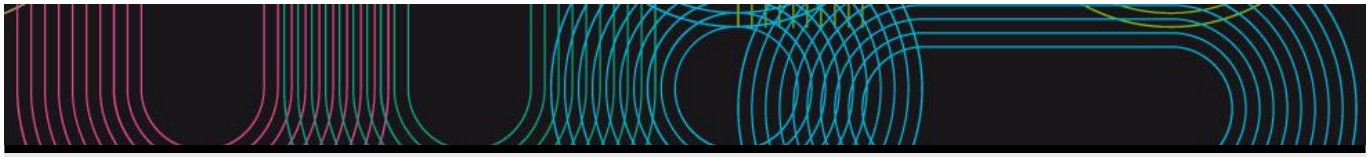

(*)Centro Universitario da Defensa da Escola Naval Militar de Marín

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

IDENTIFYING DATA

Government, management and ITC management

Subject	Government, management and ITC management			
Code	P52M182V01101			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Rodríguez Rodríguez, Francisco Javier			
Lecturers	Merino Gil, Miguel Ángel Manuel Rodríguez Rodríguez, Francisco Javier			
E-mail	fjavierrodriguez@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	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 related standards will be discussed: ISO 38.500 and 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.			

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-directed 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.
C1	CE1 - Acquire knowledge and skills to develop effective leadership for the digital transformation of an organization.
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.
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.
D1	CT1 - Ability to understand the meaning and application of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more egalitarian society.
D3	CT3 - Incorporate criteria of sustainability and environmental commitment into professional practice. Acquire skills in the equitable, responsible and efficient use of resources.

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 B1 B3 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 support processes.	A7 A10 B1 B3 B6 C1 C3 D1 D3
LO5: Understand the use of balanced scorecards and ICT performance indicators.	A7 A9 A10 B1 B3 B6 C1 C2 D1 D3
LO6: Understand how human resource management contributes to strategic objectives.	A7 A8 A10 B1 B3 B6 C1 D1 D3

Contents	
Topic	
Topic 1. Introduction to strategic business planning	1.1. Introduction. Basic management functions. 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 COBIT 5	2.1. ICT Governance. 2.2. Implementation of ICT Governance. 2.3. Reference frameworks for governance and management of ICT. 2.4. ISO/IEC 38500. Introduction. 2.5. ISO/IEC 38500. Main objectives and basic principles. 2.6. ISO/IEC 38500. Implementation objectives. 2.7. COBIT, Control Objectives for Information and Related Technologies: Introduction. 2.8. COBIT. Reference Framework. 2.9. COBIT. Principles. 2.10. COBIT. Enabling Processes 2.11. COBIT. Product family. 2.12. COBIT 5 and other standards and frameworks. 2.13. Ministry of Defence STIC policy. 2.14. Supplementary information.
Topic 3. Vision and mission of the ICT manager	3.1. Introduction. 3.2. CIO competencies. 3.3. Key relationships of the CIO. 3.4. Director of CISTIC and CIO of the Ministry of Defence. 3.5. Further reading and activities
Topic 4. Value generation and performance management	4.1. Introduction. 4.2. The Value of an Exercise Machine. 4.3. Value of IT in the context of Business. 4.4. How to communicate value. 4.5. New ways to create value. The 4-source model of value creation from IT. 4.6. Value analysis in different IT scenarios, frameworks, methodologies and new IT trends. 4.7. References.
Topic 5. Balanced Scorecards and Performance Management	5.1. The Balanced Scorecard. Introduction and concepts. 5.2. Perspectives of the BSC and objectives. 5.3. Strategy maps. 5.4. Key performance indicators, KPIs. 5.5. Strategic initiatives 5.6. BSC applied to ICT 5.7. KPI indicators, application to ICT. 5.8. Complementary information. Links.
Topic 6. Human and material resources management	6.1. Theoretical-technical elements of management and strategic change: From human resources to talent-based people management (TPD). 6.2. Managing people and talent as a strategic factor. 6.3. Motivational and creative approach to human behaviour.

Planning

	Class hours	Hours outside the classroom	Total hours
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

*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 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	Training and Learning 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. There will be 6 deliverables in the 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: - E1: exercise on the application of Porter's 5 forces (topic 1) (10%), - 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%).	67.5	A7 B1 C1 D1 A8 B3 C2 D3 A9 B6 C3 A10 C4
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a project, exercise, project, etc. Knowledge, skills and attitudes can be assessed through the presentation. The following exercises will be presented by the student in the classroom phase (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%).	32.5	A7 B1 C1 D1 A8 B3 C3 D3 A9 B6 A10

Other comments on the Evaluation

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

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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

IDENTIFYING DATA

IT process management and continuous improvement

Subject	IT process management and continuous improvement			
Code	P52M182V01102			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Ares Tarrío, Miguel Ángel Fernández Gavilanes, Milagros Pérez Ribas, Francisco Manuel			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	ICT processes' Management and Continuous Improvement offers a general vision of processes management in organizations, according to the philosophy of Total Quality and the most widespread Excellence models. The objective is to provide the student with the necessary knowledge in the field of process management, notably increasing their capacity in the design, analysis and diagnosis of processes, focused on their continuous improvement. An overview of the CMMI reference model is also offered, as a model that develops and integrates a set of good practices and that is currently a reference framework in the software industry and that generates value in the prioritization of actions in the improvement of processes of IT companies; also allowing to emphasize the alignment of processes in accordance with the objectives defined within the strategic plan of the organization.			

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-directed 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.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
C1	CE1 - Acquire knowledge and skills to develop effective leadership for the digital transformation of an organization.
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

LO1. Understand what BPM process management is and learn to identify and document them.	B1 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 9000-PECAL21XX, EFQM.	A6 A8 A10 B1 B3 C1 C2 C3 C5 D5
LO5. Know the maturity models, CMM.	B1 C1 C2 C3 C5

Contents	
Topic	
Topic 1. Process management, BPM.	- Management by functions - From functional management to process management. - 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, TQM and EFQM excellence models.	- Excellence models (TQM- Deming Model, NIST, EFQM) - Continuous improvement models and practices (TPS-JIT, Lean Philosophy, Six Sigma) - Application of continuous improvement in Defense.
Topic 4. Quality Management and Assurance Systems, ISO9000-PECAL.	- ISO 9000:2015 standard. Basics and vocabulary - UNE-EN ISO 9001:201 standard. Quality management system. 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.

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 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.

Assessment

	Description	Qualification	Training 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.	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	A6 A10	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

Other comments on the Evaluation

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

MED_CON = 0.09* AO1 + 0.06*AO2+ 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

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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.

IDENTIFYING DATA				
Service management and service quality				
Subject	Service management and service quality			
Code	P52M182V01103			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Ares Tarrío, Miguel Ángel Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The subject Service Management and Service Quality aims to provide students with a gentle approach to the world of Service Management. The ITIL methodology in its versions ITIL v3 2011 and ITIL v4 will be used as a framework. The aim is not to prepare for an ITIL certification, but certification test questions will be provided for a better understanding. The objective is to understand the concepts of service management and to be able to achieve a theoretical basis for practical application and implementation using reference material or other necessary resources. It will be reinforced by analysis of historical use cases and management models from different service companies and organisations.			

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-directed or autonomous.
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.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
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.
C5	CE5 - Define and implement standard models, establishment of standards and reference methodologies and taxonomy of ICT services and information security.
D4	CT4 - Oral and written communication skills.

Expected results from this subject	Training and Learning Results
LO1: Understand the definition of service and its applicability in the work environment.	A6 A7 A8 A9 A10 B3 B4 C2 C5 D4

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

Contents	
Topic	
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. DevOps.	- ITIL - Service Improvement. - ITIL 4. - DevOps.

Planning			
	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
*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 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.

Discussion Forum	Activity carried out in a virtual environment where a variety of current issues related to the academic and / or professional field are debated.

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.
Case studies	Given the blended nature of the course, we will distinguish 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 lecturers 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 will also be used.

Assessment

	Description	Qualification	Training 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.	20	A6 A7 A8 A9 A10 B3 C2 D4 B4 C5
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.	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 exam	Tests that assess knowledge and include closed questions with different answer 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

Other comments on the Evaluation

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 information
Basic Bibliography
Complementary Bibliography
ITIL Foundation, **ITIL 4 edition**, 4, Axelos, 2019
Office of Government Commerce, **ITIL Diseño del Servicio**, Stationery Office, 2010
Office of Government Commerce, **ITIL Estrategia del Servicio**, Stationery Office, 2010
Office of Government Commerce, **ITIL Operación del Servicio**, Stationery Office, 2010
Office of Government Commerce, **ITIL Transición del Servicio**, 2009
Office of Government Commerce, **The official introduction to the ITIL service lifecycle**, 1, Stationery Office, 2007
Peter Farenden, **ITIL for Dummies**, 1, For Dummies, 2012

Recommendations

IDENTIFYING DATA				
Networks and telecommunication systems				
Subject	Networks and telecommunication systems			
Code	P52M182V01104			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
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.uvigo.gal			
General description	This subject provides fundamental concepts of communication networks and telematic services: the technological basis of data transmission, the architecture of communication networks and services, the main components of ICT infrastructures, network management and planning methods and the basic aspects of security in computer networks. 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 self-directed 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

Contents

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

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	Training and Learning 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.	15	A6 A7 A8 B1 B3 B6 C7
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.	10	A6 A7 A8 A9 B1 B3 C7
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.	30	A6 A7 A8 A9 B1 B3 B6 C7 D4
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.	15	A6 A7 A8 A9 A10 B1 B3 C7 D4
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.	30	A6 A7 A8 A9 A10 B1 B3 C7

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

J. F. Kurose, K. W. Ross, **Computer Networking: A Top-Down Approach**, 6ª Edición, Pearson, 2012

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

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

Recommendations

Other comments

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

IDENTIFYING DATA				
Information systems				
Subject	Information systems			
Code	P52M182V01105			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
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.gal			
General description	The Information Systems subject aims to offer students an integrated vision of the different elements necessary to make the holistic concept of Information Systems possible from a technological perspective. To this end, the different technologies and paradigms that are used in the different layers involved in the design and development of Information Systems will be examined. The proposed approach, far from seeking to show low-level descriptions, seeks a high-level approach concerned with the advantages and disadvantages of the different possibilities.			

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-directed 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 information systems.	A6 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 system	- Basic concepts of software architectures - Architecture models - Layered architecture models - 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
Processing and presentation of information	- Introduction to Big Data and its applications - Statistical information processing - 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

Planning			
	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 not take into account the heterogeneity 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.

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 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.

Assessment				
	Description	Qualification	Training 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 during the online part of the course.	5	A8 A10	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 on the work done during the online phase of the course.	20	A6 A7 A9	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 A10	B1 C8 D5
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 A7	B1 C8 D4

Other comments on the Evaluation

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

Grigoris Antoniou, Frank Harmalen, **Manual de web semántica**, COMARES, 2011

Brendan Burns, **Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services**, 1, O'Reilly Media, 2018

Zikopoulos, Paul, and Chris Eaton., **. Understanding big data: Analytics for enterprise class hadoop and streaming data**, McGraw-Hill Osborne Media, 2011

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

Recommendations

IDENTIFYING DATA				
Security of the information				
Subject	Security of the information			
Code	P52M182V01106			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Rodelgo Lacruz, Miguel			
Lecturers	Rodelgo Lacruz, Miguel			
E-mail	mrodelgo@cud.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	This subject aims to provide students with training in the fundamental concepts of information security: the threats and vulnerabilities posed by new technologies, the most common types of computer attacks and ways to protect against them, the basic uses and applications of cryptography, user authentication methods and permissions management. Classroom lectures will be used for the introduction of theoretical concepts, which will be complemented by 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 self-directed 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.
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.
D5	CT5 - Autonomous learning and work.

Expected results from this subject	Training and Learning Results
LO1 - Relate the terminology and essential concepts, both from a conceptual and technical point of view in the field of information security.	A6 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.	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 well as the management of identities and associated authorizations.	A6 A7 A8 A9 A10 B1 B3 B6 B7 C9 D5

Contents

Topic	
Definitions, concepts and basic principles	- Introduction - Properties of information security - Basic Concepts - Fundamental principles. - New cyber defense scenario
Threats and vulnerabilities	- Malware - Application threats - Network threats - Social engineering
Physical Security	- Environmental Threats - Technical threats - Man-made threats - Damage recovery and backup - Physical and logical security integration
Operational Security	- Human Resources - Systems operation
Cryptographic techniques	- Symmetric cryptography - Asymmetric cryptography - Cryptographic Hash
Identification and authentication	- Introduction: Authentication process, Authentication risk. - Authentication methods: Passwords, Tokens, Biometrics. - Remote authentication - Identity management
Authorization and access control	- Components of access control: Authentication, Authorization and Auditing. - AAA Protocols - Access control policies: DAC, MAC, RBAC, ABAC. - Identity Federation

Planning

	Class hours	Hours outside the classroom	Total hours
Previous studies	0	25	25

Lecturing	8	8	16
Practices through ICT	6	0	6
Seminars	1	0	1
Discussion Forum	0	5	5
Objective questions exam	2	0	2
Essay	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.

Assessment

	Description	Qualification	Training and Learning Results
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 the subject.	75	A6 A7 A8 A9 A10 B1 B6 B7 C9 D5
Essay	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).	25	A6 A7 A8 A9 A10 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**, 4ª Ed., Pearson Education India, 2017

White, Gregory, et al., **CompTIA Security+ all-in-one exam guide**, 5ª 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.

IDENTIFYING DATA

Security management and risk analysis

Subject	Security management and risk analysis			
Code	P52M182V01107			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros López Román, Iago			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The Security Management and Risk Analysis course aims to provide students with an overview of Information Security Management Systems (ISMS), describing the fundamentals of the existing standards for the certification of an ISMS, and paying special attention to risk analysis and management methodologies, as well as security incident response plans.			

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-directed 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 B7 C9 D6
LO4: To be familiar with MINISDEF's information security policy and management and the recommendations issued by the CCN.	A10 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 A8 A10 B2 B6 B7 C9 D6

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

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 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 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.
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	Training 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 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.	10	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 A8 A9 A10	B1 C9 D6 B2 B3 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

Other comments on the Evaluation

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

IDENTIFYING DATA

Systems engineering and ICT project management

Subject	Systems engineering and ICT project management			
Code	P52M182V01201			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Carreño Morales, Rafael María Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The subject of Systems Engineering and ICT Project Management has two aspects. The first focuses on systems engineering and the other on project management, which are interrelated since the development or modification of a new or existing system is a project in itself. In both parts, a theoretical introduction and the analysis of practical cases will be developed.			

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-directed or autonomous.
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.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
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.
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 practical examples and cases.	A6 A7 B2 C4 D5
LO2: Basic knowledge of the main processes, activities and documents of project/programme management.	A6 C4
LO3: Knowledge of the main standards and methodologies for project management, in particular PMBOK and PRINCE2. Introductory knowledge of AGILE methods and practices.	A6 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 CIS, ICT and SEGINFO.	A7 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

Contents	
Topic	
Topic 1: Systems Engineering	- Introduction - Life Cycle / Models - Validation versus Verification - Structure / Processes: specification, design, development, testing, operation - Integral Life Cycle. Case Study
Topic 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 Project Management	- PMBOK versus PRINCE2 - AGILE practices and methodologies. Scrum
Topic 4: Project planning, monitoring and control	- Key processes of project management - Case studies and exercises
Topic 5: Project Management Tools	- Classic techniques and tools - Computer tools. Introduction to Microsoft Project - Case studies
Topic 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 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.

Personalized assistance	
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 B4 C4 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 C4 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 C4 D5
Objective questions exam	Test that assesses knowledge and includes closed questions with different answer 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 C4 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: the T activity covers topics 1, 4 and 5 of the subject.	10	A9 A10 B4 C4 D4 D5

Other comments on the Evaluation

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**, 7ª Edición, Project Management Institute, 2021

Complementary Bibliography

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Recommendations

IDENTIFYING DATA				
Deseño de arquitecturas TIC				
Subject	Deseño de arquitecturas TIC			
Code	P52M182V01202			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1	2c
Teaching language	Castelán			
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 description	A arquitectura é a estrutura fundamental sobre a que se asintan os sistemas software. A arquitectura dun sistema software está formada polos seus elementos fundamentais, as propiedades visibles dos mesmos e as relacións que existen entre eles. Dentro das arquitecturas software empresariais destacan, entre outros, conceptos como as arquitecturas orientadas a servizos (SOA), os servizos web ou a xestión de procesos de negocio BPM (Business Proccess 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	
Code	
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.
C5	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.
D5	CT5 - Aprendizaxe e traballo autónomos.
D6	CT6 - Manexar apropiadamente recursos de información.

Resultados 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 básicas.	A6 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 desenvolvemento de solucións tecnolóxicas orientadas á integración de servizos.	A6 A7 A8 A9 A10 B1 B2 B5 B6 C6 D5
RA3. Concibir, despregar, organizar e xestionar servizos en contextos empresariais ou institucionais para mellorar os seus procesos de negocio.	A6 A7 A8 A9 A10 B2 B5 B6 C6 D5
RA4. Valorar a importancia para a organización dunha adecuada arquitectura tecnolóxica baseada en servizos.	A6 A7 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	
Topic	
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 Servizos	2.1 Arquitectura Orientada a 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	4.1 BPM: Características e antecedentes. 4.2 Implantación e implicacións na organización. 4.3 Ferramentas de soporte. 4.4 Modelización de procesos de negocio.
Tema 5: Arquitecturas na nube	5.1 Introdución ás arquitecturas na nube 5.2 Interconexión de servizos 5.3 Arquitecturas de microservizos

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 guidance only and does not take into account the heterogeneity 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 personalizada	
Methodologies	**Description**
Lección maxistral	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 (individual e/ou grupal).
Foros de discusión	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 (individual e/ou grupal).

Resolución de problemas	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 (individual e/ou grupal).
Prácticas de laboratorio	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 (individual e/ou grupal).
Seminario	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 (individual e/ou grupal).

Avaliación

	Description	Qualification	Training and Learning Results			
Foros de discusión	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 B5 B6	C6	D5 D6
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	B1 B2 B5	C6	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	B1 B2 B5	C6	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 B2 B5	C5 C6	D5 D6

Other comments on the Evaluation

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

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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

IDENTIFYING DATA				
Planning and management of ICT infrastructures				
Subject	Planning and management of ICT infrastructures			
Code	P52M182V01203			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros Suarez Lorenzo, Fernando			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	This course enables students to learn the knowledge and application of the processes required to manage an ICT infrastructure aligned with business requirements. Define the processes, interfaces and dependencies 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 system and 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 student will be able to make strategic decisions that integrate them.			

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-directed 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.
C6	CE6 - Plan and manage ICT infrastructures.
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.

Expected results from this subject	
Expected results from this subject	Training and Learning Results

LO1: Know how to implement, configure and maintain virtualisation services on servers.	A6 A7 A8 B1 B2 B3 B6 C6 D3 D4
LO2: Understand the main architectures of high availability systems.	A6 B1 B2 B3 B6 C6 D3 D4
LO3: Know how to implement and configure high availability systems based on standard servers.	A6 A7 A8 A9 B1 B2 B3 B6 C6 D3 D4
LO4: To know the basics of hardware planning in large installations, as well as its integration with communications systems.	A7 A8 A9 B1 B2 B3 B6 C6 D3 D4
LO5: Know how to deal with the management of large system infrastructures	A6 A8 A10 B1 B2 B3 B6 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
LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware	A6 A8 B1 B2 B3 B6 C6 D3 D4

Contents	
Topic	
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 Resources.	4.1. High availability: load balancing, distributed computing and clustering. 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 and control	7.1. CPD monitoring. 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 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.
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 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.
Studies excursion	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.
Seminars	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.

Assessment

	Description	Qualification	Training 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 discussion forum activity (F) will be carried out during the distance phase.	20	A6 A7 A8 A10 B1 B2 B6 C6 D4
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 B2 B3 B6 C6 D4
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 the face-to-face phase.	30	A6 A7 A8 A9 B1 B2 B3 B6 C6 D3 D4

Other comments on the Evaluation

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.

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

indicated in the teaching guide in Spanish will always prevail.

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.

IDENTIFYING DATA				
Satellite communication systems, positioning, remote sensing and radionavigation				
Subject	Satellite communication systems, positioning, remote sensing and radionavigation			
Code	P52M182V01204			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
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://moovi.uvigo.gal			
General description	The course of Satellite Communications Systems, Positioning, Remote Sensing and Radionavigation aims to provide students with an overview of the main satellite communications systems. Radionavigation Systems aims to provide students with an overview of the main remote positioning and communication systems. communication and remote positioning systems. The course details the technologies involved, regulatory and safety aspects of this type of systems. regulatory and safety aspects of this type of systems.			

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-directed 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 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 characteristics their most outstanding characteristics.	A9 A10 B1 B2 B5 C12 C13 D4 D5

Contents

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

Planning

	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 assistance	
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.

Assessment				
	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 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.	40	A6 A7 A8 A9	B1 C12 D4 B2 C13 B5
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.	20	A6 A7 A8 A9 A10	B1 C12 D4 B2 C13 D5 B5

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	B1 B2 B5	C12 C13	D4 D5
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	B1 B2 B5	C12 C13	D4 D5

Other comments on the Evaluation

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

IDENTIFYING DATA				
Seguridade en sistemas de telecomunicacións				
Subject	Seguridade en sistemas de telecomunicacións			
Code	P52M182V01205			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Optional	1	2c
Teaching language	Castelán			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros Zamorano Pinal, Carlos			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	Esta materia proporciona unha descrición xeral da seguridade nas redes de telecomunicación modernas. Abordaranse contidos como a protección e interceptación das comunicacións, así como a aplicación de distintas tecnoloxías que permitan dispor de comunicacións seguras nos distintos medios de transmisión.			

Resultados de Formación e Aprendizaxe	
Code	
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.
B3	CG3 - Dirixir, planificar, coordinar, organizar e/ou supervisar tarefas, proxectos e/ou grupos humanos. Traballar cooperativamente en equipos multidisciplinares actuando, no seu caso, como integrador/a de coñecementos e liñas de traballo.
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.
B7	CG7 - Valorar a importancia dos aspectos de seguridade na xestión de sistemas e información, identificando necesidades de seguridade, analizando posibles ameazas e riscos e contribuíndo á definición e avaliación de criterios e políticas de seguridade.
C14	CISTT3 - Definir, analizar e implantar as medidas de seguridade en sistemas de telecomunicacións en función do dominio da información manexada.
D5	CT5 - Aprendizaxe e traballo autónomos.
D6	CT6 - Manexar apropiadamente recursos de información.

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 B6 B7 C14 D5 D6
RA3. Coñecer e aplicar técnicas de securización das comunicacións.	A6 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

RA6. Coñecer e configurar redes privadas de forma segura.	A6 A7 A8 A9 A10 B1 B3 B6 B7 C14 D5 D6

Contidos	
Topic	
Tema 1: Tecnoloxías e técnicas de protección das comunicacións.	- Xestión baseada en regras - 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 interceptación das comunicacións.	- Tecnoloxías de interceptación das comunicacións. - Técnicas de interceptación das comunicacións.
Tema 3: Protocolos de aplicación á seguridade das comunicacións.	- Controis de ciberseguridade - 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 de rede (incluídos sistemas de control de acceso centralizados).	- Devasas - Routers - 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 guidance only and does not take into account the heterogeneity 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.

Atención personalizada

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	Training and Learning Results			
Resolución de problemas	Actividade na que se formulan problemas e/ou exercicios relacionados coa materia. O alumno/a debe desenvolver as solucións axeitadas e correctas. Avaliarase (RP) mediante un entregable na fase a distancia.	20	A6 A7 A8 A9 A10	B1 B3 B6 B7	C14	D5 D6

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 B1 C14 D5 A7 B3 D6 A8 B6 A9 B7 A10
Exame de preguntas de desenvolvemento	Proba 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.	40	A6 B1 C14 D5 A7 B3 D6 A8 B6 A9 B7 A10
Traballo	Texto 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.	20	A6 B1 C14 D5 A7 B6 D6 A8 B7 A9
Estudo de casos	Feito, 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 tódolos contidos da materia por medio dun entregable na fase presencial.	10	A6 B1 C14 D5 A7 B3 D6 A8 B6 A9 B7 A10

Other comments on the Evaluation

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.

Bibliografía. Fontes de información

Basic Bibliography

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+ (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

Subjects that it is recommended to have taken before

Redes e sistemas de telecomunicación/P52M182V01104
Seguridade da información/P52M182V01106

IDENTIFYING DATA				
Services and software applications				
Subject	Services and software applications			
Code	P52M182V01206			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The subject of Software Services and Applications aims to provide students with a generalised vision of the concepts of distributed applications, client-server models and web services, with special emphasis on the development and management methodologies currently in force.			

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-directed 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.
C17	CISTI3 - Define and implement technologies and methodologies in the development of systems, applications and software services in web, distributed, mobile environments, etc.
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: Know the existing web engineering methodologies.	A8 B1 B2 B3 C17
LO2: Understand the inner workings of a web service, and the different technologies currently available to implement them.	A7 B1 B2 B3 C17 D4 D5
LO3: Understand the basic principles of distributed computing and systems and their differences with centralised systems.	B1 B2 B3 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

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

Planning

	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 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/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.

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.

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	Training and Learning Results			
Discussion Forum	Activity carried out in a virtual environment where a variety of current issues 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. Participation in the forums (F) carried out during the distance phase will be evaluated.	10	A6 A7 A8 A9 A10	B1 B2	C17	D4 D5
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. To be assessed (AV) during the distance phase.	30	A7	B1 B2	C17	
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 test (EO) will take place during the face-to-face phase.	25	A6 A8 A9 A10	B1 B2 B3	C17	D4 D5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the course or the results of a work, exercise, project, etc. Through the presentation, knowledge, skills and attitudes can be evaluated. Esta actividad de presentación (P) se realizará en la fase a distancia.	20	A6 A7 A8 A9 A10	B1		D4 D5
Essay questions exam	Test (EP) that assesses knowledge and includes open-ended essay questions about the practices carried out during the face-to-face phase.	15	A6 A7 A8 A9 A10	B1 B2 B3	C17	D4 D5

Other comments on the Evaluation

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

IDENTIFYING DATA				
Security in information systems				
Subject	Security in information systems			
Code	P52M182V01207			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros Vales Alonso, Javier			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The subject of Security in information systems will show the techniques, protocols and architectures related to security that exist at the different levels of implementation of a modern information system, with a particular emphasis on the communications part. The subject will focus on the clear exposition of 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 self-directed 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 software can be made more secure.	A6 A7 A8 A9 A10 B1 B2 B7 C18

LO2: Describe the problems, threats and solutions used at different levels of a communications system/service.	A6 A7 A8 A9 A10 B1 B2 B7 C18
LO3: Describe the modern technical foundations of cryptography on which symmetric key and public key systems are based.	A6 A7 A8 A9 A10 B1 B2 B7 C18
LO4: Study public key infrastructure systems, including in detail how the creation, maintenance, distribution, use, storage and revocation of digital certificates will be addressed.	A6 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 D6

Contents	
Topic	
Topic 1. Introduction to security in information systems.	- Introduction to Data Centres. - 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 - Elliptic Curve Cryptography (ECC)
Topic 5. Digital signatures.	- MAC and Hash systems - MD5 - SHA - HMAC
Topic 6. Key distribution systems and authentication.	- Introduction - Kerberos - X509 - Public key infrastructure (PKI)
Topic 7. Transport and web security.	- Motivation - SSL - TLS - SSH

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

Planning

	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 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	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.

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 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.
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	Training and Learning 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 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.	40	A6 A7 A8 A9 A10 B1 B2 B7 C18 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.	10	A6 A7 A8 A9 A10 B1 B2 B7 C18 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.	20	A6 A7 A8 A9 A10 B1 B2 B7 C18 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).	30	A6 A7 A8 A9 A10 B1 B2 B7 C18 D4

Other comments on the Evaluation

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