8	
A9	
A10	
B3	
B4	
C2	
C5	
D4	

LO2: Knowing successful models of service management implementation	A6
	Α7
	A8
	A9
	A10
	B3
	B4
	C2
	C5
	D4
LO3: Know the ITIL framework at a high level.	A6
	A7
	A8
	A9
	A10
	B3
	B3 B4
	C2
	C5
	D4
104 Identifier and the life for and lighter in some due	
LO4: Identifying opportunities for application in current work	A6
	Α7
	A8
	A9
	A10
	B3
	B4
	C2
	C5
	D4

Contents	
Торіс	
Topic 1: Introduction to service management.	- Definition of IT Service and Service Strategy.
	- Service Management. Introduction to ITSM.
	- What is ITIL. ITIL v3 2011 / ITIL 4.
	- ITIL - Service Strategy.
Topic 2: Service Design and Service Transition.	- ITIL - Service Design.
	- ITIL - Service Transition.
Topic 3: Service Operation.	-ITIL - Service Operation.
Topic 4: Continuous Service Improvement, ITIL 4.	- ITIL - Service Improvement.
DevOps.	- ITIL 4.
	- DevOps.

	Class hours	Hours outside the classroom	Total hours
Previous studies	0	50	50
Lecturing	12	10	22
Case studies	7	0	7
Discussion Forum	0	10	10
Essay questions exam	1	4	5
Presentation	2	0	2
Objective questions exam	0	4	4

	Description
Previous studies	Search, reading, documentation work and / or autonomous development of any other activity that the student considers necessary to allow him / her to acquire knowledge and skills related to the subject. It is usually carried out before classes, laboratory practices and / or evaluation tests.
Lecturing	Presentation by a lecturer of the contents of the subject under study, theoretical bases and / or guidelines of a work or exercise that the student has to develop.
Case studies	Analysis of a fact, problem or real event with the aim of knowing it, interpreting it, solving it, generating hypotheses, contrasting data, reflecting, completing knowledge, diagnosing it and training in alternative solution procedures.

Personalized	assistance			
Methodologi	es Description			
Lecturing	Given the blended nature of the course, we will distinguish two cases: (1) Attent phase: it will be carried out through the use of telematic means. Students who v questions to the faculty in forums or by email. They will also be able to arrange the lecturer, which will take place via videoconference. (2) Attention in the face- the use of telematic mechanisms is still possible, during this phase face-to-face also be used.	vish to do individua to-face p	o so ma Il tutori ohase: a	ay raise ies with although
Case studies	Given the blended nature of the course, we will distinguish two cases: (1) Attent phase: this will be carried out through the use of telematic means. Students who the lecturers questions in forums or by e-mail. They will also be able to arrange the teacher, which will be carried out by videoconference. (2) Attention in the fa although it is still possible to use telematic mechanisms for student attention, de face tutoring mechanisms will also be used.	o wish to individua ce-to-fac	do so al tutor e phas	may ask ials with se:
According				
Assessment	Description Q	Jualificati	on Tr	aining and
		dumeut		Learning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be assessed.	20	A6 A7 A8 A9 A10	B3 C2 D4 B4 C5
Essay questior exam	ns Assessment test which includes open questions and/or exercises on a topic. Students must develop, relate, organise and present their knowledge of the subject in a reasoned response. It can be used to assess knowledge and skills.	10	A6 A7 A8 A9 A10	B3 C2 D4 B4 C5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Knowledge, skills and attitudes can be assessed through the presentation.	10	A6 A7 A8 A9 A10	B3 C2 D4 B4 C5
Objective questions exa	Tests that assess knowledge and include closed questions with different answer m alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. There will be two written tests of multiple-choice questions (PT and PE). PT will be taken during the distance learning phase on topics 1, 2 and 3 of the subject and will be weighted 30%. PE will take place at the end of the classroom phase, in which all the topics and contents of the subject will be evaluated (including the contents of the distance and classroom phase) and will be weighted 30%.	60	A6 A7 A8 A10	B3 C2 B4

If we call the average continuous assessment mark MED\_CON, which is calculated as:

MED\_CON = 0.2\*D + 0.3\*PT+ 0.3\*PE + 0.1\*P + 0.1\*PD

It will be necessary to obtain at least 50% of the grade to pass the subject.

In the event that the student does not manage to pass the subject in the ordinary call, he/she will have the right to a second opportunity for assessment (extraordinary call) on the dates established for this purpose by the Master's Academic Committee. The evaluation of the extraordinary call will be carried out in distance mode and will consist in this case of a single written test that will account for 100% of the grade, being necessary to obtain at least 50% to pass the subject.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall

continuous assessment and independently of other disciplinary actions that may be applied.

In the event that there is any difference between the guides in Galician/Spanish/English related to the assessment, the Spanish guide will always prevail.

Sources of inform Basic Bibliograph	
Complementary B	
ITIL Foundation, <b>ITI</b>	<b>4 edition</b> , 4, Axelos, 2019
Office of Governme	nt Commerce, ITIL Diseño del Servicio, Stationery Office, 2010
Office of Governme	nt Commerce, ITIL Estrategia del Servicio, Stationery Office, 2010
Office of Governme	nt Commerce, ITIL Operación del Servicio, Stationery Office, 2010
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Office of Governme	nt Commerce, The official introduction to the ITIL service lifecycle, 1, Stationery Office, 2007
Peter Farenden, ITI	for Dummies, 1, For Dummies, 2012

### Recommendations

IDENTIFYIN	IG DATA			
Networks a	and telecommunication systems			
Subject	Networks and			
	telecommunication			
_	systems			
Code	P52M182V01104			
Study	Master Universitario			·
programme	en Dirección TIC			
	para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching	Spanish			
language				
Department				
Coordinator	Troncoso Pastoriza, Francisco Manuel			
Lecturers	Fernández Gavilanes, Milagros			
	Troncoso Pastoriza, Francisco Manuel			
E-mail	ftroncoso@cud.uvigo.es			
Web	http://campus.defensa.gob.es   https://moovi.uv			
General	This subject provides fundamental concepts of o			
description	technological basis of data transmission, the arc			
	components of ICT infrastructures, network mar	nagement and planning	methods and th	ne basic aspects of
	security in computer networks.			
	Classroom lectures will be used for the introduct	tion at theoretical conce	nte which will	he complemented with

Classroom lectures will be used for the introduction of theoretical concepts, which will be complemented with various laboratory practices.

### Training and Learning Results

Code

A6 CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

A7 CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.

A8 CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.

- A9 CB9 That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
- A10 CB10 That students possess the learning skills that allow them to continue studying in a way that will be largely selfdirected or autonomous.
- B1 CG1 Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
- B3 CG3 Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.

B6 CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.

C7 CE7 - Analyze and model the architecture of a communications system, including its different components and access, transport and transmission services, both in local and wide-area environments.

D4 CT4 - Oral and written communication skills.

Expected results from this subject		
Expected results from this subject	Training and	
	Learning Results	
LO1: Know the technological basis on which telematics and data transmission are based.	A6	
	A7	
	A8	
	A9	
	A10	
	B1	
	B3	
	B6	
	C7	
	D4	

LO2: Understand the basic principles and architectures of communication networks and services.	A6
	A7
	A8
	A9
	A10
	B1
	B3
	B6
	C7
LO3: Know the main components of ICT infrastructures.	A6
	A7
	A8
	A9
	A10
	B1
	B3
	B6
	C7
	D4
LO4: Know the methods of network management and planning.	A6
	A7
	A8
	A9
	A10
	C7
	D4
LO5: Know military communication systems.	A6
· · · · · · · · · · · · · · · · · · ·	A7
	A8
	A9
	A10
	C7
	D4

Торіс	
Block I: Introduction to computer networks	<ul> <li>Objectives and motivation</li> <li>Use of computer networks, social and economic impact</li> <li>Components of computer networks and types of networks</li> <li>Connections and routing</li> <li>Layers, services and protocols</li> <li>Reference models (OSI/Internet)</li> <li>History of the Internet</li> </ul>
Block II: Computer network management	<ul> <li>Objectives and motivation</li> <li>Network design and planning: sub-networks, demilitarised zones, VLANs and NAT.</li> <li>Network monitoring and management: network access control, virtualisation and network management (fault, configuration, account, performance, security, and SNMP)</li> </ul>
Block III: Computer network architecture	<ul> <li>Architecture and components of telecommunication systems: introduction, addressing, performance, security</li> <li>Transmission media (spectrum, frequency bands): introduction, frequencies and spectrum, channel characterisation, transmission media</li> <li>Military communication equipment and systems: introduction, rugerisation, military networks</li> </ul>

Planning			
	Class hours	Hours outside the classroom	Total hours
Previous studies	0	38	38
Lecturing	8	8	16
Problem solving	0	2	2
Seminars	1	0	1
Practices through ICT	5	0	5
Autonomous problem solving	0	4	4
Discussion Forum	0	1	1
Self-assessment	0	3	3

Essay	0	2	2	
Presentation	2	0	2	
Objective questions exam	1	0	1	

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

Methodologies	
	Description
Previous studies	Research, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable him to acquire knowledge and skills related to the subject. This is usually carried out prior to classes, laboratory practices and/or assessment tests.
Lecturing	Presentation by the lecturer of the contents of the subject, theoretical bases and/or guidelines of a work or exercise that the student has to develop.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop appropriate and correct solutions by exercising routines, applying formulas or algorithms, applying procedures for transforming the available information and interpreting the results.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.
Practices through ICT	Activities involving the application of knowledge in a given context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT.
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject independently.
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated.

Personalized assistance		
Methodologies	Description	
Problem solving	Attention in the distance learning phase: This will be carried out through the use of telematic means Students who wish to do so will be able to ask the faculty questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will take place via videoconference.	
Practices through ICT	Attention in the face-to-face phase: Although it is still possible to use telematic mechanisms for student attention, face-to-face tutoring mechanisms (individual and/or group) will also be used during this phase.	

Assessment				
	Description	Qualification	l	aining and _earning Results
Practices through ICT	Activities involving the application of knowledge in a specific context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT. They allow the student's knowledge and skills to be assessed. They will be assessed by means of deliverables. They will be assessed by means of deliverables (PT) and will be carried out in the face-to-face phase.		A6 A7 A8	B1 C7 B3 B6
Self-assessment	A mechanism in which, by means of a series of questions or activities, it is possible for the student to autonomously evaluate his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. Three questionnaires (AV1, AV2 and AV3) will be carried out and assessed during the distance phase.		A6 A7 A8 A9	B1 C7 B3
Essay	Delivery of a report by the students, individually or in groups, about a topic related to the contents of the subject or about the results of a work, exercise project, etc. This work (T) will be assessed during the distance phase.	,	A6 A7 A8 A9	B1 C7 D4 B3 B6
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc. Knowledge, skills and attitudes can be assessed through the presentation. This presentation (P) will be assessed during the face-to-face phase.		A6 A7 A8 A9 A10	B1 C7 D4 B3
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. This written examination (PE) will take place at the end of the face-to-face phase.		A6 A7 A8 A9 A10	B1 C7 B3

### Other comments on the Evaluation

If we call the average mark for continuous assessment MED\_CON, which is calculated as follows:

MED\_CON = 0.1\* (AV1+AV2+AV3)/3 + 0.3\* T + 0.15\*P + 0.15\*PT + 0.3\*PE

A minimum mark of 50% is required to pass the course.

In the event that the student does not manage to pass the subject in the ordinary call, he/she will have the right to a second opportunity for assessment (extraordinary call) on the dates established for this purpose by the Master's Academic Committee. The assessment of the extraordinary call will be carried out in distance mode. In order to pass the course it will be necessary to pass the different parts into which the subject is divided.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the event of any discrepancies between the guides in Galician/Spanish/English regarding evaluation, the indications stated in the Spanish version of the course guide will always prevail.

Sources of information Basic Bibliography

**Complementary Bibliography** 

S. Tanenbaum, D. Wetherall, Computer Networks: International Version, 5ª Edición, Prentice-Hall, 2010

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R. K. Jain, The Art of Computer Systems Performance Analysis: Techniques for Experimental Design, Measurement, Simulation, and Modeling, 1ª Edición, Wiley, 1991

K. R. Fall, W. R. Stevens, TCP/IP Illustrated, Volume 1: The Protocols, 2ª Edición, Addison-Wesley, 2011

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### Recommendations

### Other comments

It is recommended that students taking this course have a basic knowledge of computer networks.

IDENTIFYIN	G DATA			
Information	1 systems			
Subject	Information			
	systems			
Code	P52M182V01105			
Study	Master			
programme	Universitario en			
	Dirección TIC para			
	la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching	Spanish			
language				
Department				
Coordinator	Álvarez Sabucedo, Luis Modesto			
Lecturers	Álvarez Sabucedo, Luis Modesto			
E-mail	lsabucedo@det.uvigo.es			
Web	http://campus.defensa.gob.es   https://moovi.uvigo.ga			
General	The Information Systems subject aims to offer student	s an integrated	vision of the diffe	erent elements
description	necessary to make the holistic concept of Information	Systems possibl	e from a technol	ogical perspective. To
	this end, the different technologies and paradigms that	it are used in the	e different layers	involved in the design
	and development of Information Systems will be exam	ined. The propos	sed approach, fa	r from seeking to show
	low-level descriptions, seeks a high-level approach con different possibilities.	ncerned with the	advantages and	d disadvantages of the

# Training and Learning Results Code A6 CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context. A7 CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study. A8 CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments. A9 CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way. A10 CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self

A10 CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely selfdirected or autonomous.

B1 CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.

B5 CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.

C8 CE8 - Analyze and model the architecture of an information system, including its main components and functions, as well as the mechanisms that enable these components to be articulated, especially in distributed environments.

- D4 CT4 Oral and written communication skills.
- D5 CT5 Autonomous learning and work.

### Expected results from this subject

Expected results from this subject	Training and Learning Results
LO1. To know how to identify the architecture and components of a given service model.	A6
	A7
	A8
	A9
	A10
	B1
	B5
	C8
	D4
	D5

LO2. To understand the different models for information storage	A6
	A7
	A8
	A9
	A10
	B1
	B5
	C8
	D4
	D5
LO3. To understand the basic principles of information classification and analysis.	A6
	A7
	A8
	A9
	A10
	B1
	B5
	C8
	D4
	D5
LO4. To know the fundamental elements of information interface design.	A6
	A7
	A8
	A9
	A10
	B1
	B5
	C8
	D4
	D5
LO5. To understand the basic characteristics of information systems and their impact on the use of	A6
information systems.	A7
	A8
	A9
	A10
	B1
	B5
	C8
	D4
	D5
LO6. To know the basic principles of information systems in the military area.	A6
	A7
	A8
	A9
	A10
	B1
	B5
	C8
	D4
	D5
Contents	
Topic	
Architecture and components of an information - Basic concepts of software architectures	

system       - Architecture models         Layered architecture models       - Layered architecture models         - Most common technologies       - Most concepts of information management         Databases and information storage mechanisms       - Basic concepts of information management         - Information representation models       - Structured information storage media         - Introduction to NoSQL databases       - Introduction to Semantic information models         Processing and presentation of information       - Introduction to Big Data and its applications         - Statistical information processing       - Statistical information processing         - Basic concepts in interface design       - Technological solutions applied to the final presentation of information.	Architecture and components of an information	<ul> <li>Basic concepts of software architectures</li> </ul>
- Most common technologies         Databases and information storage mechanisms       - Basic concepts of information management         - Metadata for information management       - Information representation models         - Structured information storage media       - Introduction to NoSQL databases         - Introduction to semantic information models       - Introduction to Big Data and its applications         - Statistical information processing       - Statistical information processing	system	- Architecture models
Databases and information storage mechanisms       - Basic concepts of information management         - Metadata for information management       - Information representation models         - Structured information storage media       - Introduction to NoSQL databases         - Introduction to semantic information models         Processing and presentation of information       - Introduction to Big Data and its applications         - Statistical information processing       - Basic concepts in interface design		- Layered architecture models
<ul> <li>Metadata for information management         <ul> <li>Information representation models</li> <li>Structured information storage media</li> <li>Introduction to NoSQL databases</li> <li>Introduction to semantic information models</li> </ul> </li> <li>Processing and presentation of information         <ul> <li>Introduction to Big Data and its applications</li> <li>Statistical information processing</li> <li>Basic concepts in interface design</li> </ul> </li> </ul>		- Most common technologies
- Information representation models         - Structured information storage media         - Introduction to NoSQL databases         - Introduction to semantic information models         Processing and presentation of information         - Introduction to Big Data and its applications         - Statistical information processing         - Basic concepts in interface design	Databases and information storage mechanisms	- Basic concepts of information management
- Structured information storage media         - Introduction to NoSQL databases         - Introduction to semantic information models         Processing and presentation of information         - Introduction to Big Data and its applications         - Statistical information processing         - Basic concepts in interface design		- Metadata for information management
<ul> <li>Introduction to NoSQL databases         <ul> <li>Introduction to semantic information models</li> </ul> </li> <li>Processing and presentation of information         <ul> <li>Introduction to Big Data and its applications</li> <li>Statistical information processing</li> <li>Basic concepts in interface design</li> </ul> </li> </ul>		- Information representation models
<ul> <li>- Introduction to semantic information models</li> <li>- Introduction to Big Data and its applications</li> <li>- Statistical information processing</li> <li>- Basic concepts in interface design</li> </ul>		- Structured information storage media
Processing and presentation of information       - Introduction to Big Data and its applications         - Statistical information processing       - Basic concepts in interface design		<ul> <li>Introduction to NoSQL databases</li> </ul>
- Statistical information processing - Basic concepts in interface design		<ul> <li>Introduction to semantic information models</li> </ul>
- Basic concepts in interface design	Processing and presentation of information	- Introduction to Big Data and its applications
		- Statistical information processing
- Technological solutions applied to the final presentation of information.		- Basic concepts in interface design
		- Technological solutions applied to the final presentation of information.

Distributed information systems	- Distributed systems concepts - P2P models - BlockChain model
Information management	- Introduction and basic concepts - The DMBoK data management model

	Class hours	Hours outside the classroom	Total hours
Discussion Forum	0	3	3
Autonomous problem solving	0	6	6
Previous studies	0	38	38
Lecturing	7	7	14
Presentation	6	0	6
Problem solving	1	1	2
Self-assessment	0	3	3
Essay questions exam	1	0	1
*The information in the planning table is	for guidance only and does no	t take into account the het	erogeneity of the students

Methodologies	
	Description
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated.
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject independently.
Previous studies	Research, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to classes, laboratory practicals and/or assessment tests.
Lecturing	Presentation by a lecturer of the contents of the subject being studied, theoretical bases and/or guidelines for a project or exercise to be carried out by the student.
Presentation	Activity in which problems and/or exercises related to the subject are formulated. The student must develop appropriate and correct solutions by exercising routines, applying formulas or algorithms, applying procedures for transforming the available information and interpreting the results.
Problem solving	Assessment test which includes open questions and/or exercises on a topic. Students must develop, relate, organise and present their knowledge of the subject in a reasoned response. It can be used to assess knowledge and skills.

Methodologi	es Description
Lecturing	Given the blended nature of the course, we will distinguish between two cases: 1. Attention in the distance phase: this will be carried out through the use of telematic means. Students who wish to do so may ask the teacher questions in forums or by e-mail. They will also be able to arrange individual tutorials with the teacher, which will be carried out by videoconference. 2. Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase, face-to-face tutoring mechanisms (individual and/or group) will also be used.
Presentation	Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, face-to-face tutoring mechanisms (individual and/or group) will also be used during this phase

	Description	Qualification	L	aining and earning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be assessed during the online part of the course.	-	48 410	C8 D5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Knowledge, skills and attitudes will be assessed through the presentation. It will take place during the face-to-face phase of the course. It will be based or the work done during the online phase of the course.		46 47 49	B1 C8 D4 B5

Self-assessment	A mechanism in which, by means of a series of questions or activities, it is possible for the student to autonomously evaluate his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. It will take place during the online phase of the course and will include the contents presented in this first part of the course.	35	A8 B1 C8 D5 A10
Essay questions exam	Assessment test which includes open questions and/or exercises on a topic. Students must develop, relate, organise and present their knowledge of the subject in a reasoned response. It will be used to assess knowledge and skills. It will take place during the face-to-face phase of the course and will include all course content.	40	A6 B1 C8 D4 A7

A continuous assessment mechanism will be used, with the aim of monitoring the student's progress throughout the course, assessing their overall effort, and trying to detect as early as possible any difficulties that may arise in the learning process.

It will be necessary to achieve at least the 40% of the grade in order to pass the course in the presentation, self-assessment test and essay questions exam.

In the event that the student does not manage to pass the subject in the ordinary exam, he/she will have the right to a second evaluation opportunity (extraordinary exam). Those students who take the extraordinary exam will have to pass a written exam in which the whole syllabus may be evaluated and in which it will be necessary to achieve at least 50% of the grade in order to pass the subject.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

Sources of information

Basic Bibliography Teaching staff, Slides from class, 2022

Complementary Bibliography

Roger S. Pressman, Ingeniería del Software, 7, McGraw-Hill Interamericana, 2010

Korth, Henry, and Abraham Silberschatz, **Fundamentos de bases de datos**, 6, McGraw-Hill Interamericana de España S.L.;, 2014

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DAMA-DMBOK: Data Management Body of Knowledge: 2nd Edition (Inglés), 2, Technics Publications, 2011

Recommendations

IDENTIFYIN	G DATA			
	the information			
Subject	Security of the			
	information			
Code	P52M182V01106			
Study	Master			
programme	Universitario en			
-	Dirección TIC para			
	la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching	Spanish			
anguage				
Department				
Coordinator	Rodelgo Lacruz, Miguel			
ecturers	Rodelgo Lacruz, Miguel			
-mail	mrodelgo@cud.uvigo.es			
Veb	http://moovi.uvigo.gal			
General	This subject aims to provide students with trainin	g in the fundamental	concepts of info	prmation security: the
description	threats and vulnerabilities posed by new technological	gies, the most comm	on types of con	nputer attacks and ways
	to protect against them, the basic uses and applie			
	permissions management.			
	Classroom lectures will be used for the introduction	on of theoretical conc	epts, which will	be complemented by
	laboratory practices.			
Training an	d Learning Results			
Code				
A6 CB6 - P	ossess and understand knowledge that provides a	basis or opportunity t	o be original in	the development and / o
	ion of ideas, often in a research context.		-	·
	nat students know how to apply the acquired know	ledge and their ability	y to solve proble	ems in new or poorly
	ood environments within broader (or multidisciplin			
48 CB8 - T	nat students are able to integrate knowledge and f	ace the complexity of	formulating jud	dgments based on
	tion that, being incomplete or limited, includes ref			
	ion of their knowledge and judgments.			
	nat students know how to communicate their conc	lusions and the knowl	edge and ultimation	ate reasons that support
	a specialized and unspecialized public in a clear a			
	That students possess the learning skills that allow			that will be largely self-
	d or autonomous.		, , ,	5,7
B1 CG1 - P	ossess advanced and highly specialized knowledge	e and demonstrate a c	detailed and we	ll-founded understandin
	neoretical and practical aspects dealt with in the d			
33 CG3 - D	irect, plan, coordinate, organize and/or supervise t	asks, projects and/or	human groups.	Work cooperatively in
	ciplinary teams acting, where appropriate, as an i			
	e able to make decisions in environments characte			
	alternatives in order to select the one with the mo			
	ted with the decision.		,	
B7 CG7 - A	ssess the importance of security aspects in the ma	nagement of systems	and informatio	on, identifying security
	analyzing possible threats and risks and contributi			
policies				,
	anage information security in regulatory, technical	and methodological	aspects.	
	utonomous learning and work.		•	
	aulto from this subject			
	esults from this subject			Training and
expected res	ults from this subject			Training and
				Learning Results

	Learning Results
LO1 - Relate the terminology and essential concepts, both from a conceptual and technical point of view i	nA6
the field of information security.	A7
	A8
	A9
	A10
	B1
	B6
	B7
	C9
	D5

LO2 - Know the threats and vulnerabilities posed by new technologies, the most common types of computer attacks and ways to protect against them. A8 A9 A10 B1 B3 B6 B7 C9 D5 LO3 - Know the fundamentals, applications and uses of modern cryptography. A6 A7 A8 A9 A10 B1 B3 B6 B7 C9 D5 LO3 - Know the fundamentals, applications and uses of modern cryptography. A6 A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6 A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6 A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6 A9 A10 B1 B3 B1 B3		
A8 A9 A10 B1 B3 B6 B7 C9 D5 LO3 - Know the fundamentals, applications and uses of modern cryptography. A6 A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A7 A8 A9 A10 B1 B3		A6
A9 A10 B1 B3 B6 B7 C9 D5 L03 - Know the fundamentals, applications and uses of modern cryptography. A6 A7 A8 A9 A10 B1 B7 C9 D5 L04 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A6 A9 A10 B1 B7 C9 D5 D5 C9 D5 D5 C9 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5	computer attacks and ways to protect against them.	
A10         B1         B3         B6         B7         C9         D5         L03 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7         A8         A9         A10         B1         B7         C9         D5		A8
LO3 - Know the fundamentals, applications and uses of modern cryptography. LO3 - Know the fundamentals, applications and uses of modern cryptography. LO3 - Know the fundamentals, applications and uses of modern cryptography. A6 A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B1 B1 B1 B1		A9
B3       B6         B7       C9         D5       D5         LO3 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7       A8         A9       A10         B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A9       A10       B1         B1       B3       B1		A10
B6       B7         C9       D5         LO3 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7       A8         A9       A10         B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A9       A10       B1         B7       C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6       A7         A8       A9       A10         B1       B1       B1         B3       B1       B1		B1
LO3 - Know the fundamentals, applications and uses of modern cryptography. LO3 - Know the fundamentals, applications and uses of modern cryptography. A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6 A7 A8 A9 A10 B1 B3		B3
C9       D5         LO3 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7       A8         A9       A10         B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as       A6         well as the management of identities and associated authorizations.       A7         A8       A9         A10       B1         B7       C9         D5       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as       A6         A9       A10         B1       B3		B6
D5         LO3 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7       A8         A9       A10         B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A9       A10       A7         B3       B1       B1		B7
D5         LO3 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7       A8         A9       A10         B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A9       A10       A7         B3       B1       B1		C9
LO3 - Know the fundamentals, applications and uses of modern cryptography.       A6         A7       A8         A9       A10         B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A9       A10       B1         B7       C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6       A6         Well as the management of identities and associated authorizations.       A7         A8       A9       A10         B1       B3       B3		
A7 A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B3	LO3 - Know the fundamentals, applications and uses of modern cryptography.	
A8 A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B3		
A9 A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B3		
A10 B1 B7 C9 D5 LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B3		
B1       B7         C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A8       A9         A10       B1         B3       B3		
B7       C9         D5       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.       A6         A8       A9         A10       B1         B3       B3		
C9       D5         LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as       A6         well as the management of identities and associated authorizations.       A7         A8       A9         A10       B1         B3       B3		
LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as       A6         well as the management of identities and associated authorizations.       A7         A8       A9         A10       B1         B3       B3		
LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as A6 well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B3		
well as the management of identities and associated authorizations. A7 A8 A9 A10 B1 B3	LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as	
A8 A9 A10 B1 B3		
A9 A10 B1 B3		
A10 B1 B3		
B1 B3		
B3		
BD BD		B6
B7		
C9		
D5		

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	- Identity Federation			
Planning				
-	Class hours	Hours outside the classroom	Total hours	
Previous studies	0	25	25	
	<u> </u>			

8	8	16	
6	0	6	
1	0	1	
0	5	5	
2	0	2	
0	20	20	
	8 6 1 0 2 0	8         8           6         0           1         0           0         5           2         0           0         20	8         8         16           6         0         6           1         0         1           0         5         5           2         0         2           0         20         20

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

### Methodologies

	Description
Previous studies	Search, reading, documentation work and / or autonomously performing any other activity that the student considers necessary to enable the acquisition of knowledge and skills related to the subject. It is usually carried out prior to classes, laboratory practices and/or evaluation tests.
Lecturing	Presentation by a teacher of the contents of the subject under study, theoretical basis and / or guidelines for a work or exercise that the student has to develop.
Practices through ICT	Activities of knowledge application in a given context and acquisition of basic and procedural skills in relation to the subject, through the use of ICT.
Seminars	Activity focused on a specific topic, which allows to extend or complement the contents of the subject.
Discussion Forum	Activity developed in a virtual environment in which diverse and current topics related to the academic and/or professional field are discussed.

Personalized assistance			
Methodologies	Description		
Lecturing	It will be carried out through the use of online means. Students who may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with him, which will be carried out by videoconference.		
Practices through ICT	Although it is still possible to use telematic mechanisms for student attention, in this case, face-to- face tutoring mechanisms will also be used.		
Seminars	Although it is still possible to use telematic mechanisms for student attention, in this case, face-to- face tutoring mechanisms will also be used.		

Assessme						
	Description	Qualification	Tra	ainin	g ai	nd
			Lear	ning	Res	sults
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. During the distance phase, three scoreable self-assessment questionnaires (P1, P2, and P3) will be conducted that will cover Block I (topics 1 and 2), II (topics 3 and 4), and III (topics 5, 6 and 7), respectively, and a specific questionnaire on social engineering (SE). At the end of the face-to-face phase, a final exam (FE) will be conducted that covers all the theoretical topics and practical contents of		47	B1 B6 B7	C9	D5
Essay	the subject. An essay or document prepared on a topic that must be written according to established rules of style and length. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. An essay (E) will be carried out that will be evaluated during the distance phase: the E activity covers Block I (topics 1 and 2).		47	B1 B3 B7	C9	D5

### Other comments on the Evaluation

If we denote MED\_CON as the average score of continuous assessment, it is calculated as:

 $MED_CON = 0.1*P1 + 0.1*P2 + 0.1*P3 + 0.05*SE + 0.25*E + 0.4*FE.$ 

To pass the subject, it will be necessary to obtain 50% of the score and at least a 4 out of 10 on the final exam. The continuous assessment grade of students who do not obtain at least a 4 out of 10 on the final exam will be calculated as:  $MED_CON_FINAL = min(4, MED_CON)$ .

In the event that the student fails to pass the course in the ordinary call, he/she will be entitled to a second evaluation opportunity (extraordinary call) to be held in the distance mode on the dates established for this purpose by the Master's Academic Committee. In this case, the evaluation will consist of a single written test that will account for 100% of the grade, being necessary to obtain at least 50% to pass the course.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

### Sources of information

Basic Bibliography

Complementary Bibliography

William, Stallings, **Computer Security: Principles and Practice**, 4<sup>a</sup> Ed., Pearson Education India, 2017 White, Gregory, et al., **CompTIA Security+ all-in-one exam guide**, 5<sup>a</sup> Ed., McGraw-Hill, Inc., 2018 Centro Criptológico Nacional, **CCN-STIC guides**,

### Recommendations

### **Other comments**

It is recommended that students taking this course have a basic knowledge of computer systems and computer networks operation.

IDENTIFYIN	IG DATA			
Security ma	anagement and risk analysis			
Subject	Security			
	management and			
	risk analysis			
Code	P52M182V01107			
Study	Master			
programme	Universitario en			
	Dirección TIC para			
	la defensa			· · · ·
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	<u>1st</u>
Teaching	Spanish			
language				
Department				
Coordinator				
Lecturers	Fernández Gavilanes, Milagros			
	López Román, lago			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es   https://moovi.uvigo.ga			
General	The Security Management and Risk Analysis course air			
description	Security Management Systems (ISMS), describing the			
	certification of an ISMS, and paying special attention to	o risk analysis an	d management	t methodologies, as well
	as security incident response plans.			
Training an	d Learning Results			
Code				
A6 CB6 - P	ossess and understand knowledge that provides a basis	or opportunity t	o be original in	the development and / or
applica	tion of ideas, often in a research context.	,	-	
A7 CB7 - T	hat students know how to apply the acquired knowledge	e and their ability	/ to solve probl	ems in new or poorly
underst	cood environments within broader (or multidisciplinary)	contexts related	to their area of	study.
	hat students are able to integrate knowledge and face t			
	ation that, being incomplete or limited, includes reflection	ns on the social	and ethical res	ponsibilities linked to the
	ation that, being incomplete or limited, includes reflection	ns on the social	and ethical res	ponsibilities linked to the

- application of their knowledge and judgments.
   A9 CB9 That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
- A10 CB10 That students possess the learning skills that allow them to continue studying in a way that will be largely selfdirected or autonomous.
- B1 CG1 Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
- B2 CG2 Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
- B3 CG3 Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
- B6 CG6 Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
- B7 CG7 Assess the importance of security aspects in the management of systems and information, identifying security needs, analyzing possible threats and risks and contributing to the definition and evaluation of security criteria and policies.
- C9 CE9 Manage information security in regulatory, technical and methodological aspects.
- D6 CT6 Properly manage information resources.

### Expected results from this subject

Expected results from this subject

Training and Learning Results

LO1: Understand the concept of Risk Management and assess its importance in ICT Systems.	A6
	A7
	A8
	A9
	A10
	B1
	B2
	B6
	B7
	C9
	D6
LO2: Understand the characteristics of the ISMS certification process.	A9
	A10
	B1
	B7
	C9
	D6
LO3: Study the methodologies and tools available to analyse and manage risks.	A7
	A10
	B1
	B3
	B6
	B3
	C9
	D6
LO4: To be familiar with MINISDEF's information security policy and management and the	A10
recommendations issued by the CCN.	B7
	C9
	D6
LO5: Assess the scope and methodology to be followed in ICT system security audits.	A7
	A8
	A9
	A10
	B2
	B6
	B7
	C9
	D6
LO6: Understand how to carry out proper security incident management.	A7
Loo. onderstand how to carry out proper security includent management.	A8
	A10
	B2
	B6
	B7
	C9
	D6
	00

Topic	
Topic 1: Introduction to Information Security Management.	<ul> <li>The strategic importance of information and digital assets.</li> <li>The information security management process.</li> <li>Definition of security policies, plans, and procedures.</li> <li>Information Security Professionals: competencies, training, and certifications.</li> </ul>
Topic 2: Risk Analysis and Management - The process of risk identification, analysis, and evaluation.	<ul> <li>Review of major vulnerabilities and types of attacks on computer systems.</li> <li>Risk treatment.</li> <li>MAGERIT methodology.</li> <li>The model proposed by ISO 31000.</li> </ul>
Topic 3: Information Security Management System.	<ul> <li>Characteristics of an ISMS (Information Security Management System).</li> <li>Security certifications and standards: ISO 27001 and ENS.</li> <li>Information security policy and management in MINISDEF.</li> <li>STIC regulations of CCN.</li> </ul>
Topic 4: Security Audits and Incident Response.	<ul> <li>The information security audit process.</li> <li>Security incident management.</li> </ul>

Topic 5: The importance of the human factor in information security.

- Aspects to consider regarding the human factor and security.
- Social Engineering techniques.
- Phishing attacks.

- Definition of policies for safe and acceptable use of computer resources.

Planning	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	5	5
Previous studies	0	55	55
Lecturing	16	8	24
Problem solving	2	2	4
Discussion Forum	0	5	5
Self-assessment	0	3	3
Presentation	3	0	3
Essay questions exam	1	0	1
*The information in the planning table is	for guidance only and does no	ot take into account the hete	erogeneity of the students.

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject independently.
Previous studies	Research, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to classes, laboratory practicals and/or assessment tests.
Lecturing	Presentation by a teacher of the contents of the subject under study, theoretical bases and/or guidelines for a project or exercise that the student has to develop.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop appropriate and correct solutions by exercising routines, applying formulas or algorithms, applying procedures for transforming the available information and interpreting the results.
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated.

### Personalized assistance

**Methodologies Description** 

Lecturing	There are two methods of personalised attention: (1) Attention in the distance phase: this will be carried out through the use of telematic means. Students who wish to do so may ask the lecturers questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase face-to-face tutoring mechanisms will also be used.
Droblem colving	There are two methods of personalised attentions (1) Attention in the distance phase, this will be carried

Problem solving There are two methods of personalised attention: (1) Attention in the distance phase: this will be carried out through the use of telematic means. Students who wish to do so may ask the lecturers questions in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will be carried out by videoconference. (2) Attention in the face-to-face phase: although it is still possible to use telematic mechanisms for student attention, during this phase face-to-face tutoring mechanisms will also be used.

Assessment				
	Description	Qualification	Le	ining and earning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the assessment of skills, knowledge and, to a lesser extent, attitudes of the learner. A forum activity (F) will be carried out and assessed during the distance phase: activity F will cover topic 1 of the subject.		A6 A7 A10	C9 D6
Self-assessment	Mechanism in which, by means of a series of questions or activities, the student is able to autonomously assess his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. A questionnaire (AV) covering subjects 1, 2 and 3 will be carried out during the distance learning phase.	30		B1 C9 D6

Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Through the presentation, knowledge, skills and attitudes can be assessed. This presentation work (P) will be assessed during the face-to-face phase and will cover topics 1 and 2.	30	A7 B1 C9 D6 A8 B2 A9 B3 A10 B6 B7
Essay questions exam	Assessment test which includes open questions and/or exercises on a topic. Students must develop, relate, organise and present their knowledge of the subject in a reasoned response. It can be used to assess knowledge and skills. A written test (PE) will be held at the end of the face-to-face phase, in which topics (1-5) of the subject will be assessed.	30	A10 B1 C9 D6

If we call the average continuous assessment mark MED\_CON, which is calculated as:

MED CON = 0.1\*F + 0.3\*AV + 0.3\*P + 0.3\*PE

In order to pass the course, it will be necessary to achieve a grade of 50% or higher in all the evaluations of the course.

In the event that the student does not manage to pass the subject in the ordinary call, he/she will have the right to a second opportunity for assessment (extraordinary call) which will be carried out in distance mode on the dates established for this purpose by the Master's Academic Committee. The assessment process in the extraordinary call will be by means of a final exam.

### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

Sources of information				
Basic Bibliography				
Complementary Bibliography				
Fernández, C. Manuel., Piattini, M., y Peso, E., Auditoría Informática: Un enfoque práctico, 2, Ra-Ma, 2000				
Merino Bada, C. y Cañizares Sales, R., Implantación de un sistema de gestión de seguridad de la información según				
ISO 27001, 1, Fundación Confemetal, 2011				
Talabis, M. y Martin, J., Information Security Risk Assessment Toolkit: Practical Assessments through Data				
Collection and Data Analysis, 1, Syngress, 2012				

Tipton, H. F. and Micki K., Information Security Management Handbook, 5, Auerbach Publications, 2004

### Recommendations

Subjects that are recommended to be taken simultaneously

Information systems/P52M182V01105

Choose	Year	Quadmester
Mandatory	1st	2nd
handatory		2110
nagement has t	wo aspects. The	first focuses on systems
ich are interrelat		
		l introduction and the
or opportunity t	o be original in t	he development and / or
•••••••••••••••••••••••••••••••••••••••	o 20 o 19.10 i	
	to solve proble	ms in new or poorly
e and their ability		
		gments based on
contexts related		onsibilities linked to the
contexts related he complexity of		
contexts related he complexity of	edge and ultima	te reasons that support
contexts related he complexity of ns on the social	-	
contexts related he complexity of ns on the social		hat will be largely self-
contexts related he complexity of ns on the social ns and the knowl nambiguous way		
contexts related he complexity of ns on the social as and the knowl nambiguous way n to continue stu	dying in a way t	new or imprecisely
contexts related he complexity of ns on the social as and the knowl nambiguous way n to continue stu	dying in a way t lve problems in	
contexts related he complexity of ns on the social ambiguous way n to continue stu s the ability to so ted to their field	dying in a way t lve problems in of study.	
contexts related he complexity of ns on the social ambiguous way n to continue stu s the ability to so ted to their field the adequacy of	dying in a way t lve problems in of study. solutions, not c	nly in the exercise of
contexts related he complexity of ns on the social ambiguous way n to continue stu s the ability to so ted to their field	dying in a way t lve problems in of study. solutions, not c	
contexts related he complexity of ns on the social ambiguous way n to continue stu s the ability to so ted to their field the adequacy of	dying in a way t lve problems in of study. solutions, not c ethical and env	ironmental
	to continue stu	

foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.

C4 CE4 - Strategically plan, direct, coordinate and technically and economically manage projects in the field of ICTs and information security, applying the current normative and regulatory framework in the technical-economic-legal fields.

D3 CT3 - Incorporate criteria of sustainability and environmental commitment into professional practice. Acquire skills in the equitable, responsible and efficient use of resources.

- D4 CT4 Oral and written communication skills.
- D5 CT5 Autonomous learning and work.

### Expected results from this subject Expected results from this subject Training and Learning Results LO1: Understand the basic concepts of systems engineering and its structure. Ability to apply them to A6 practical examples and cases. A7 B2 C4 D5 LO2: Basic knowledge of the main processes, activities and documents of project/programme A6 management. C4 LO3: Knowledge of the main standards and methodologies for project management, in particular PMBOK A6 and PRINCE2. Introductory knowledge of AGILE methods and practices. C4

LO4: Basic and introductory knowledge of the most commonly used IT tools in project management.	A6
	C4
	D5
LO5: Theoretical and practical knowledge of the fundamentals of project planning, execution and control.	A6
	A10
	B4
	C4
	D5
LO6: Ability to undertake the planning, programming, monitoring and control of a project in the field of	A7
CIS, ICT and SEGINFO.	A8
	B2
	B4
	C4
	D3
	D4
LO7: Knowledge of the fundamentals of risk management and risk analysis in the framework of a project.	A6
	A8
	B2
	C4
	D5
LO8: Ability to develop actions and make decisions that allow a satisfactory response to project risks.	A7
	A8
	A9
	B2
	B5
	C4
	D4

Γορίς	
Topic 1: Systems Engineering	- Introduction
	- Life Cycle / Models
	- Validation versus Verification
	- Structure / Processes: specification, design, development, testing
	operation
	- Integral Life Cycle. Case Study
Fopic 2: Project Management / Programme	- Introduction
	- Life Cycle Project / Product
	- Concepts, elements and actors of project management
	- Key processes and activities
	- Projects versus Programmes
	- Basic financial concepts
Topic 3: Methodologies and Standards related to	- PMBOK versus PRINCE2
Project Management	<ul> <li>AGILE practices and methodologies. Scrum</li> </ul>
Topic 4: Project planning, monitoring and control	- Key processes of project management
	- Case studies and exercises
opic 5: Project Management Tools	- Classic techniques and tools
	<ul> <li>Computer tools. Introduction to Microsoft Project</li> </ul>
	- Case studies
Fopic 6: Risk Management	- Introduction
	- Plan Risk Management
	- Identify Risks
	- Risk Analysis
	- Plan Risk Responses
	- Implement Risk Responses
	- Monitor Risks
	- Exercises and case studies

Planning			
	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	12	12
Previous studies	0	44	44
Lecturing	8	8	16
Problem solving	2	2	4
Practices through ICT	6	0	6
Presentation	3	0	3

Seminars	2	0	2	
Discussion Forum	0	4	4	
Self-assessment	0	4	4	
Objective questions exam	1	0	1	
Essay	0	4	4	
The information in the planning table i		a wak kales laka a sase wak		ماميمام

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

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject in an autonomous way.
Previous studies	Research, reading, documentation work and/or autonomously carrying out any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to the classes, laboratory practices and/or assessment tests.
Lecturing	Lecturer's presentation of the contents of the subject being studied, theoretical bases and/or guidelines for a project or exercise to be carried out by the student.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the appropriate and correct solutions through the exercise of routines, application of formulas or algorithms, application of transformation procedures of the available information and interpretation of the results.
Practices through ICT	Activities for applying knowledge in a given context and acquiring basic and procedural skills in relation to the subject, through the use of ICT.
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated.

Methodologies	Description
Discussion Forum	It will be carried out through the use of telematics systems. Students who wish to do so will be able to ask questions to the teacher in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will take place via videoconference.
Autonomous problem solving	It will be carried out through the use of telematics systems. Students who wish to do so will be able to ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the teacher, which will take place via videoconference.
Lecturing	It will be carried out through the use of telematics systems. Students who wish to do so will be able to ask questions to the teacher in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer, which will take place via videoconference. While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.
Problem solving	It will be carried out through the use of telematics systems. Students who wish to do so will be able to ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the teacher, which will take place via videoconference. While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.
Practices through ICT	While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.
Presentation	While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.
Seminars	While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.

### Assessment

Description

Qualification Training and Learning Results

Practices through ICT	Activities involving the application of knowledge in a given context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT. They make it possible to assess the student's knowledge and skills. There will be three deliverable activities (AE1, AE2 and AE3) that will be assessed during the distance phase: AE1 and AE2 will cover topics 2, 3, 4 and 5 while AE3 will cover topic 6 of the subject.	20	A6 A7	B2 C B4	4 D3 D5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc. A presentation (P) will be given and assessed during the face-to-face phase: activity P will cover topics 1, 2 and 4 of the subject. Knowledge, skills and attitudes can be assessed by means the presentation.	20	A9 A10	B4 C	4 D4 D5
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It assesses the skills, knowledge and, to a lesser extent, attitudes of the student. A discussion or debate activity (D) will be carried out in a virtual environment and will be assessed during the distance phase: activity D will cover topic 1 of the subject.	10	A8	B5 C	4 D5
Objective questions exa	Test that assesses knowledge and includes closed questions with different manswer alternatives (true or false, multiple choice, item matching, etc.). There will be a written test (PE) at the end of the face-to-face phase, in which all the topics and contents of the subject will be evaluated (including the contents of the distance and face-to-face phases).	40	A6	B2 C	4 D4 D5
Essay	A text or document on a topic which must be written according to established rules of style and length. It allows the assessment of the student's skills, knowledge and, to a lesser extent, attitudes. A report (T) will be produced and assessed during the distance learning phase:	10		B4 C	4 D4 D5
	-				

If we call the average mark for continuous assessment MED\_CON, which is calculated as follows:

MED\_CON = 0.2\* (AE1 + AE2+ AE3)/3 + 0.1\* D + 0.1\*T + 0.2\*P + 0.4\*PE

It will be necessary to obtain at least 50% of the grade to pass the subject. If the subject is not passed in the ordinary call, there will be a second opportunity to pass it in the extraordinary call, which will be held in distance mode on the dates established for this purpose by the Master's Academic Committee.

The evaluation process in this second call would be carried out by means of a single written test for 100% of the grade, being necessary to obtain at least 50% of the grade to pass the subject.

### **ACADEMIC INTEGRITY:**

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

### Sources of information

Basic Bibliography

Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK GUIDE) and the Standard for Project Management, 7<sup>a</sup> Edición, Project Management Institute, 2021

### Complementary Bibliography

Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide), 5ª Edición, Project Management Institute, 2013

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Pressman, Roger, Ingeniería del Software. Un enfoque práctico, 10ª Edición, McGraw Hill, 2010 INCOSE Systems Engineering Handbook, A guide for system life cycle processes and activities, 4ª Edición, INCOSE-International Council on Systems Engineerin, 2015 Reifer, Donald J., **Software War Stories: Case Studies in Software Management**, 1ª Edición, Wiley, 2013 Buchtik, Liliana, **Secretos para dominar la gestión de riesgos en proyectos**, 1ª Edición, Buchtikglobal, 2012

Haimes, Yacov Y., Risk modeling, assessment, and management, 4ª Edición, Wiley, 2015

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Highsmith, Jim, **Agile project management: creating innovative products**, 1<sup>ª</sup> Edición, Pearson Education, 2009 Sutherland, J., K. Schwaber, **The Scrum Guide: the definitive guide to Scrum**, Ken Schwaber and Jeff Sutherland, 2017

Recommendations

IDENTIFYIN	IDENTIFYING DATA				
Deseño de	arquitecturas TIC				
Subject	Deseño de				
	arquitecturas TIC				
Code	P52M182V01202				
Study	Master				
programme	Universitario en				
	Dirección TIC para				
	a defensa				
Descriptors	ECTS Credits	Choose	Year	Quadmester	
	3	Mandatory	1	2c	
Teaching	Castelán				
language					
Department					
Coordinator	Rodríguez Martínez, Francisco Javier				
Lecturers	Otero Cerdeira, Lorena				
	Rodríguez Martínez, Francisco Javier				
E-mail	franjrm@uvigo.es				
Web	http://campus.defensa.gob.es   https://moovi.uvigo.	gal			
General	A arquitectura é a estrutura fundamental sobre a qu	ue se asintan os sis	temas software	. A arquitectura dun	
description	sistema software está formada polos seus elemento				
	relacións que existen entre eles.				
	Dentro das arquitecturas software empresariais des				
orientadas a servizos (SOA), os servizos web ou a xestión de procesos de negocio BPM (Business Procce					
	Management), como solución aos problemas de integración en sistemas cada vez máis heteroxéneos e de				
	carácter distribuído.				

Nesta materia estudaranse devanditos conceptos e a súa aplicación en contornas empresariais sendo o alumno capaz de tomar decisións estratéxicas que integren os mesmos.

# Resultados de Formación e Aprendizaxe

Cod	2
A6	CB6 - Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser orixinais no desenvolvemento
	e/ou aplicación de ideas, a miúdo nun contexto de investigación.
A7	CB7 - Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en
	contornas novas ou pouco coñecidas dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa
	área de estudo.
A8	CB8 - Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a
	partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e
	éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A9	CB9 - Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a
	públicos especializados e non especializados dun modo claro e sen ambigüidades.
A10	CB10 - Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que
	haberá de ser en gran medida autodirixido ou autónomo.
B1	CG1 - Posuír coñecementos avanzados e altamente especializados e demostrar unha comprensión detallada e
	fundamentada dos aspectos teóricos e prácticos tratados nas diferentes áreas de estudo.
B2	CG2 - Integrar e aplicar os coñecementos adquiridos, e posuír capacidade de resolución de problemas en contornas
	novas ou definidas de forma imprecisa, incluíndo contextos de carácter multidisciplinar relacionados co seu ámbito de
	estudo.
B5	CG5 - Avaliar de maneira crítica a estrutura e validez dos razoamentos, analizando, interpretando e cuestionando os
	fundamentos de ideas, accións e xuízos propios ou alleos, antes de aceptalos como válidos.
B6	CG6 - Ser capaz de tomar decisións en contornas caracterizadas pola complexidade e incerteza, avaliando as distintas
	alternativas existentes co obxectivo de seleccionar aquela cuxo resultado esperado sexa máis favorable, xestionando adecuadamente o risco asociado á decisión.
CS	CE5 - Definir e implantar modelos normalizados, establecemento de estándares e metodoloxías de referencia e taxonomía de servizos TIC e de seguridade da información.
C6	CE6 - Planificar e xestionar infraestruturas TIC.
	CT5 - Aprendizaxe e traballo autónomos.
D6	CT6 - Manexar apropiadamente recursos de información.
Res	ultados previstos na materia

Expected results from this subject

Training and Learning Results

RA1. Coñecer as arquitecturas software, a súa tipoloxía, paradigmas, a súa estrutura e características	A6
básicas.	A7
	A8
	A9
	A10
	B1
	B2
	B5
	B6
	C5
	C6
	D5
	D6
RA2. Entender en profundidade o deseño arquitectónico de aplicacións baseadas en servizos e	A6
desenvolvemento de solucións tecnolóxicas orientadas á integración de servizos.	A7
	A8
	A9
	A10
	B1
	B2
	B5
	B5 B6
	C6
	D5
RA3. Concibir, despregar, organizar e xestionar servizos en contextos empresariais ou institucionais para	
mellorar os seus procesos de negocio.	A7
	A8
	A9
	A10
	B2
	B5
	B6
	C6
	D5
RA4. Valorar a importancia para a organización dunha adecuada arquitectura tecnolóxica baseada en	A6
	A0 A7
servizos.	
	A8
	A9
	A10
	B2
	B5
	C6
	D5
RA5. Manexar os estándares de Servizos Web e as tecnoloxías asociadas.	A6
	A7
	A8
	A9
	A10
	C5
	D5
	D6

Contidos			
Торіс			
Tema 1. Conceptos de arquitectura.	1.1 Arquitectura de sistemas vs Arquitecturas de software		
	1.2 Ferramentas de deseño e representación		
	1.3 Tecnoloxías base.		
Tema 2: Introdución á Arquitectura Orientada a	2.1 Arquitectura Orientada a Servizos		
Servizos	2.2 Modelos de servizos		
	2.3 Integración de aplicacións. ESB (Enterprise Service Bus) como		
	backbone de integración.		
	2.4 Enxeñaría do Software Orientado a Servizos		
Tema 3: Servizos Web	3.1 Introdución aos Servizos Web		
	3.2 Definición de servizos.		
	3.3 Formato de representación, mensaxes e protocolos de mensaxería.		
	3.4 Seguridade de Servizos Web		

Tema 4: BPM Xestión de procesos de negocio	<ul> <li>4.1 BPM: Características e antecedentes.</li> <li>4.2 Implantación e implicacións na organización.</li> <li>4.3 Ferramentas de soporte.</li> <li>4.4 Modelización de procesos de negocio.</li> </ul>
Tema 5: Arquitecturas na nube	<ul><li>5.1 Introdución ás arquitecturas na nube</li><li>5.2 Interconexión de servizos</li><li>5.3 Arquitecturas de microservizos</li></ul>

# Planificación

	Class hours	Hours outside the classroom	Total hours
Foros de discusión	0	3	3
Resolución de problemas de forma autónoma	0	6	6
Resolución de problemas	2	2	4
Prácticas de laboratorio	4	0	4
Seminario	2	0	2
Estudo previo	0	39	39
Lección maxistral	6	6	12
Autoavaliación	0	2	2
Presentación	2	0	2
Exame de preguntas obxectivas	1	0	1
*The information in the planning table is for guid	ance only and does no	ot take into account the het	erogeneity of the students

Metodoloxía docente	
	Description
Foros de discusión	Control do avance da aprendizaxe, realizando achegas fundamentadas nos espazos da materia. Recomendacións para lograr os obxectivos da materia a nivel individual. Apoio e axuda na resolución das tarefas propostas.
Resolución de problemas de forma autónoma	Realización de actividades puntuais de carácter non presencial na aula virtual. Periodicamente durante o curso exporanse tarefas, resolución de exercicios, preguntas e tests autoavaliables na aula virtual que deben ser realizadas polos estudantes de forma individual, autónomo e non presencial, sempre cunha data límite.
Resolución de problemas	Actividade na que se formulan problemas e/ou exercicios relacionados coa materia. O alumnado debe desenvolver as solucións adecuadas mediante a aplicación dos contidos tratados. Utilízase como complemento da lección maxistral e dos traballos de aula.
Prácticas de laboratorio	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e procedimentais relacionadas coa materia obxecto de estudo.
Seminario	Apoio, atención e resolución de dúbidas e/ou cuestións do alumnado.
Estudo previo	Procura, lectura, traballo de documentación e/ou realización de forma autónoma de calquera outra actividade que o alumno/a considere necesaria para permitirlle a adquisición de coñecementos e habilidades relacionadas coa materia. Adóitase levar a cabo con anterioridade ás clases, prácticas de laboratorio e/ou probas de avaliación.
Lección maxistral	Presencial: presentación, mediante medios audiovisuais, dos contidos teóricos de cada tema. Este método combinarase con exemplos ilustrativos e coa realización de preguntas para motivar e incrementar o interese do alumno. Non presencial: revisión, comprensión e afianzamento dos contidos.

Atención personal	Atención personalizada			
Methodologies	Description			
Lección maxistral	<ol> <li>Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia.</li> <li>Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).</li> </ol>			
Foros de discusión	<ol> <li>Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia.</li> <li>Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).</li> </ol>			

Resolución de problemas	<ol> <li>Atención na fase a distancia: levará a cabo mediante o uso de medios f que o desexen poderán expor dúbidas ao profesorado en foros ou mediar Tamén poderán concertar titorías individuais co profesor, que se desenvo videoconferencia.</li> <li>Atención na fase presencial: aínda que segue sendo mecanismos telemáticos de atención ao alumno, durante esta fase empre mecanismos de titoría presencial (individual e/ou grupal).</li> </ol>	ite correo e lverán mec posible o u	electrói liante so de		S
Prácticas de laboratorio	<ol> <li>Atención na fase a distancia: levará a cabo mediante o uso de medios a que o desexen poderán expor dúbidas ao profesorado en foros ou mediar Tamén poderán concertar titorías individuais co profesor, que se desenvo videoconferencia. 2. Atención na fase presencial: aínda que segue sendo mecanismos telemáticos de atención ao alumno, durante esta fase empre mecanismos de titoría presencial (individual e/ou grupal).</li> </ol>	ite correo e lverán mec posible o u	electrói liante so de		S
Seminario	<ol> <li>Atención na fase a distancia: levará a cabo mediante o uso de medios o que o desexen poderán expor dúbidas ao profesorado en foros ou mediar Tamén poderán concertar titorías individuais co profesor, que se desenvo videoconferencia.</li> <li>Atención na fase presencial: aínda que segue sendo mecanismos telemáticos de atención ao alumno, durante esta fase empre mecanismos de titoría presencial (individual e/ou grupal).</li> </ol>	ite correo e lverán mec posible o u	electrói liante so de		S
Avaliación					
	Description	Qualificati		aining Learni Resul	ng
Foros de discusio	ón Participación con achegas orixinais e fundamentadas nos foros da materia. Se realizarán 2 actividades de discusión o debate (D1 e D2) nun entorno virtual que será evaluada durante a fase a distancia: estas actividades abarcarán os temas 1 (D1) e 2 (D2) da asignatura.	10	A6 A7 A8 A9 A10	B2 C B5 B6	
Autoavaliación	Tarefas, resolución de exercicios, preguntas e tests autoavaliables na aula virtual que deben ser realizadas polos estudantes de forma individual, autónomo e non presencial, sempre cunha data límite. Realizaránse 4 actividades entregables (AE1, AE2, AE3 e AE4) que serán avaliadas durante a fase a distancia: cada actividade abarcará un tema correspondente da materia.	30	A6 A7 A8 A9		26 D5 D6
Presentación	Inclúe a preparación dun tema e a súa exposición oral (sempre que o tempo en presencial o permita). Será unha única actividade e abarcará toda a materia vista en clase. Realizarase un traballo TP co seu correspondente defensa e presentación. (en presencial e dependente do tempo dispoñible)	20	A6 A7 A8 A9 A10	B2 B5	26 D5 D6
Exame de preguntas obxectivas	Preguntas directas que o alumnado debe responder de maneira breve en base aos coñecementos que ten sobre a materia. Realizarase unha proba escrita (PE) o final da fase presencial, na que se avaliarán todolos temas e contidos da materia (incluindo os contidos da fase a distancia e da fase presencial).	40	A6 A7 A8 A9 A10	B1 C B2 C B5	25 D5 26 D6

Utilizarase un mecanismo de avaliación continua, co que se pretende realizar un seguimento da evolución do alumno ao longo do curso, valorando o seu esforzo de maneira global, non puntual, e tentando detectar canto antes dificultades que poidan xurdir no proceso de aprendizaxe.

A táboa a continuación especifica as distintas actividades que levarán a cabo para avaliar o traballo do alumno na materia, así como a ponderación que ditas actividades van ter á hora de calcular a nota final do curso e as competencias relacionadas con cada proba ou actividade. Será necesario obter polo menos o 50% da cualificación para superar a materia.

Si denominamos MED\_CON a nota media da avaliación continua, a cal calculase como:MED\_CON = 0,1\*(D1+D2)/2+0.2\* (AE1 + AE2 + AE3 + AE4)/4 + 0.2\* TP + 0.4\*PE

#### Segunda oportunidade

No caso de que o alumno non consiga aprobar a materia na convocatoria ordinaria, terá dereito a unha segunda oportunidade de avaliación (convocatoria extraordinaria) nas datas establecidas para ese efecto pola Comisión Académica de Máster. A avaliación da convocatoria extraordinaria realizarase en modalidade a distancia, tal e como indica a seguinte táboa:

Sistemas de evaluación	

Denominación	Calificación (%)	Competencias
Actividades de autoavaliación (test)	40%	CB6, CB7, CB8, CB9, CG1, CG2 CG5, CE6, CT5, CT6
Proba escrita	60%	CB6, CB7, CB8, CB9, CG1, CG2 CG5, CE6, CT5, CT6

## **COMPROMISO ÉTICO:**

Espérase que o alumnado teña un comportamento ético axeitado, comprometéndose a actuar con honestidade. En base ao artigo 42.1 do Regulamento sobre a avaliación, a calificación e a calidade da docencia e do proceso de aprendizaxe do estudiantado da Universidade de Vigo, o emprego de procedementos fraudulentos nas probas de avaliación, así como a cooperación neles implicará a calificación de cero (suspenso) na acta da convocatoria correspondente, con independencia do valor que sobre a calificación global tivese a proba en cuestión e sen perxuicio das posibles consecuencias de índole disciplinaria que puidesen producirse .

No caso de que exista algunha diferencia entre as guías en galego/español relacionada coa avaliación prevalecerá sempre o indicado na guía docente en español.

Bibliografía. Fontes de información Basic Bibliography Jos Dirksen, SOA Governance in Action: REST and WS-\* Architectures, 1º Edición, Manning Publications, 2012

Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju, Web Services: Concepts, Architectures and Applications (Data-Centric Systems and Applications), Springer, 2010

Manouvrier, Bernard; Menard, Laurent, Application Integration: EAI B2B BPM and SOA (ISTE), Wiley-ISTE, 2008 Complementary Bibliography

Robert C. Martin, Clean Architecture: A Craftsman's Guide to Software Structure and Design, Prentice Hall, 2017 Michael J. Kavis, Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS), Wiley, 2014

#### Recomendacións

Planning and management of ICT infrastructures Subject Planning and management of ICT infrastructures Code P52M182V01203 Study Master programe Universitario en Dirección TIC para la defensa Descriptors ECTS Credits Choose Year Ouadme Teaching Spanish language Department Coordinator Fernández Gavilanes, Milagros Lecturers Fernández Gavilanes, Milagros Lectures Konvelede of preix to subsets students to learn the knowledge and application of the processes required to mar description ICT Infrastructure aligned with business requirements. Define the processes interfaces and dependen associated with the ICT infrastructure management Will be acquired to complement knowledge of sys network integration, support and maintenance. Knowledge of project organisation and management will be acquired to complement knowledge of sys network integration, storage systems, paraliel architectures and basic IT installation environments. In this subject, these concepts and their application in business environments will be studied and the will be able to make strategic decisions that integrate them. Training and Learning Results Code AG CG6 AG - Possess and understand knowledge that provides a basis or opportunity to be orginal in the developmen application of tiles, often a research context. AT CG7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or p understood environments within broader (or multidiscipinary contexts readet to their ace of study. AG CG9- That students know how to apply the acquired knowledge and	IDENTIFYIN				
management of ICT infrastructures         Code       PS2M182V01203         Study       Master         programme       Universitario en Discrción TC para la defensa         Descriptors       ECTS Credits       Choose       Year       Quadme         Teaching       Spanish       Ianguage       Descriptors       ECTS Credits       Choose       Year       Quadme         Department       Coordinator       Fernández Gavilanes, Milagros       Ecturers       Fernández Gavilanes, Milagros         Lecturers       Fernández Gavilanes, Milagros       Ecturers       Fernández Gavilanes, Milagros         Centro       Suarez Lorenzo, Fernando       Ecturers       Fernández Gavilanes, Milagros         Centro       Infrastructure aligned with business requirements Define the processes interfaces and dependen associated with the ICT infrastructure management will be acquired to complement knowledge of sy: network integration, storage systems, parallel architecycle, including strategic parallel and the will be able to make strategic decisions that integrate them. <tr< th=""><th></th><th></th><th></th><th></th><th></th></tr<>					
ICT infrastructures         Study       Master         programme       Universitario en Dirección TIC para la defensa         Descriptors       ECTS Credits       Choose       Year       Quadme         4       Mandatory       1st       2nd         Teaching       Spanish       Mandatory       1st       2nd         Earding       Spanish       Mandatory       1st       2nd         Ectrorers       Fernández Gavilanes, Milagros       Coordinator       Fernández Gavilanes, Milagros         Cordinator       Fernández Gavilanes, Milagros       Starzez Lorenzo, Fernando       Email       Migavilanes@cuvilagros         Cortinitator       Fernández Gavilanes, Milagros       Starzez Lorenzo, Fernando       Email       Migavilanes@cuvilagros         General       This course enables students to learn the knowledge and application of the processes required to mar description       It infrastructure aligned with business requirements. Define the processes, interfaces and dependen associated with the ICT Infrastructure management lifecycle, including strategic planning, design, implementation, operations, support and malintenance.         Knowledge of project organisation and management will be acquired to complement knowledge of sys network integration, storage systems, parallel architectures and basic IT installation environments.         In this subject, these concepts and their application in business requirements will be	Subject				
Code         PS2M182V01203           Study         Master           programme         Universitario en Dirección TIC para la defensa         Pectros           Descriptors         ECTS Credits         Choose         Year         Quadme           4         Mandatory         1st         Znd           Teaching         Spanish         Ianguage         Department           Coordinator         Fernández Gavilanes, Milagros         Ecturers         Fernández Gavilanes, Milagros           Ecturers         Fernández Gavilanes, Milagros         Ecturers         Fernández Gavilanes, Milagros           Ecturers         Fernández Gavilanes, Milagros         Ecturers         Fernández Gavilanes, Milagros           Ederrial         Infigurianes@cud.uvigo.es         Mandatory         1st         Znd           Enail         migurianes@cud.uvigo.es         Reveration of the processes required to mar         Master           Messociated with He ICT Infrastructure anagneement lifecycle, including strategic planning, design, implementation, operations, support and maintenance.         Knowledge of project organisation and management will be acquired to complement knowledge of sy: network integration, storage systems, parallel architectures and basic IT installation environments.           In this subject, these concepts and their application in business environments will be studied and the will be able to make strategic decisions					
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Direction TIC para           Ia defensa           Descriptors         ECTS Credits         Choose         Year         Quadme           4         Mandatory         1st         2nd           Teaching         Spanish         Imaguage         Imaguage         Imaguage         Imaguage         Imaguage         Imaguage         Imaguage         Imaguage         Imaguage         Imagualmes, Milagros         Imagualmes, Milagros         Imagualmes, Milagros         Imagualmes, Caludoyo, es         Imagualmes, Caludoyo, es         Imagualmes, Milagros         Imagu					
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Descriptors         ECTS Credits         Choose         Year         Quadme           4         Mandatory         1st         2nd           Teaching         Spanish         Inst.         2nd           Department         Coordinator         Fernández Gavilanes, Milagros         Suarez Lorenzo, Fernández           Eventari         Infgavilanes, Qiudavigo, es         Web         http://campus.clefensa.gob.es [ https://movil.uvigo.gal           General         This course enables students to learn the knowledge and application of the processes required to mar associated with the ICT infrastructure management lifecycle, including strategic planning, design, implementation, operations, support and maintenance.           Knowledge of project organisation and management will be acquired to complement knowledge of systext, network integration, storage systems, parallel architectures and basic IT installation environments.           In this subject, these concepts and their application in business environments will be studied and the will be able to make strategic decisions that integrate them.           Training and Learning Results         Code           A6         CB6 - Fossess and understand knowledge that provides a basis or opportunity to be original in the development application of ideas, often in a research context.           A7         CB7 - That students know how to appit the acquired knowledge and their ability to solve problems in new or punderstood environments within brace decisions in thene concolasin and the knowledge and judgments.					
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Training and Learning Results

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LO6: To learn about real examples of large ICT infrastructures in companies and/or administrations. A7 A9 A10 B1 B2 B3 B6 C6 D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B6 C6 D3 D4 C6 D3 D4		
LO6: To learn about real examples of large ICT infrastructures in companies and/or administrations.          A7         A9         A10         B1         B2         B3         B6         C6         D3         D4		
D4         LO6: To learn about real examples of large ICT infrastructures in companies and/or administrations.       A7         A9       A10         B1       B2         B3       B6         C6       D3         D4       D4         LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware       A6         A8       B1         B2       B3         B3       B6         C6       D3         D4       D4		
LO6: To learn about real examples of large ICT infrastructures in companies and/or administrations. A7 A9 A10 B1 B2 B3 B6 C6 D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B3 B6 C6 D3 D4 D4 D4 D4 D4 D3 D4 D4 D4 D4 D4 D3 D4 D4 D3 D4 D4 D3 D4 D4 D3 D4 D3 D3 D3 D3 D3 D3 D3 D3 D3 D3 D3 D3 D3		
A9 A10 B1 B2 B3 B6 C6 D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A6 A8 B1 B2 B3 B1 B2 B3 B1 B2 B3 B3 B6 C6 D3 D4	LO6: To learn about real examples of large ICT infrastructures in companies and/or administrations.	A7
LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A6 A8 B1 B2 B3 B6 C6 D3 D4 A8 B1 B2 B3 B3 B6 C6 D3 D3		A9
B2 B3 B6 C6 D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B3 B6 C6 D3 D4		
B3 B6 C6 D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B3 B6 C6 D3 D3		
B6       C6         D3       D4         L07: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware       A6         A8       B1         B2       B3         B3       B6         C6       D3         D3       D4		
C6 D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B6 C6 D3		B6
D3 D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B3 B6 C6 D3		
D4 LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware A8 B1 B2 B3 B3 B6 C6 D3		
A8 B1 B2 B3 B6 C6 D3		D4
B1 B2 B3 B6 C6 D3	LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware	
B2 B3 B6 C6 D3		
B3 B6 C6 D3		
B6 C6 D3		
C6 D3		
D3		
D4		D4

# Contents

Торіс	
Topic 1: Introduction to large ICT infrastructures.	1.1. Introduction to Data Centers.
	1.2. Usual structure
	1.3. Data Centers Administration
Topic 2: Infrastructure planning.	2.1. Elements and physical organization of a CPD.
	2.2. Design requirements and regulations.
	2.3. Elements and devices for network management.
Topic 3: Communications infrastructure.	3.1. Communications networks: topologies, protocols, connection
	elements.
	3.2. Network security: VPN and Firewalling.
Topic 4: Management and Planning of Virtualized	4.1. High availability: load balancing, distributed computing and clustering
Resources.	4.2. Virtualization.
Topic 5: Cloud Computing.	5.1. Introduction to Cloud Computing.
	5.2. Tools.
	5.3. OpenStack and vCloud.
Topic 6: Storage systems.	6.1. Storage networks: topologies, protocols, connection elements.
	6.2. Storage systems: architectures and components.
	6.3. Backups.
Topic 7: Infrastructure management, monitoring	7.1. CPD monitoring.
and control	7.2. Evaluation and performance measures.
	7.3. Asset management.

Planning	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	8	8
Previous studies	0	53	53
Lecturing	8	8	16
Problem solving	2	2	4
Studies excursion	4	0	4
Seminars	3	0	3
Discussion Forum	0	4	4
Self-assessment	0	3	3
Presentation	3	0	3
Objective questions exam	2	0	2
*The information in the planning table is	s for guidance only and does no	t take into account the het	erogeneity of the student

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject in an autonomous way.
Previous studies	Research, reading, documentation work and/or autonomously carrying out any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to the classes, laboratory practices and/or assessment tests.
Lecturing	Lecturer's presentation of the contents of the subject being studied, theoretical bases and/or guidelines for a project or exercise to be carried out by the student.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student mus develop the appropriate and correct solutions through the exercise of routines, application of formulas or algorithms, application of transformation procedures of the available information and interpretation of the results.
Studies excursion	Activities involving the application of knowledge in a specific context in an external space (research centre, laboratory, museum, institution, company, etc.) of academic-professional interest to students.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated.

# Personalized assistance Methodologies Description

Lecturing	It will be carried out through the use of telematics systems. Students who wis ask questions to the teacher in forums or by e-mail. They will also be able to with the lecturer, which will take place via videoconference. While the use of is still possible, face-to-face tutoring mechanisms will also be used during this	arrange indi telematics s	vidua	al tutorials
Problem solving	It will be carried out through the use of telematics systems. Students who wis ask questions to the lecturer in forums or by e-mail. They will also be able to with the teacher, which will take place via videoconference. While the use of is still possible, face-to-face tutoring mechanisms will also be used during this	arrange indi telematics s	vidua	al tutorials
Studies excursion	It will be carried out through the use of telematics systems. Students who wis ask questions to the lecturer in forums or by e-mail. They will also be able to with the teacher, which will take place via videoconference. While the use of is still possible, face-to-face tutoring mechanisms will also be used during this	arrange indi telematics s	vidua	al tutorials
Seminars	It will be carried out through the use of telematics systems. Students who wis ask questions to the lecturer in forums or by e-mail. They will also be able to with the teacher, which will take place via videoconference. While the use of is still possible, face-to-face tutoring mechanisms will also be used during this	arrange indi telematics s	vidua	al tutorials
Assessment				
	Description	Qualificatio		aining and Learning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be assessed. This discussior forum activity (F) will be carried out during the distance phase.	20	A6 A7 A8 A10	
Self-assessment	A mechanism in which, by means of a series of questions or activities, the student is able to autonomously assess his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. This self-assessment activity (SA) will be carried out during the distance learning phase.	20	_A7	B1 C6 D3
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Through the presentation, knowledge, skills and attitudes can be assessed. This presentation activity (P) will be carried out during the face-to-face phase.	30	A6 A7 A8 A9	B1 C6 D4 B2 B3 B6
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. This developmental questions (E) examination activity will be carried out during	30	A6 A7 A8 A9	B1 C6 D3 B2 D4 B3 B6

If we call the average continuous assessment mark MED CON, which is calculated as:

MED CON = 0.2\*F + 0.2\*AV+ 0.3\*P + 0.3\*ED

It will be necessary to achieve 50% of the grade in order to pass the course.

the face-to-face phase.

In the event that the student does not manage to pass the subject in the ordinary call, he/she will have the right to a second opportunity for assessment (extraordinary call) which will be carried out in distance mode on the dates established for this purpose by the Master's Academic Committee. In the case of the evaluation in the extraordinary call, the weight will be divided 50/50 between the written test and the presentation of the final work of the subject. It will be necessary to achieve at least 50% of the grade in order to pass the course.

## ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo, any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the event that there is any difference between the guides in Galician/Spanish/English related to the evaluation, what is

Sources of information

Basic Bibliography

Stephen R Smoot, Nam K Tan, **Private Cloud Computing: Consolidation, Virtualization, and Service-Oriented** Infrastructure, 1, Morgan Kaufmann, 2011

Maurizio Portolani, Data Center Fundamentals, CiscoPress, 2003

**Complementary Bibliography** 

Christopher Poelker, Alex Nikitin, **Storage Area Networks for Dummies**, 2, John Wiley & Sons Inc, 2008 Josep Ros, **Virtualización Corporativa con VMware**, 2011

J. María González, **Descubre y domina Vmware Vsphere**, Lexington, 2011

#### Recommendations

#### **Other comments**

A visit to a Data Processing Centre would be desirable in order to visualise the knowledge acquired throughout the course.

IDENTIFYIN	IG DATA			
Satellite co	mmunication systems, positioning, rem	ote sensing and radiona	avigation	
Subject	Satellite	<u> </u>	-	
-	communication			
	systems,			
	positioning, remote			
	sensing and			
	radionavigation			
Code	P52M182V01204			
Study	Master			
programme	Universitario en			
	Dirección TIC para			
	la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching	Spanish			
language				
Department				
Coordinator	Nocelo López, Rubén			
Lecturers	Nocelo López, Rubén			
	Núñez Ortuño, José María			
E-mail	rubennocelo@cud.uvigo.es			
Web	http://campus.defensa.gob.es   https://moov	vi.uvigo.gal		
General	The course of Satellite Communications Sys	tems, Positioning, Remote	Sensing and Rad	dionavigation aims to
description	provide students with an overview of the ma	ain satellite communicatio	ns systems. Radi	ionavigation Systems
	aims to provide students with an overview of			
	communication and remote positioning syst			
	safety aspects of this type of systems. regul	atory and safety aspects of	of this type of sys	stems.
Training an	d Learning Results			
Code				

A6 CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

A7 CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.

A8 CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.

A9 CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.

A10 CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely selfdirected or autonomous.

B1 CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.

B2 CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.

B5 CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.

C12 CISTT1 - Deepen the knowledge of telecommunications systems based on different technologies applicable to the tactical, operational and strategic fields; to fixed and mobile environments; with different types and volumes of data.

C13 CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.

D4 CT4 - Oral and written communication skills.

D5 CT5 - Autonomous learning and work.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
LO1: Understand the mechanisms of satellite propagation and communications.	A6
	A7
	B1
	B2
	C12
	C13
	D4
	D5

LO2: To know the basic operation of the different radionavigation systems existing today.	A8
2021 To know the basic operation of the american rationary gation systems existing today.	B1
	B2
	B5
	C12
	D4
	D5
LO3: To know the basic operation of the different positioning systems currently existing.	A9
	B1
	B2
	C12
	D4
	D5
LO4: To know the basic operation of the different remote sensing systems.	A10
	B1
	B2
	C12
	D4
	D5
LO5: To know the different existing systems in the military field, as well as their most remarkable	A9
characteristics their most outstanding characteristics.	A10
	B1
	B2
	B5
	C12
	C13
	D4
	D5

Contents	
Торіс	
Subject 1: Satellite communications	- Historical evolution and generalities
	<ul> <li>Structure of a satellite communication system</li> </ul>
	- Coverage
	- Access methods
	- Link budget
	- SECOMSAT
	<ul> <li>Other systems: IRIDIUM, THURAYA, INMARSAT, GLOBALSTAR</li> </ul>
Subject 2: Positioning systems	- Global positioning systems (GNSS)
	- Augmentation systems
	<ul> <li>Location services based on GSM networks</li> </ul>
	- Indoor positioning systems (IPS)
	- NAVWAR
Subject 2: Radionavigation systems	- Radiogoniometry
	<ul> <li>Directional and no directional radiobecaons</li> </ul>
	- ILS/MLS system
	<ul> <li>Augmented GNSS systems: WAAS, EGNOS and MSAS</li> </ul>
	- Other systems
Subject 4: Teledetection systems	- Components
	- Classification
	- Sensors types
	- Main characteristics
	<ul> <li>Satellite teledetection systems: radar, SAR and optoelectronics</li> </ul>

	Class hours	Hours outside the classroom	Total hours
Lecturing	8	8	16
Problem solving	2	2	4
Previous studies	0	29	29
Practices through ICT	2	0	2
Autonomous problem solving	0	6	6
Seminars	2	0	2
Self-assessment	0	2	2
Presentation	2	1	3
Problem and/or exercise solving	0	7	7
Laboratory practice	4	0	4

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

Methodologies	
	Description
Lecturing	Presentation by a lecturer of the contents of the subject of study, theoretical bases and/or guidelines for a work or exercise that the student has to develop.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the appropriate and correct solutions through the exercise of routines, application of formulas or algorithms, application of transformation procedures of the available information and interpretation of the results.
Previous studies	Search, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable the acquisition of knowledge and skills related to the subject. It is usually carried out prior to classes, laboratory practices and/or evaluation tests. This includes the reading and analysis of documents, and the viewing of multimedia resources.
Practices through ICT	Activities for the application of knowledge in a given context and the acquisition of basic and procedural skills related to the subject matter, through the use of ICTs.
Autonomous problem solving	Activity in which students analyze and solve problems and/or exercises related to the subject in an autonomous way.
Seminars	Activity focused on working on a specific topic, which allows to deepen or complement the contents of the subject.

Personalized assistanc	e
Methodologies	Description
Lecturing	Personalized answers to the doubts related to the exposition by the lecturer of the contents of the subject matter, theoretical bases and/or guidelines of a work or exercise that the student has to develop. exercise that the student has to develop
Problem solving	Attention in the distance phase: It will be carried out through the use of telematic resources. Students who wish to do so may ask questions to the lecturer in forums or by e-mail. They will also be able to arrange individual tutorials with the lecturer , which will be developed by videoconference. Personalized comments to the resolution of problems and/or exercises related to the subject.
Seminars	Personalized comments on the work on a specific topic, which allows to deepen or complement the contents of the subject.
Practices through ICT	Personalized attention will be given individually and in person to the activities of application of knowledge in a given context and acquisition of basic and procedural skills in relation to the subject, through the use of ICT.
Tests	Description
Laboratory practice	Guidance in the realization of the different laboratory practices related to the syllabus of the course.
Problem and/or exercise solving	Personalized comments and guidance on the work proposed in class, which allow to deepen or complement the contents of the subject.

	Description	Qualification	Training and
			Learning Results
Self-assessment	Mechanism in which, by means of a series of questions or activities, the learner is activities, it is possible for the student to evaluate autonomously his or her autonomously their degree of acquisition of	ļ	A6 B1 C12 D4 A7 B2 C13 A8 B5
	knowledge and skills about the the subject, allowing a self-regulation of the personal learning process. personal learning process. There will be two intermediate tests (PE1 and PE2), one hour long, to control the follow-up of the subject. Each test of control has a weight of 20%. The first test that covers topics 1 and 2 will be carried out in the distance phase, while the second test that will cover topics 3 and 4 will be carried out in the face-to-face phase.		(9 )9
Presentation	Presentation by the students, individually or in groups, of a work (T1 and T2) related to the contents of the topic 1 and 2 of the subject . Each task has a weight of 10% and will be evaluated in the distance phase.	<	A6 B1 C12 D4 A7 B2 C13 D5 A8 B5 A9 A10

Problem and/or exercise solving	Resolution of different exercises (E1 and E2) proposed in class on assumptions applicable to each of the topics 3 and 4 of the syllabus. Each exercise has a weight of 10% and will be carried out in the distance phase.	20	A6 A7 A8 A9 A10	C12 C13	
Laboratory practice	Evaluation of two laboratory practices (PL1 and PL2) related to the course syllabus by means of deliverable reports that will be carried out in the face-to-face phase. Each practice has a weight of 10%.	20	A6 A7 A8 A9 A10	 C12 C13	

If the average grade of continuous assessment, called MED\_CON, is calculated as:

#### MED CON=0.4\*(PE1+PE2)/2+0.2\*(T1+T2)/2+0.2\*(E1+E2)/2+0.2\*(PL1+PL2)/2

it will be necessary to obtain at least 50% of the grade to pass the course.

In case of not passing the course in the ordinary call, there would be a second opportunity to pass it in the extraordinary call, which would be carried out in distance mode on the dates established for this purpose by the Academic Committee of the Master. The evaluation of the second call will be carried out in distance mode, through the evaluation of a deliverable (work) which will account for 60% of the grade and the completion of a written test (with development questions and / or test type) using telematic means, which will account for the remaining 40%. It will be necessary to obtain at least 50% of the grade to pass the course. The evaluation process in this second call would be carried out as indicated in the following table

Assessment systems		
Denomination	Qualification(%)	Competences
Evaluation of deliverables (work)	60%	CB6, CB7, CB8, CB9, CB10 CG1,CG2, CG5 CE12,CE13 CT4, CT5
Written test	40%	CB6, CB7, CB8, CB9, CB10 CG1,CG2, CG5 CE12,CE13 CT4, CT5

#### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the event that there is any difference between the Galician/Spanish/English guides related to evaluation the Spanish guide will always prevail.

Sources of information Basic Bibliography Complementary Bibliography Richard Curry, Radar Essentials, Scitech Publishing Inc., 2012 M. L. Skolnik, Radar Handbook, McGraw Hill, 2008

#### Recommendations

#### Subjects that it is recommended to have taken before

Networks and telecommunication systems/P52M182V01104

IDENTI	FYING DATA			
	dade en sistemas de telecomunicacións			
Subject				
,	sistemas de			
	telecomunicacións			
Code	P52M182V01205			
Study	Master Universitario			
	nme en Dirección TIC			
program	para a defensa			
Descript	tors ECTS Credits	Choose	Year	Quadmester
Descript	4	Optional	1	20
Teachin	ng Castelán	optional		
languag	5			
Departm				
<u>.</u>	ator Fernández Gavilanes, Milagros			
Lecturer	-			
Lecturer	Zamorano Pinal, Carlos			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es   https://moovi.u			
General			es de telecomun	icación modernas
descript				
uescript	tecnoloxías que permitan dispor de comunicaci			
		ons seguras nos distint		
Deculto	adas da Farmasián a Anrondizava			
	ados de Formación e Aprendizaxe			
Code				· · · · ·
	36 - Posuír e comprender coñecementos que aporten ou aplicación de ideas, a miúdo nun contexto de inve		dade de ser orixi	hais no desenvolvemento
	7 - Que os estudantes saiban aplicar os coñecement		anacidado do roc	alución do problemas on
cor	ntornas novas ou pouco coñecidas dentro de context ea de estudo.			
	18 - Que os estudantes sexan capaces de integrar co	accomentos e enfrenta	rso á comploxida	do do formular xuízos a
	rtir dunha información que, sendo incompleta ou lim			
	cas vinculadas á aplicación dos seus coñecementos		soure as respons	sabilidades sociais e
	9 - Que os estudantes saiban comunicar as súas con		ntos o rozóns úl	timas que as sustentan a
	blicos especializados e non especializados dun modo			limas que as sustentan a
	10 - Que os estudantes posúan as habilidades de ap			ctudanda dun mada qua
	berá de ser en gran medida autodirixido ou autónom			studando dun modo que
			runha compron	ción detallada e
B1 CG	61 - Posuír coñecementos avanzados e altamente esp ndamentada dos aspectos teóricos e prácticos tratad		ir unna comprens do octudo	sion delaliada e
				manaa Trahallar
	63 - Dirixir, planificar, coordinar, organizar e/ou super			
	operativamente en equipos multidisciplinares actuar aballo.	ido, no seu caso, como	integrador/a de o	conecementos e linas de
		tarizadas nola sometav	idada a incortan	a avalianda az distintas
	66 - Ser capaz de tomar decisións en contornas carac			
	ernativas existentes co obxectivo de seleccionar aqu	iela cuxo resultado esp	erado sexa mais	tavorable, xestionando
	ecuadamente o risco asociado á decisión.	a na vastián da sistana		identificando
	67 - Valorar a importancia dos aspectos de seguridad			
	cesidades de seguridade, analizando posibles ameaz			avaliación de criterios e
	líticas de seguridade.		- +-l	iána an funalián da
	STT3 - Definir, analizar e implantar as medidas de se	gundade en sistemas d	e telecomunicac	ions en función do
	minio da información manexada.			
	5 - Aprendizaxe e traballo autónomos.			
D6 CT	6 - Manexar apropiadamente recursos de informació	n.		
Desults	ados provistos na matoria			

# Resultados previstos na materia Expected results from this subject

Training and Learning Results

RA1. Coñecer a base tecnolóxica sobre a que se apoia a protección das comunicacións.	A6
	A7
	A8
	A9
	A10
	B1
	B3
	B6
	B7
	C14
	D5
	D6
RA2. Coñecer as tecnoloxías e técnicas de interceptación de comunicacións e as súas contramedidas.	A6
	A7
	A8
	A9
	A10
	B1
	B3
	B5 B6
	B7
	C14
	D5
	D5 D6
RA3. Coñecer e aplicar técnicas de securización das comunicacións.	A6
RAS. Conecer e aplicar techicas de securización das comunicacións.	A0 A7
	A8
	A9
	A10
	B1
	B3
	B6
	B7
	C14
	D5
	D6
RA4. Saber despregar e configurar redes inalámbricas de forma segura.	A6
	A7
	A8
	A9
	A10
	B1
	B3
	B6
	B7
	C14
	D5
	D6
RA5. Coñecer e configurar os dispositivos de protección de redes.	A6
	A7
	A8
	A9
	A10
	B1
	B3
	B6
	B7
	C14
	D5
	D6

A6
A7
A8
A9
A10
B1
B3
B6
B7
C14
D5
D6

Contidos	
Topic	
Tema 1: Tecnoloxías e técnicas de protección da	is - Xestión baseada en regras
comunicacións.	- Regras en devasas
	- Regras en IDS
	- Xestión de VLAN
	- Configuración segura de encaminadores
	- Listas de control de acceso
	- Seguridade de portos
	- 802.1x
	- Gardas contra inundacións
	- Protección contra bucles
	- Denegación implícita
	- Separación de redes
	- Análises de rexistros
Tema 2: Tecnoloxías e técnicas de interceptació	n - Tecnoloxías de interceptación das comunicacións.
das comunicacións.	<ul> <li>Técnicas de interceptación das comunicacións.</li> </ul>
Tema 3: Protocolos de aplicación á seguridade	- Controis de ciberseguridade
das comunicacións.	- Probas de penetración
Tema 4: Redes privadas virtuais.	- Zonas de seguridade DMZ
	- DMZ
	- Trunking (VLAN)
	- Virtualización
	- Computación na nube
	- NAT
	- IPsec
Tema 5: Seguridade en redes inalámbricas.	- Redes Inalámbricas
	- Operacións en Redes Inalámbricas
Tema 6: Dispositivos e sistemas de seguridade o	le- Devasas
rede (incluídos sistemas de control de acceso	- Routers
centralizados).	- Switches
	- Load Balancers
	- Proxies
	- Concentradores VPN
	- IDS
	- IPS
	- Analizador de Protocolos

Planificación			
	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	8	8
Estudo previo	0	45	45
Lección maxistral	5	5	10
Resolución de problemas	5	5	10
Prácticas con apoio das TIC	8	0	8
Seminario	2	0	2
Foros de discusión	0	4	4
Exame de preguntas de desenvolvemento	2	0	2
Traballo	0	6	6
Estudo de casos	0	5	5
*The information in the planning table is for guid	dance only and does no	ot take into account the het	erogeneity of the students.

Metodoloxía docente

	Description
Resolución de problemas de forma autónoma	Actividade na que o alumnado analiza e resolve problemas e/ou exercicios relacionados coa materia de forma autónoma.
Estudo previo	Procura, lectura, traballo de documentación e/ou realización de forma autónoma de calquera outra actividade que o alumno/a considere necesaria para permitirlle a adquisición de coñecementos e habilidades relacionadas coa materia. Adóitase levar a cabo con anterioridade ás clases, prácticas de laboratorio e/ou probas de avaliación.
Lección maxistral	Exposición por parte dun profesor/a de os contidos da materia obxecto de estudo, bases teóricas e/ou directrices dun traballo ou exercicio que o/a estudante ten de desenvolver.
Resolución de problemas	Actividade na que se formulan problemas e/ou exercicios relacionados coa materia. O alumno/a debe desenvolver as solucións adecuadas e correctas mediante a exercitación de rutinas, aplicación de fórmulas ou algoritmos, a aplicación de procedementos de transformación da información dispoñible e a interpretación dos resultados.
Prácticas con apoio das TIC	Actividades de aplicación dos coñecementos nun contexto determinado e de adquisición de habilidades básicas e procedementais en relación coa materia, a través do uso das TIC.
Seminario	Actividade enfocada ao traballo sobre un tema específico, que permite profundar ou complementar nos contidos da materia.
Foros de discusión	Actividade desenvolvida nunha contorna virtual na que se debate sobre temas diversos e de actualidade relacionados co ámbito académico e/ou profesional.

Methodologies	Description
Lección maxistral	Dado o carácter semipresencial do curso, distinguiremos dous casos: (1) Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. (2) Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial.
Resolución de problemas	Dado o carácter semipresencial do curso, distinguiremos dous casos: (1) Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. (2) Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial.
Prácticas con apoio das TIC	Dado o carácter semipresencial do curso, distinguiremos dous casos: (1) Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. (2) Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial.
Seminario	Dado o carácter semipresencial do curso, distinguiremos dous casos: (1) Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. (2) Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial.
Tests	Description
Estudo de casos	Dado o carácter semipresencial do curso, distinguiremos dous casos: (1) Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. (2) Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial.
Avaliación	

	Description	Qualification	T	rainin	ig and
			Lea	rning	Results
Resolución de	Actividade na que se formulan problemas e/ou exercicios relacionados	20	A6	B1 (	C14 D5
problemas	coa materia. O alumno/a debe desenvolver as solucións axeitadas e		A7	Β3	D6
	correctas. Avaliarase (RP) mediante un entregable na fase a distancia.		A8	B6	
	-		A9	Β7	
			A10		

Exame de preguntas de desenvolvementoProba de avaliación que inclúe preguntas abertas e/ou exercicios, sobre un tema. Os alumnos/as deben desenvolver, relacionar, organizar e presentar os coñecementos que teñan sobre a materia nunha resposta argumentada. Pódese utilizar para avaliar coñecementos e habilidades. Esta proba (PD) realizarase durante a fase presencial.40A6B1 C14 D5TraballoTexto ou documento elaborado sobre un tema que debe redactarse seguindo unhas normas establecidas de estilo e lonxitude. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.A0B1 C14 D5Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA6B1 C14 D5B1C14D5B2D6B3D6B4D6B4D6B4D6B4D6B5D6B4D6B4D6B4D6B4D6B4D6B4D6B5D6B4D6B4D6B4D6B4D6B4D6B4D6B4D6B4D6B5D6B5D6B4D6B4D6B4D6B4 <th>Prácticas con apoio das TIC</th> <th>Actividades de aplicación dos coñecementos nun contexto determinado e de adquisición de habilidades básicas e procedementais en relación coa materia, a través do uso do TIC. Permiten avaliar os coñecementos e habilidades do alumno/a. Avaliaranse (P) mediante entregables durante a fase presencial.</th> <th>10</th> <th>A6 A7 A8 A9 A10</th> <th>B1 B3 B6 B7</th> <th>C14</th> <th>D5 D6</th>	Prácticas con apoio das TIC	Actividades de aplicación dos coñecementos nun contexto determinado e de adquisición de habilidades básicas e procedementais en relación coa materia, a través do uso do TIC. Permiten avaliar os coñecementos e habilidades do alumno/a. Avaliaranse (P) mediante entregables durante a fase presencial.	10	A6 A7 A8 A9 A10	B1 B3 B6 B7	C14	D5 D6
presentar os coñecementos que teñan sobre a materia nunha resposta argumentada. Pódese utilizar para avaliar coñecementos e habilidades. Esta proba (PD) realizarase durante a fase presencial.A8B6TraballoTexto ou documento elaborado sobre un tema que debe redactarse seguindo unhas normas establecidas de estilo e lonxitude. PermiteA7B6D6avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.A8B7Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA8B6B6A9B1C14D5B6D6B1C14D5B7B1C14D5B8B1C14D5B8B1C14D5B9B1C14D5B1C14D5B1C14D5B2B1C14D5B3D6B1B4B4B4B4B4B4B5B4B4B6B4B4B6B4B4B6B4B4B6B4B6B4B6B4B6B4B6B4B6B4B6B4B6B4B6B4B6<	1 5		40			C14	
Esta proba (PD) realizarase durante a fase presencial.A10TraballoTexto ou documento elaborado sobre un tema que debe redactarse seguindo unhas normas establecidas de estilo e lonxitude. Permite20A6B1 C14 D5avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.A7B6D6Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA10				A8	B6		
TraballoTexto ou documento elaborado sobre un tema que debe redactarse seguindo unhas normas establecidas de estilo e lonxitude. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.20A6B1 C14 D5Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de 		argumentada. Pódese utilizar para avaliar coñecementos e habilidades.		A9	Β7		
seguindo unhas normas establecidas de estilo e lonxitude. PermiteA7B6D6avaliar as habilidades, os coñecementos e, en menor medida, asA8B7actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.A9Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de10A6B1 C14 D5coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos,A7B3D6reflexionar, completar coñecementos, diagnosticarlo e entrenarse nosA8B6procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA9B7		Esta proba (PD) realizarase durante a fase presencial.		A10			
avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.A8B7Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA8B7B7	Traballo	Texto ou documento elaborado sobre un tema que debe redactarse	20	A6	Β1	C14	D5
actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.A9Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de10A6B1 C14 D5coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA9B7		seguindo unhas normas establecidas de estilo e lonxitude. Permite		A7	B6		D6
Estudo de casosFeito, problema ou suceso real que será analizado coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolos10A6B1C14D5A7B3D6B6B6B7				A8	Β7		
coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos,A7B3D6reflexionar, completar coñecementos, diagnosticarlo e entrenarse nosA8B6procedimentos alternativos de solución. Avaliarase (EC) sobre tódolosA9B7		actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.		_A9			
reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos A8 B6 procedimentos alternativos de solución. Avaliarase (EC) sobre tódolos A9 B7	Estudo de casos	Feito, problema ou suceso real que será analizado coa finalidade de	10	A6	Β1	C14	D5
procedimentos alternativos de solución. Avaliarase (EC) sobre tódolos A9 B7		coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos,		A7	Β3		D6
				A8	B6		
contidos da materia por medio dun entregable na fase presencial. A10		procedimentos alternativos de solución. Avaliarase (EC) sobre tódolos		A9	Β7		
		contidos da materia por medio dun entregable na fase presencial.		_A10			

Se denominamos MED\_CON á nota media de avaliación continua, que se calcula como:

MED CON = 0.2\*RP + 0.1\*P+ 0.4\*PD + 0.2\*T + 0.1\*EC

Será necesario obter polo menos o 50% da cualificación para superar a materia.

No caso de que o alumno non consiga aprobar a materia na convocatoria ordinaria, terá dereito a unha segunda oportunidade de avaliación (convocatoria extraordinaria) que se realizará en modalidade a distancia nas datas establecidas para ese efecto pola Comisión Académica de Máster. O sistema de avaliación na convocatoria extraordinaria será o mesmo que na convocatoria ordinaria, realizándose a entrega de prácticas e a proba escrita mediante medios telemáticos. Será necesario obter polo menos o 50% da cualificación para superar a materia.

#### **COMPROMISO ÉTICO:**

Espérase que o alumnado teña un comportamento ético axeitado, comprometéndose a actuar con honestidade. En base ao artigo 42.1 do Regulamento sobre a avaliación, a calificación e a calidade da docencia e do proceso de aprendizaxe do estudiantado da Universidade de Vigo, o emprego de procedementos fraudulentos nas probas de avaliación, así como a cooperación neles implicará a calificación de cero (suspenso) na acta da convocatoria correspondente, con independencia do valor que sobre a calificación global tivese a proba en cuestión e sen perxuicio das posibles consecuencias de índole disciplinaria que puidesen producirse .

No caso de que exista algunha diferencia entre as guías en galego/español relacionada coa avaliación prevalecerá sempre o indicado na guía docente en español.

Complementary Bibliography	
A. S. Tanenbaum, D. Wetherall, Computer Networks: International Version, 5, Prentice Hall, 2010	
Dr. Wm. Arthur Conklin, Dr. Gregory White, Chuck Cothren, Roger L. Davis, Dwayne Williams, CompTIA Security	y+ (All-in-
One Exam Guide), 5, McGraw-Hill, 2018	
Mike Meyers, CompTIA Network+ Certification (All-in-One Exam Guide), 7, McGraw-Hill Education, 2018	
Recomendacións	

Redes e sistemas de telecomunicación/P52M182V01104

Seguridade da información/P52M182V01106

IDENTIFYIN	G DATA			
	d software applications			
Subject	Services and			
	software			
	applications			
Code	P52M182V01206			
Study	Master			
programme	Universitario en			
	Dirección TIC para			
	la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Feaching	Spanish			
anguage				
Department	Free (adam Cardlen on Mile and			
Coordinator	Fernández Gavilanes, Milagros			
ecturers	Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es	u a l		
Veb	http://campus.defensa.gob.es   https://moovi.uvigo.g			
General description	The subject of Software Services and Applications air concepts of distributed applications, client-server mo	ms to provide stu-	dents with a gen	ieralised vision of the
description	development and management methodologies curre		vices, with spec	ial emphasis on the
		entry in force.		
	d Learning Results			
Code				
	ossess and understand knowledge that provides a bas	sis or opportunity	to be original in	the development and / o
	ion of ideas, often in a research context.			
underst	nat students know how to apply the acquired knowled ood environments within broader (or multidisciplinary	) contexts related	to their area of	study.
informa	nat students are able to integrate knowledge and face tion that, being incomplete or limited, includes reflect tion of their knowledge and judgments.			
49 CB9 - T	hat students know how to communicate their conclusion a specialized and unspecialized public in a clear and			ate reasons that support
A10 CB10-	That students possess the learning skills that allow the			that will be largely self-
	ossess advanced and highly specialized knowledge ar neoretical and practical aspects dealt with in the diffe			ll-founded understanding
defined	tegrate and apply the knowledge acquired, and posse environments, including multidisciplinary contexts re	lated to their field	d of study.	
multidis	irect, plan, coordinate, organize and/or supervise tasl sciplinary teams acting, where appropriate, as an inte	grator of knowled	ge and lines of v	vork.
	Define and implement technologies and methodologies eservices in web, distributed, mobile environments, e		ment of systems	s, applications and
D4 CT4 - O	ral and written communication skills.			
D5 CT5 - A	utonomous learning and work.			
Synastad re	aculto from this subject			
	esults from this subject			Training and
•	ults from this subject			Training and Learning Results
_O1: Know tł	ne existing web engineering methodologies.			A8
				B1
				B2
				B3
				C17

C17
LO2: Understand the inner workings of a web service, and the different technologies currently available to A7
implement them.
B1
B2
B3
C17
D4
D5
LO3: Understand the basic principles of distributed computing and systems and their differences with
B1
C17
D4
D5
C17

C17

LO4: Understand the concept of middleware and its basic principles of operation.	B1
	B2
	B3
	C17
LO5: Know the basics of distributed application programming, and the different existing technologies.	A10
	C17
	D4
	D5
LO6: Know the basic fundamentals of mobile applications for the different existing operating systems.	A6
	A9
	C17
	D4
	D5

Contents	
Торіс	
Topic 1: Introduction to web engineering.	- Introduction and salient features
	<ul> <li>Web engineering vs. software engineering</li> </ul>
	- Basic elements of the Web
	- Historical perspective
Topic 2: Technology and web services.	- Introduction
	<ul> <li>Dynamic web services vs. static websites</li> </ul>
	- Basic characteristics
	- Architecture of a web service
	<ul> <li>Most common technologies: frontend and backend</li> </ul>
Topic 3: Distributed systems.	- Most common architectures
	- Client-Server Model
	- Multi-layer architectures
	- P2P and Grid architectures
Topic 4: Web development and management	- General characteristics
methodologies.	- Traditional methodologies vs. Agile methodologies
	<ul> <li>Phases of the development process</li> </ul>
	- Development methodologies
Topic 5: Middleware technologies.	- Introduction and fundamental concepts
	- Applications
	- Typology and most relevant characteristics
Topic 6: Technologies applicable to the	- Most common technologies
development of distributed applications.	- Others
Topic 7: Applications on mobile devices.	- Generic characteristics of the most important mobile operating systems
	- Native applications vs. web applications
	- Security
	- Ubiquitous computing

	Class hours	Hours outside the classroom	Total hours
Previous studies	0	40	40
Lecturing	8	10	18
Discussion Forum	0	2	2
Practices through ICT	4	0	4
Self-assessment	0	2	2
Objective questions exam	1	0	1
Presentation	4	3	7
Essay questions exam	1	0	1
*The information in the planning table is	for guidance only and does n	ot take into account the het	erogeneity of the students

Methodologies	
	Description
Previous studies	Research, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to classes, laboratory practices and/or assessment tests.
Lecturing	Presentation by a lecturer of the contents of the subject under study, theoretical bases and/or guidelines for a project or exercise that the student has to carry out.
Discussion Forum	Activity carried out in a virtual environment in which a debate is held on a variety of current topics related to the academic and/or professional field.

Personalized assistance				
Methodologies	Description			
Lecturing	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may raise questions to the faculty in forums or by email. They will also be able to arrange individual tutories with the lecturer, which will take place via videoconference. (2) Attention in the face-to-face phase: although the use of telematic mechanisms is still possible, during this phase face-to-face tutoring mechanisms will also be used.			
Practices through ICT	Attention in the face-to-face phase: Although it is still possible to use telematic mechanisms for student attention, face-to-face tutoring mechanisms (individual and/or group) will also be used during this phase.			

Assessment						
	Description	Qualification			ng ar	
			Lea	rning	g Res	ults
Discussion Forum	Activity carried out in a virtual environment where a variety of current		A6		C17	
	issues related to the academic and / or professional field are debated. It		A7	B2		D5
	allows evaluating the skills, knowledge and, to a lesser extent, the		A8			
	attitudes of the student. Participation in the forums (F) carried out during		A9			
	the distance phase will be evaluated.		A10			
Self-assessment	A mechanism in which, by means of a series of questions or activities, it is	s 30 .	A7		C17	
	possible for the student to autonomously evaluate his/her degree of			B2		
	acquisition of knowledge and skills on the subject, allowing self-regulation					
	of the personal learning process. To be assessed (AV) during the distance					
· · · · · · · · · · · · · · · · · · ·	phase.					
	s A test that assesses knowledge and includes closed questions with		A6		C17	D4
exam	different answer alternatives (true or false, multiple choice, item		A8	B2		D5
	matching, etc.). Students select an answer from a limited number of		A9	B3		
	possibilities. This test (EO) will take place during the face-to-face phase.		A10			
Presentation	Presentation by the students, individually or in groups, of a topic related		A6	Β1		D4
	to the contents of the course or the results of a work, exercise, project,		A7			D5
	etc. Through the presentation, knowledge, skills and attitudes can be		A8			
	evaluated. Esta actividad de presentación (P) se realizará en la fase a		A9			
	distancia.		A10			
Essay questions	Test (EP) that assesses knowledge and includes open-ended essay		A6		C17	
exam	questions about the practices carried out during the face-to-face phase.		A7	B2		D5
			A8	B3		
			A9			
			A10			

We call the average continuous assessment mark MED\_CON, which is calculated as:

MED\_CON = 0.1 \* F+ 0.3 \* AV + 0.25 \* EO + 0.2 \* P + 0.15 \* EP

A minimum mark of 50% is required to pass the course.

If the subject is not passed in the ordinary call, there will be a second opportunity to pass it in the extraordinary call, which will be held in distance mode on the dates established for this purpose by the Master's Academic Committee. The assessment process in this second call would be carried out as indicated below:

Self-assessment activities (test-theory) - 60%.

Self-assessment activities (test-practical) - 40%.

#### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of the *Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo,* any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall

continuous assessment and independently of other disciplinary actions that may be applied.

In the event of any discrepancies between the guides in Galician/Spanish/English regarding evaluation, the indications stated in the Spanish version of the course guide will always prevail.

Sources of information

Basic Bibliography Complementary Bibliography

A. S. Tanenbaum, **Redes de computadoras**, Pearson, 2013

Qusay H. Mahmoud, Middleware for Communications, John Wiley & Sons, 2004

Joseph Ingeno, Software Architect s Handbook, 1º, Packt Publishing, 2018

#### Recommendations

Subjects that it is recommended to have taken before

Networks and telecommunication systems/P52M182V01104

IDENTIFYIN	G DATA				
Security in	information systems				
Subject	Security in				
	information				
	systems				
Code	P52M182V01207				
Study	Master				
programme	Universitario en				
	Dirección TIC para				
	la defensa				
Descriptors	ECTS Credits	Choose	Year	Quadmester	
	4	Optional	1st	2nd	
Teaching	Spanish		,		
language					
Department					
Coordinator	Fernández Gavilanes, Milagros				
Lecturers	Fernández Gavilanes, Milagros				
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Web	http://campus.defensa.gob.es   https://moovi.uvigo.gal				
General	The subject of Security in information systems will show the techniques, protocols and architectures related to				
description	security that exist at the different levels of implementation of a modern information system, with a particular				
	emphasis on the communications part. The		lear exposition o	f these problems, and	
	their practical resolution through practical	study cases.			

## Training and Learning Results

Code

A6 CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.

A7 CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.

A8 CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.

A9 CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.

A10 CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely selfdirected or autonomous.

B1 CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.

B2 CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.

B7 CG7 - Assess the importance of security aspects in the management of systems and information, identifying security needs, analyzing possible threats and risks and contributing to the definition and evaluation of security criteria and policies.

C18 CISTI4 - Define, analyze and implement security mechanisms throughout the life cycle of information systems.

D4 CT4 - Oral and written communication skills.

D6 CT6 - Properly manage information resources.

# Expected results from this subject

Expected results from this subject	Training and
	Learning Results
LO1: Understand the threats and vulnerabilities inherent in software development by showing how	A6
software can be made more secure.	A7
	A8
	A9
	A10
	B1
	B2
	B7
	C18

LO2: Describe the problems, threats and solutions used at different levels of a communications	A6
system/service.	A7
	A8
	A9
	A10
	B1
	B2
	B7
	C18
LO3: Describe the modern technical foundations of cryptography on which symmetric key and public key	A6
systems are based.	A7
	A8
	A9
	A10
	B1
	B2
	B7
	C18
LO4: Study public key infrastructure systems, including in detail how the creation, maintenance,	A6
distribution, use, storage and revocation of digital certificates will be addressed.	A7
	A8
	A9
	A10
	B1
	B2
	B7
	C18
LO5: Describe new applications and trends in the field of information systems security.	A6
	A7
	A8
	A9
	A10
	B1
	B2
	B7
	C18
	D4
	D4 D6
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Contents	
Торіс	
Topic 1. Introduction to security in information	- Introduction to Data Centres.
systems.	- Typical structure
	- Administration of Data Processing Centres
Topic 2. Security in software development.	- sSDLC
	- Vulnerabilities
	- Countermeasures
Topic 3. Symmetric key encryption.	- Mathematical principles
	- Block coders (DES, Triple-DES, AES)
	- Stream coders (RC4)
Topic 4. Public key cryptography.	- Motivation
	- Mathematical principles
	- Diffie-Hellman
	- RSA
	<ul> <li>Elliptic Curve Cryptography (ECC)</li> </ul>
Topic 5. Digital signatures.	- MAC and Hash systems
	- MD5
	- SHA
	- HMAC
Topic 6. Key distribution systems and	- Introduction
authentication.	- Kerberos
	- X509
	- Public key infrastructure (PKI)
Topic 7. Transport and web security.	- Motivation
	- SSL
	- TLS
	- SSH

Topic 8.	Security in	networks.
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Topic 8. Security in networks.	- IPSec - Firewalls - VPNs - Cloud systems
Topic 9. Trends in the use of security systems.	<ul> <li>Blockchain</li> <li>Deep web</li> <li>Anonymization</li> <li>Cryptocurrencies</li> <li>Zero Knowledge Proof Cryptography</li> <li>Deniable Encryption</li> <li>White box cryptography</li> <li>Sharing of secrets</li> <li>Steganography</li> <li>Quantum cryptography</li> <li>Electronic voting</li> </ul>

	Class hours	Hours outside the classroom	Total hours		
Autonomous problem solving	0	9	9		
Previous studies	0	52	52		
Lecturing	8	8	16		
Problem solving	3	3	6		
Practices through ICT	4	0	4		
Seminars	4	0	4		
Self-assessment	0	4	4		
Presentation	4	0	4		
Essay questions exam	1	0	1		
*The information in the planning table is	for guidance only and does no	ot take into account the het	erogeneity of the students		

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyze and solve problems and/or exercises related to the subject autonomously.
Previous studies	Search, reading, documentation work and/or autonomous performance of any other activity that the student considers necessary to enable him or her to acquire knowledge and skills related to the subject. It is usually carried out before classes, laboratory practices and/or evaluation tests.
Lecturing	Exposition by a lecturer of the contents of the subject under study, theoretical bases and/or guidelines of a work or exercise that the student has to develop.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the appropriate and correct solutions by exercising routines, applying formulas or algorithms, applying procedures for transforming the available information and interpreting the results.
Practices through ICT	Activities of application of knowledge in a specific context and acquisition of basic and procedural skills in relation to the subject, through the use of ICTs.
Seminars	Activity focused on work on a specific topic, which allows delving into or complementing the contents of the subject.

Personalized assistance			
Methodologies	Description		
Lecturing	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may pose questions to the teaching staff in forums or by email. They may also arrange individual tutorials with the teacher, which will take place via videoconference. (2) Attention in the face-to-face phase: although the use of telematic mechanisms for student attention is still possible, face-to-face tutoring mechanisms will also be used during this phase.		
Problem solving	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may pose questions to the teaching staff in forums or by email. They may also arrange individual tutorials with the teacher, which will take place via videoconference. (2) Attention in the face-to-face phase: although the use of telematic mechanisms for student attention is still possible, face-to-face tutoring mechanisms will also be used during this phase.		

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Seminars	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may pose questions to the teaching staff in forums or by email. They may also arrange individual tutorials with the teacher, which will take place via videoconference. (2) Attention in the face-to-face phase: although the use of telematic mechanisms for student attention is still possible, face-to-face tutoring mechanisms will also be used during this phase.

Assessment					
	Description	Qualification		aining a ning Re	
Practices through ICT	Activities of application of knowledge in a specific context and acquisition of basic and procedural skills in relation to the subject, through the use of ICT. They allow evaluating the knowledge and skills of the student. There will be four deliverable activities (AE1, AE2, AE3 and AE4). The first three will be assessed during the distance learning phase: AE1 and AE2 will cover topic 3 while AE3 will cover topic 4 of the subject. In the case of deliverable AE4 this will be done during the face-to-face phase. Each deliverable will score 10% of the final mark.		A7	B1 C18 B2 B7	3 D4
Self-assessment	Mechanism in which, through a series of questions or activities, it is possible for the student to autonomously assess their degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. A questionnaire (AV) covering topics (1 to 8) will be administered during the distance learning phase.		A7	B1 C18 B2 B7	3 D4 D6
Presentation	Exhibition by the students, individually or in groups, of a topic related to the contents of the subject or the results of a job, exercise, project, etc. Through the presentation you can assess knowledge, skills and attitudes. This exhibition task (T) will be assessed during the face-to-face phase.		A7	B1 C18 B2 B7	3 D4 D6
Essay questions exam	Assessment test that includes open questions and/or exercises on a topic. Students must develop, relate, organize and present the knowledge they have on the subject in an argued response. It can be used to assess knowledge and skills. There will be a written test (PE) at the end of the face- to-face phase, in which all the topics and contents of the subject will be all the subjects and contents of the course (including the contents of the distance and face-to-face contents of the distance and face-to-face phases).		A7	B1 C18 B2 B7	3 D4

If we call MED\_CON the average mark for continuous assessment, which is calculated as follows:

MED\_CON = 0.1\*AE1 + 0.1\*AE2+ 0.1\*AE3 + 0.1\*AE4 + 0.1\*AV + 0.2\*T + 0.3\*PE

A grade of no less than 50% will be required to pass the subject.

In the case of evaluation in an extraordinary call, the student will have the option of redoing (totally or partially) the following evaluation activities:

- Self-assessment activities (test)
- Deliverables (practices)
- Presentations and/or expositions
- Exam

While participation in forums will be integrated into self-assessment activities.

Those activities that the student decides to repeat will be reassessed, losing the note of the previous call. The written test will be done online.

#### ACADEMIC INTEGRITY:

Students are expected to show adequate ethical behaviour, committing to act honestly. Based on article 42.1 of

the Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo, any violation of academic integrity in the assessment process, as well as the cooperation in it will result in the assignment of a failing grade to the student (zero) for the entire course in the corresponding assessment opportunity, regardless of the percentage of importance that the test in question had in the overall continuous assessment and independently of other disciplinary actions that may be applied.

In the event that there is any difference between the guides in Galician/Spanish/English related to the evaluation, what is indicated in the teaching guide in Spanish will always prevail.

Sources of information

Basic Bibliography

William Stallings, Network Security Essentials. Applications and Standards, 5, Prentice Hall, 2013 Joshua Davies, Implementing SSL/TLS. Using Cryptography and PKI, Wiley, 2011 Complementary Bibliography Tanenbaum Andrew, Wetherall David, Computer Networks, 5, Prentice Hall, 2010

Stuart McClure, Joel Scambray, George Kurtz, Hacking exposed 7 network security secrets and solution, 7, McGraw‐Hill, 2012

#### Recommendations

#### Subjects that it is recommended to have taken before

Security of the information/P52M182V01106