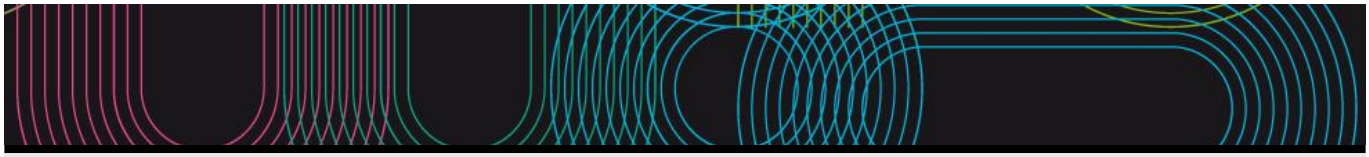

(*)Centro Universitario da Defensa da Escola Naval Militar de Marín

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	ICT 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

Year 2nd

Code	Name	Quadmester	Total Cr.
P52M182V01301	Digital transformation and innovation	1st	3
P52M182V01302	Regulations and legislation	1st	3
P52M182V01303	Wireless and optical communication systems	1st	3
P52M182V01304	Broadband networks	1st	3
P52M182V01305	Computer Systems	1st	3

P52M182V01306	Storage and information management	1st	3
P52M182V01307	Master□s final dissertation	1st	6

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	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Rodríguez Rodríguez, Francisco Javier			
Lecturers	Ares Tarrío, Miguel Ángel 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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG3	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.
CG6	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.
CE1	CE1 - Acquire knowledge and skills to develop effective leadership for the digital transformation of an organization.
CE2	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.
CE3	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.
CE4	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.
CT1	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.
CT3	CT3 - Incorporate criteria of sustainability and environmental commitment into professional practice. Acquire skills in the equitable, responsible and efficient use of resources.

Learning outcomes	
Learning outcomes	Competences

LO1: Know a complete vision of the strategic management of the company.	CB10 CG1 CG3 CG6 CE1 CT1 CT3
LO2: Understand the concept of ICT strategic alignment.	CB10 CG1 CG3 CG6 CE1 CE2 CE4 CT1 CT3
LO3: ICT governance and related standards: ISO 38.500, COBIT 5.	CB6 CB7 CB10 CG1 CG3 CG6 CE4 CT1 CT3
LO4: Understand the functioning of the value chain and its generation and the use of technology to support processes.	CB7 CB10 CG1 CG3 CG6 CE1 CE3 CT1 CT3
LO5: Understand the use of balanced scorecards and ICT performance indicators.	CB7 CB9 CB10 CG1 CG3 CG6 CE1 CE2 CT1 CT3
LO6: Understand how human resource management contributes to strategic objectives.	CB7 CB8 CB10 CG1 CG3 CG6 CE1 CT1 CT3

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
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 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	Evaluated Competencess			
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.	50	CB7 CB8 CB9 CB10	CG1 CG3 CG6	CE1 CE2 CE3 CE4	CT1 CT3
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.	10	CB6 CB10	CG1 CG3 CG6	CE1 CE2	CT1 CT3
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.	20	CB6 CB7 CB8 CB10	CG1 CG3 CG6	CE1 CE2 CE3 CE4	CT1 CT3
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.	20	CB7 CB8 CB9 CB10	CG1 CG3 CG6	CE1 CE3	CT1 CT3

Other comments on the Evaluation

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.

Fraud or attempted fraud on the part of the student in the evaluation process (copying or plagiarism or facilitating it to third parties) will be penalised by giving the student a failing grade (0.0) in the exam session in which it occurs.
In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.

Sources of information

Basic Bibliography

Complementary Bibliography

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

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

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

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

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

Recommendations

Subjects that are recommended to be taken simultaneously

ICT process management and continuous improvement/P52M182V01102

IDENTIFYING DATA				
ICT process management and continuous improvement				
Subject	ICT process management and continuous improvement			
Code	P52M182V01102			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Type	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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG3	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.
CG4	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.
CE1	CE1 - Acquire knowledge and skills to develop effective leadership for the digital transformation of an organization.
CE2	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.
CE3	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.
CE5	CE5 - Define and implement standard models, establishment of standards and reference methodologies and taxonomy of ICT services and information security.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences

LO1. Understand what BPM process management is and learn to identify and document them.	CG1 CE1 CE3
LO2. Understand the organization of processes at different levels of the organization, process maps.	CB9 CG1 CG4 CE5
LO3. Identification of critical processes and definition of process improvements.	CB6 CB7 CG1 CG4 CE1 CT5
LO4. Understand Process Management as a basis for improvement models and tools such as ISO 9000-PECAL21XX, EFQM.	CB6 CB8 CB10 CG1 CG3 CE1 CE2 CE3 CE5 CT5
LO5. Know the maturity models, CMM.	CG1 CE1 CE2 CE3 CE5

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	48	48
Lecturing	6	6	12
Problem solving	4	4	8
Practices through ICT	7	0	7
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	Evaluated Competencess
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.	40	CB8 CG1 CE2 CG3 CE3 CG4 CE5
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. Participation in the forums will be evaluated.	15	CB6 CG1 CE1 CT5 CB10 CG4
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.	25	CB6 CG1 CE1 CT5 CB7 CG4 CE3

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.	20	CB9	CG1 CE1 CG3 CG4

Other comments on the Evaluation

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.

Fraud or attempted fraud on the part of the student in the evaluation process (copying or plagiarism or its facilitation to third parties) will be penalized by giving the student a failing grade (0.0) in the call in which it occurs.

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

Harrington, H. James; Erik K. C. Esseling; H. van Nimwegen, **Business Process Improvement Workbook: Documentation, Analysis, Design, and Management of Business Process Improvement.**, McGraw - Hill Professional, 1997

Trischler, W. E., **Mejora del valor añadido en los procesos**, Ediciones Gestión 2000 S.A., 1998

Ferrando Sánchez, Miguel; Granero Castro, Javier, **Calidad total: modelo EFQM de excelencia**, 2, Fundación Confemetal, 2005

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

Eileen C. Forrester, Brandon L. Buteau, Sandy Shrum, **CMMI for Services: Guidelines for Superior Service (SEI Series in Software Engineering)**, Addison-Wesley, 2011

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David Hoyle, **ISO 9000, Manual de Sistema de Calidad**, Paraninfo, 1996

Hoyle, David, John Thompson, **Del aseguramiento a la gestión de la calidad: el enfoque basado en procesos.**, AENOR, 2005

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Jan Gillett, Paul Simpson, Susannah Clarke, **Implementing ISO 9001:2015: Thrill your customers and transform your cost base with the new gold standard for business management**, Infinite Ideas Limited, 2015

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D. R. Kiran, **Total Quality Management: Key Concepts and Case Studies**, Butterworth-Heinemann, 2016

Hoyle, David, **ISO 9000 Quality Systems Handbook-updated for the ISO 9001: 2015 standard: Increasing the Quality of an Organization□s Outputs**, Routeledge, 2017

Dan Duffy, **Business Process Improvement (Workshop in a Workbook)**, 2019

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

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				
Xestión de servizos e calidade do servizo				
Subject	Xestión de servizos e calidade do servizo			
Code	P52M182V01103			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	4	Mandatory	1	1c
Teaching language	Castelán			
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	A materia de Xestión de servizos e calidade de servizo pretende ofrecer aos alumnos unha aproximación suave ao mundo do Service Management. Utilizarase como marco de traballo a metodoloxía ITIL nas súas versións ITIL v3 2011 e ITIL v4. Non é o obxecto a preparación para unha certificación ITIL, pero facilitaranse preguntas de test de certificación para unha maior comprensión. O obxectivo é comprender os conceptos de xestión de servizos e poder alcanzar unha base teórica para a súa aplicación práctica e implantación utilizando material de referencia ou outros recursos necesarios. Reforzarase con análise de casos de uso de historia e modelos de xestión de diferentes compañías de servizos e organismos.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG3	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.
CG4	CG4 - Ser un/unha profesional comprometido/a coa calidade, cos prazos e coa adecuación das solucións, non só no exercicio da profesión senón tamén no ámbito social, incluíndo un compromiso coa sustentabilidade económica, ética e ambiental.
CE2	CE2 - Dispoñer de capacidades en relación co Goberno TIC e os Servizos de Xestión, Operación e Mantemento dos Sistemas e Tecnoloxías da Información e as Comunicacións e a Seguridade da Información.
CE5	CE5 - Definir e implantar modelos normalizados, establecemento de estándares e metodoloxías de referencia e taxonomía de servizos TIC e de seguridade da información.
CT4	CT4 - Capacidade de comunicación oral e escrita de coñecementos.

Resultados de aprendizaxe	
Learning outcomes	Competences
RA1: Entender a definición de servizo e a súa aplicabilidade no ámbito de traballo	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4

RA2: Coñecer modelos de éxito de aplicación de xestión de servizo	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4
RA3: Coñecer o marco de traballo ITIL a alto nivel	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4
RA4: Identificar oportunidades de aplicación no traballo actual	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4

Contidos	
Topic	
Tema 1: Introdución á xestión de servizos	- Definición de Servizo e Estratexia de Servicio - A xestión de servizos. Introdución a ITSM - Que é ITIL. ITIL v3 2011 / ITIL v4 - ITIL - Service Strategy.
Tema 2: Deseño e Transición de Servizo	- ITIL - Service Design - ITIL - Service Transition
Tema 3: Operación de Servizo	- ITIL - Service Operation
Tema 4: Mellora Continua do Servizo, ITIL v4. DevOps	- ITIL - Service Improvement - ITIL v4 - DevOps

Planificación			
	Class hours	Hours outside the classroom	Total hours
Estudo previo	0	58	58
Lección maxistral	12	10	22
Estudo de casos	7	0	7
Foros de discusión	0	10	10
Exame de preguntas de desenvolvemento	1	0	1
Presentación	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
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 dos contidos da materia obxecto de estudo, bases teóricas e/ou directrices dun traballo ou exercicio que o/a estudante ten de desenvolver.
Estudo de casos	Análise dun feito, problema ou suceso real coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipótese, contrastar datos, reflexionar, completar coñecementos, diagnosticalo e adestrarse en procedementos alternativos de solución.

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: levarase 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.
Estudo de casos	Dado o carácter semipresencial do curso, distinguiremos dous casos: (1) Atención na fase a distancia: levarase 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	Evaluated Competencess
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. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase a participación nos foros.	20	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4
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.	60	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4
Presentación	Exposición por parte do alumnado, de maneira individual ou en grupo, dun tema relacionado cos contidos da materia ou dos resultados dun traballo, exercicio, proxecto, etc. A través da presentación pódense avaliar coñecementos, habilidades e actitudes.	20	CB6 CB7 CB8 CB9 CB10 CG3 CG4 CE2 CE5 CT4

Other comments on the Evaluation

Será necesario obter polo menos o 50% da calificación 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) nas datas establecidas para ese efecto pola Comisión Académica de Máster. A avaliación da convocatoria extraordinaria realizarase en modalidade a distancia e consistirá nunha única proba escrita que suporá o 100% da cualificación, sendo necesario obter polo menos o 50% para superar a materia.

A fraude ou intento de fraude por parte do alumno no proceso de avaliación (copia ou plaxio ou facilitarllo a terceiros) será penalizado outorgándolle directamente unha cualificación de suspenso (0.0) na convocatoria na que se produza.

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

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

Recomendacións

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	Type	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros Troncoso Pastoriza, Francisco Manuel			
E-mail	mfgavilanes@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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG3	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.
CG6	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.
CE7	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.
CT4	CT4 - Oral and written communication skills.

Learning outcomes	
Learning outcomes	Competences
LO1: Know the technological basis on which telematics and data transmission are based.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CE7 CT4

LO2: Understand the basic principles and architectures of communication networks and services.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CE7
LO3: Know the main components of ICT infrastructures.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CE7 CT4
LO4: Know the methods of network management and planning.	CB6 CB7 CB8 CB9 CB10 CE7 CT4
LO5: Know military communication systems.	CB6 CB7 CB8 CB9 CB10 CE7 CT4

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	6	6
Discussion Forum	0	1	1
Self-assessment	0	3	3

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	Evaluated Competencess
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.	30	CB6 CB7 CB8 CG1 CG3 CG6 CE7
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.	10	CB6 CB7 CB8 CB9 CG1 CG3 CE7
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.	30	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CE7 CT4
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.	30	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CE7

Other comments on the Evaluation

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:

Self-assessment activities (test): 40% with the following associated competences CB6, CB7, CB8, CG1, CG3, CG6, CE7.

Assessment of deliverables (assignments): 60% with the following associated competences CB6, CB7, CB8, CB9, CB10, CG1, CG3, CE7, CT4.

ETHICAL COMMITMENT:

Students are expected to behave ethically in an appropriate manner. If unethical behaviour (copying, plagiarism, use of unauthorised electronic devices or others) is detected, the student will be penalised by being awarded a mark of 0 in the exam session in which it occurs.

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

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	Type	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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG5	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.
CE8	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.
CT4	CT4 - Oral and written communication skills.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences
LO1. To know how to identify the architecture and components of a given service model.	CB6 CB7 CB8 CB9 CB10 CG1 CG5 CE8 CT4 CT5

LO2. To understand the different models for information storage	CB6 CB7 CB8 CB9 CB10 CG1 CG5 CE8 CT4 CT5
LO3. To understand the basic principles of information classification and analysis.	CB6 CB7 CB8 CB9 CB10 CG1 CG5 CE8 CT4 CT5
LO4. To know the fundamental elements of information interface design.	CB6 CB7 CB8 CB9 CB10 CG1 CG5 CE8 CT4 CT5
LO5. To understand the basic characteristics of information systems and their impact on the use of information systems.	CB6 CB7 CB8 CB9 CB10 CG1 CG5 CE8 CT4 CT5
LO6. To know the basic principles of information systems in the military area.	CB6 CB7 CB8 CB9 CB10 CG1 CG5 CE8 CT4 CT5

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	Evaluated Competencess
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.	5	CB8 CE8 CT5 CB10
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.	35	CB6 CG1 CE8 CT4 CB7 CG5 CB9
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.	15	CB8 CG1 CE8 CT5 CB10

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.	45	CB6 CB7	CG1 CE8 CT4

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 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 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.

Fraud or attempted fraud on the part of the student in the evaluation process (copying or plagiarism or facilitating it to third parties) will be penalised by giving the student a grade of 0 in the call in which it occurs.

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**, 9786071503145, 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**, 8498367808, COMARES, 2011

Brendan Burns, **Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services**, 1491983647, 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	Type	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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG3	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.
CG6	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.
CG7	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.
CE9	CE9 - Manage information security in regulatory, technical and methodological aspects.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences
LO1 - Relate the terminology and essential concepts, both from a conceptual and technical point of view in the field of information security.	CB6 CB7 CB8 CB9 CB10 CG1 CG6 CG7 CE9 CT5

LO2 - Know the threats and vulnerabilities posed by new technologies, the most common types of computer attacks and ways to protect against them.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE9 CT5
LO3 - Know the fundamentals, applications and uses of modern cryptography.	CB6 CB7 CB8 CB9 CB10 CG1 CG7 CE9 CT5
LO4 - Be able to design and evaluate appropriate measures for user identification and authentication, as well as the management of identities and associated authorizations.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE9 CT5

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	Evaluated Competencess			
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.	70	CB6 CB7 CB8 CB9 CB10	CG1 CG6 CG7	CE9	CT5
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.	30	CB6 CB7 CB8 CB9 CB10	CG1 CG3 CG7	CE9	CT5

Other comments on the Evaluation

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

A continuous evaluation mechanism will be used, with the purpose of monitoring the evolution of the student throughout the course, evaluating his overall effort.

There will be two written tests: one at the beginning of the face-to-face phase, in which the contents taught in the distance learning phase will be evaluated, which will account for 20% of the grade; and one at the end of the face-to-face phase, in which all the contents of the course will be evaluated (including the contents of the distance learning phase and the classroom phase), which will account for 50% of the grade.

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.

Fraud or attempted fraud on the part of the student in the evaluation process (copying or plagiarism or its facilitation to third parties) will be penalized by giving the student a grade of 0 in its corresponding exam session.

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				
Xestión da seguridade e análise de riscos				
Subject	Xestión da seguridade e análise de riscos			
Code	P52M182V01107			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	4	Mandatory	1	1c
Teaching language	Castelán			
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	A materia de Xestión da Seguridade e Análise de Riscos pretende ofrecer aos alumnos unha visión xeral dos Sistemas de Xestión da Seguridade da Información (SXSI), coa descrición dos fundamentos dos estándares existentes para a certificación dun SXSI, e prestando especial atención ás metodoloxías de análises e xestión de riscos, así como aos plans de resposta a incidentes de seguridade.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG1	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.
CG2	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.
CG3	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.
CG6	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.
CG7	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.
CE9	CE9 - Xestionar a seguridade da información nos aspectos normativo, técnico e metodolóxico.
CT6	CT6 - Manexar apropiadamente recursos de información.

Resultados de aprendizaxe	
Learning outcomes	Competences

RA1. Entender o concepto de Xestión de Riscos e valorar a súa importancia nos Sistemas TIC.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CG7 CE9 CT6
RA2. Comprender as características o proceso de certificación dun SXSI.	CB9 CB10 CG1 CG7 CE9 CT6
RA3. Estudar as metodoloxías e ferramentas dispoñibles para analizar e xestionar os riscos.	CB7 CB10 CG1 CG3 CG6 CG7 CE9 CT6
RA4. Coñecer a política e xestión da seguridade da información no MINISDEF e as recomendacións emitidas polo CCN.	CB10 CG7 CE9 CT6
RA5. Valorar o alcance e a metodoloxía que deben seguir as auditorías de seguridade de sistemas TIC.	CB7 CB8 CB9 CB10 CG2 CG6 CG7 CE9 CT6
RA6. Entender como se pode levar a cabo unha correcta xestión de incidentes de seguridade.	CB7 CB8 CB10 CG2 CG6 CG7 CE9 CT6

Contidos	
Topic	
Tema 1: Introdución á Xestión da Seguridade da Información	- A importancia estratéxica da información e os activos dixitais - O proceso de xestión da seguridade da información. - Definición de Políticas, Plans e Procedementos de Seguridade. - Os profesionais da Seguridade da Información: Competencias, formación e certificacións.
Tema 2: Análise e Xestión de Riscos	- O proceso de identificación, análise e avaliación de riscos. - Revisión das principais vulnerabilidades e tipos de ataques a sistemas informáticos. - Tratamento dos riscos. - Metodoloxía MAGERIT. - O modelo proposto pola ISO 31000.
Tema 3: Sistema de Xestión de Seguridade da Información	- Características dun SXSI. - Certificacións e estándares de seguridade: ISO 27001 e ENS. - Política e xestión da seguridade da información no MINISDEF. - Normativa STIC do CCN.
Tema 4: Auditorías de seguridade e resposta a incidentes	- O proceso de auditoría da seguridade da información. - Xestión de incidentes de seguridade.

Tema 5: A importancia do factor humano na seguridade da información	- Aspectos a considerar relacionados co factor humano e a seguridade. - Técnicas de Enxeñaría Social. - Ataques de Phishing. - Definición de políticas de uso seguro e aceptable dos recursos informáticos.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	5	5
Estudo previo	0	55	55
Lección maxistral	16	8	24
Resolución de problemas	2	2	4
Foros de discusión	0	5	5
Autoavaliación	0	3	3
Presentación	3	0	3
Exame de preguntas de desenvolvemento	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
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.
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	Exponse dous métodos de atención personalizada: (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	Exponse dous métodos de atención personalizada: (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	Evaluated Competencess	
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. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase a participación nos foros.	10	CB6 CB7 CB10	CE9 CT6
Autoavaliación	Mecanismo no que, por medio dunha serie de preguntas ou actividades, posibilítase que o alumno/a avalíe de maneira autónoma o seu grao de adquisición de coñecementos e habilidades sobre a materia, permitindo unha autorregulación do proceso de aprendizaxe persoal.	20	CG1	CE9 CT6

Presentación	Exposición por parte do alumnado, de maneira individual ou en grupo, dun tema relacionado cos contidos da materia ou dos resultados dun traballo, exercicio, proxecto, etc. A través da presentación pódense avaliar coñecementos, habilidades e actitudes.	35	CB7 CB8 CB9 CB10	CG1 CG2 CG3 CG6 CG7	CE9	CT6
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.	35	CB10	CG1	CE9	CT6

Other comments on the Evaluation

Para superar a materia será necesario alcanzar unha cualificación do 50% ou superior no conxunto das avaliacións da 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 proceso de avaliación en convocatoria extraordinaria será o mesmo que en convocatoria ordinaria. A presentación e a proba escrita realizaranse utilizando medios telemáticos. O alumno terá a opción de gardar as cualificacións obtidas na convocatoria ordinaria durante o mesmo curso académico.
A fraude ou intento de fraude por parte do alumno no proceso de avaliación (copia ou plaxio ou facilitalo a terceiros) será penalizado outorgándolle directamente unha cualificación de suspenso (0.0) na convocatoria. (Sen prexuízo das posibles medidas que poida tomar a universidade fronte a estes casos.
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

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

Recomendacións

Subjects that are recommended to be taken simultaneously

Sistemas de información/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	Type	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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG2	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.
CG4	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.
CG5	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.
CE4	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.
CT3	CT3 - Incorporate criteria of sustainability and environmental commitment into professional practice. Acquire skills in the equitable, responsible and efficient use of resources.
CT4	CT4 - Oral and written communication skills.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences
LO1: Understand the basic concepts of systems engineering and its structure. Ability to apply them to practical examples and cases.	CB6 CB7 CG2 CE4 CT5
LO2: Basic knowledge of the main processes, activities and documents of project/programme management.	CB6 CE4
LO3: Knowledge of the main standards and methodologies for project management, in particular PMBOK and PRINCE2. Introductory knowledge of AGILE methods and practices.	CB6 CE4

LO4: Basic and introductory knowledge of the most commonly used IT tools in project management.	CB6 CE4 CT5
LO5: Theoretical and practical knowledge of the fundamentals of project planning, execution and control.	CB6 CB10 CG4 CE4 CT5
LO6: Ability to undertake the planning, programming, monitoring and control of a project in the field of CIS, ICT and SEGINFO.	CB7 CB8 CG2 CG4 CE4 CT3 CT4
LO7: Knowledge of the fundamentals of risk management and risk analysis in the framework of a project.	CB6 CB8 CG2 CE4 CT5
LO8: Ability to develop actions and make decisions that allow a satisfactory response to project risks.	CB7 CB8 CB9 CG2 CG5 CE4 CT4

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	48	48
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

*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	Evaluated Competencess			
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. They will be assessed by means of deliverables.	20	CB6 CB7	CG2 CG4	CE4	CT3 CT5

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 by means the presentation.	30	CB9 CB10	CG4	CE4	CT4 CT5
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. Participation will be assessed in the forums.	10	CB8	CG5	CE4	CT5
Objective questions exam	Test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.).	40	CB6	CG2	CE4	CT4 CT5

Other comments on the Evaluation

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.

Fraud or attempted fraud on the part of the student in the evaluation process (plagiarism or facilitating it to third parties) will be penalised by giving the student a failing grade (0.0) in the exam session in which it occurs.

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

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

Project Management Institute, **A Guide to the Project Management Body of Knowledge (PMBOK Guide)**, 6ª Edición, Project Management Institute, 2017

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INCOSE Systems Engineering Handbook, **A guide for system life cycle processes and activities**, 4ª Edición, INCOSE-International Council on Systems Engineerin, 2015

Reifer, Donald J., **Software War Stories: Case Studies in Software Management**, 1ª Edición, Wiley, 2013

Buchtik, Liliana, **Secretos para dominar la gestión de riesgos en proyectos**, 1ª Edición, Buchtikglobal, 2012

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

Hopkin, Paul, **Fundamentals of Risk Management: Understanding, Evaluating and Implementing Effective Risk Management**, 3ª Edición, Institute of Risk Management, 2014

Kerzner, Harold, **Project Management: A Systems Approach to Planning, Scheduling, and Controlling**, 12ª Edición, Wiley, 2017

Harris, Paul E., **Planning and Control Using Microsoft Project 2013 or 2016 and PMBOK Guide**, 5ª Edición, Eastwood Harris, 2016

Turley, Frank, **An Introduction to PRINCE2®**, Management Plaza, 2010

Highsmith, Jim, **Agile project management: creating innovative products**, 1ª Edición, Pearson Education, 2009

Sutherland, J., K. Schwaber, **The Scrum Guide: the definitive guide to Scrum**, Ken Schwaber and Jeff Sutherland, 2017

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	Type	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.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG1	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.
CG2	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.
CG5	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.
CG6	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.
CE5	CE5 - Definir e implantar modelos normalizados, establecemento de estándares e metodoloxías de referencia e taxonomía de servizos TIC e de seguridade da información.
CE6	CE6 - Planificar e xestionar infraestruturas TIC.
CT5	CT5 - Aprendizaxe e traballo autónomos.
CT6	CT6 - Manexar apropiadamente recursos de información.

Resultados de aprendizaxe	
Learning outcomes	Competences

RA1. Coñecer as arquitecturas software, a súa tipoloxía, paradigmas, a súa estrutura e características básicas.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG5 CG6 CE5 CE6 CT5 CT6
RA2. Entender en profundidade o deseño arquitectónico de aplicacións baseadas en servizos e desenvolvemento de solucións tecnolóxicas orientadas á integración de servizos.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG5 CG6 CE6 CT5
RA3. Concibir, despregar, organizar e xestionar servizos en contextos empresariais ou institucionais para mellorar os seus procesos de negocio.	CB6 CB7 CB8 CB9 CB10 CG2 CG5 CG6 CE6 CT5
RA4. Valorar a importancia para a organización dunha adecuada arquitectura tecnolóxica baseada en servizos.	CB6 CB7 CB8 CB9 CB10 CG2 CG5 CE6 CT5
RA5. Manexar os estándares de Servizos Web e as tecnoloxías asociadas.	CB6 CB7 CB8 CB9 CB10 CE5 CT5 CT6

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	Evaluated Competencess			
Foros de discusión	Participación con achegas orixinais e fundamentadas nos foros da materia.	10	CB6 CB7 CB8 CB9 CB10	CG2 CG5 CG6	CE6	CT5 CT6
Autoavaliación	Tarefas, resolución de exercicios, preguntas e tests *autoevaluables na aula virtual que deben ser realizadas polos estudantes de forma individual, autónomo e non presencial, sempre cunha data límite.	20	CB6 CB7 CB8 CB9	CG1 CG2 CG5	CE6	CT5 CT6
Presentación	Inclúe a preparación dun tema e a súa exposición oral.	30	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG5	CE6	CT5 CT6
Exame de preguntas obxectivas	Preguntas directas que o alumnado debe responder de maneira breve en base aos coñecementos que ten sobre a materia.	40	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG5	CE5 CE6	CT5 CT6

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.

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 os alumnos teñan un comportamento ético adecuado. Si detéctase un comportamento pouco ético (copia, plaxio, uso de dispositivos electrónicos non autorizados ou outros) penalizarase ao alumno outorgándolle directamente unha cualificación de 0 na convocatoria na que se produza.

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

Bibliografía. Fontes de información

Basic Bibliography

Jos Dirksen, **SOA Governance in Action: REST and WS-* Architectures**, 1º Edición, Manning Publications, 2012

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

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

Complementary Bibliography

Robert C. Martin, **Clean Architecture: A Craftsman's Guide to Software Structure and Design**, Prentice Hall, 2017

Michael J. Kavis, **Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)**, Wiley, 2014

Recomendacións

IDENTIFYING DATA				
Planificación e xestión de infraestructuras TIC				
Subject	Planificación e xestión de infraestructuras TIC			
Code	P52M182V01203			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	4	Mandatory	1	2c
Teaching language	Castelán			
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	Esta materia permite aos estudantes aprender os coñecementos e a aplicación dos procesos necesarios para a xestión dunha infraestrutura do TIC aliñada cos requisitos do negocio. Definir os procesos, os puntos de unión e as dependencias asociados co ciclo de vida da xestión das infraestruturas do TIC, entre os que se inclúe os plans estratéxicos, o deseño, a implantación, as operacións, e o soporte e o mantemento. Adquiriranse coñecementos de organización e xestión de proxectos que complementen aos coñecementos de integración de sistemas e redes, sistemas de almacenamento, arquitecturas paralelas e ambientes básicos de instalacións informáticas. Nesta materia estudaranse devanditos conceptos e a súa aplicación en contornas empresariais sendo o alumno capaz de tomar decisións estratéxicas que integren os mesmos.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG1	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.
CG2	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.
CG3	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.
CG6	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.
CE6	CE6 - Planificar e xestionar infraestruturas TIC.
CT3	CT3 - Incorporar no exercicio profesional criterios de sustentabilidade e compromiso ambiental. Adquirir habilidades no uso equitativo, responsable e eficiente dos recursos.
CT4	CT4 - Capacidade de comunicación oral e escrita de coñecementos.

Resultados de aprendizaxe	
Learning outcomes	Competences

RA1: Saber implantar, configurar e manter servizos de virtualización en servidores	CB6 CB7 CB8 CG1 CG2 CG3 CG6 CE6 CT3 CT4
RA2: Coñecer as principais arquitecturas dos sistemas de alta dispoñibilidade	CB6 CG1 CG2 CG3 CG6 CE6 CT3 CT4
RA3: Saber implantar e configurar sistemas de alta dispoñibilidade en base a servidores estándar	CB6 CB7 CB8 CB9 CG1 CG2 CG3 CG6 CE6 CT3 CT4
RA4: Coñecer as bases da planificación hardware en grandes instalacións, así como a súa integración cos sistemas de comunicacións	CB7 CB8 CB9 CG1 CG2 CG3 CG6 CE6 CT3 CT4
RA5: Saber abordar a xestión de grandes infraestruturas de sistemas	CB6 CB8 CB10 CG1 CG2 CG3 CG6 CE6 CT3 CT4
RA6: Coñecer exemplos reais de grandes infraestruturas TIC en empresas e/ou administracións	CB7 CB9 CB10 CG1 CG2 CG3 CG6 CE6 CT3 CT4
RA7: Saber aplicar eficientemente un soporte de comunicacións a unha infraestrutura hardware	CB6 CB8 CG1 CG2 CG3 CG6 CE6 CT3 CT4

Contidos	
Topic	
Tema 1: Introdución ás grandes infraestruturas TIC.	1.1. Introdución aos Centros de Datos. 1.2. Estrutura habitual 1.3. Administración de Centros e Proceso de Datos
Tema 2: Planificación da infraestrutura	2.1. Elementos e organización física dun CPD. 2.2. Requisitos de deseño e normativas. 2.3. Elementos e dispositivos para xestión de rede.
Tema 3: Infraestrutura de comunicacións	3.1. Redes de comunicacións: topoloxías, protocolos, elementos de conexión. 3.2. Seguridade en rede: VPN e Firewalling
Tema 4: Xestión e Planificación de Recursos Virtualizados	4.1. Alta dispoñibilidade: balanceo de carga, computación distribuída e clustering. 4.2. Virtualización
Tema 5: Cloud Computing	5.1. Introdución ao Cloud Computing 5.2. Ferramentas 5.3. OpenStack e vCloud
Tema 6: Sistemas de almacenamento	6.1. Redes de almacenamento: topoloxías, protocolos, elementos de conexión. 6.2. Sistemas de almacenamento: arquitecturas e compoñentes. 6.3. Copias de Seguridade
Tema 7: Xestión, monitorización e control da infraestrutura	7.1. Monitorización de CPDs. 7.2. Avaliación e medidas de rendemento 7.3. Xestión de activos

Planificación			
	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	8	8
Estudo previo	0	53	53
Lección maxistral	8	8	16
Resolución de problemas	2	2	4
Saídas de estudo	4	0	4
Seminario	3	0	3
Foros de discusión	0	4	4
Autoavaliación	0	3	3
Presentación	3	0	3
Exame de preguntas de desenvolvemento	2	0	2
*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.
Saídas de estudo	Actividades de aplicación dos coñecementos nun contexto determinado nun espazo externo (centro de investigación, laboratorio, museo, institución, empresa, etc.) de interese académico-profesional para o alumnado.
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.
Saídas de estudo	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.

Avaliación

	Description	Qualification	Evaluated Competencess
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. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase a participación nos foros.	20	CB6 CG1 CE6 CT4 CB7 CG2 CB8 CG6 CB10
Autoavaliación	Mecanismo no que, por medio dunha serie de preguntas ou actividades, posibilítase que o alumno/a avalíe de maneira autónoma o seu grao de adquisición de coñecementos e habilidades sobre a materia, permitindo unha autorregulación do proceso de aprendizaxe persoal.	20	CB7 CG1 CE6 CT3
Presentación	Exposición por parte do alumnado, de maneira individual ou en grupo, dun tema relacionado cos contidos da materia ou dos resultados dun traballo, exercicio, proxecto, etc. A través da presentación pódense avaliar coñecementos, habilidades e actitudes.	30	CB6 CG1 CE6 CT4 CB7 CG2 CB8 CG3 CB9 CG6
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.	30	CB6 CG1 CE6 CT3 CB7 CG2 CT4 CB8 CG3 CB9 CG6

Other comments on the Evaluation

Será necesario alcanzar o 50% da cualificación para poder 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. No caso da avaliación na convocatoria extraordinaria, o peso repartirase ao 50 % entre a proba escrita e a presentación do traballo final da materia. Será necesario alcanzar polo menos o 50% da cualificación para poder superar a materia.
A fraude ou intento de fraude por parte do alumno no proceso de avaliación (copia ou plaxio ou facilitalo a terceiros) será penalizado outorgándolle directamente unha cualificación de suspenso (0.0) na convocatoria na que se produza.

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

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

Recomendacións

Other comments

Sería desexable a visita a algún Centro de Proceso de Datos a fin de visibilizar o coñecemento adquirido ao longo do desenvolvemento da materia.

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	Type	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Núñez Ortuño, José María			
Lecturers	Nocelo López, Rubén Núñez Ortuño, José María			
E-mail	jnunez@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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG2	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.
CG5	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.
CE12	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.
CE13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
CT4	CT4 - Oral and written communication skills.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences
LO1: Understand the mechanisms of satellite propagation and communications.	CB6 CB7 CG1 CG2 CE12 CE13 CT4 CT5

LO2: To know the basic operation of the different radionavigation systems existing today.	CB8 CG1 CG2 CG5 CE12 CT4 CT5
LO3: To know the basic operation of the different positioning systems currently existing.	CB9 CG1 CG2 CE12 CT4 CT5
LO4: To know the basic operation of the different remote sensing systems.	CB10 CG1 CG2 CE12 CT4 CT5
LO5: To know the different existing systems in the military field, as well as their most remarkable characteristics their most outstanding characteristics.	CB9 CB10 CG1 CG2 CG5 CE12 CE13 CT4 CT5

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	Evaluated Competencess			
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, one hour long, to control the monitoring of the duration, to control the follow-up of the subject. Each test of control has a weight of 20%.	40	CB6 CB7 CB8 CB9	CG1 CG2 CG5	CE12 CE13	CT4
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.	20	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG5	CE12 CE13	CT4 CT5
Problem and/or exercise solving	Resolution of different exercises proposed in class on assumptions applicable to each of the topics of the syllabus.	20	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG5	CE12 CE13	CT4 CT5

Laboratory practice	Evaluation of different laboratory practices related to the course syllabus by means of deliverable reports.	20	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG5	CE12 CE13	CT4 CT5

Other comments on the Evaluation

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

ETHICAL COMMITMENT :

Students are expected to engage in appropriate ethical behavior. If unethical behavior (copying, plagiarism, use of unauthorized electronic devices, or other) is detected, the student will be penalized with a 0.0 grade for the current term.

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	Type	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.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG1	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.
CG3	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.
CG6	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.
CG7	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.
CE14	CISTT3 - Definir, analizar e implantar as medidas de seguridade en sistemas de telecomunicacións en función do dominio da información manexada.
CT5	CT5 - Aprendizaxe e traballo autónomos.
CT6	CT6 - Manexar apropiadamente recursos de información.

Resultados de aprendizaxe	
Learning outcomes	Competences

RA1. Coñecer a base tecnolóxica sobre a que se apoia a protección das comunicacións.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE14 CT5 CT6
RA2. Coñecer as tecnoloxías e técnicas de interceptación de comunicacións e as súas contramedidas.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE14 CT5 CT6
RA3. Coñecer e aplicar técnicas de securización das comunicacións.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE14 CT5 CT6
RA4. Saber despregar e configurar redes inalámbricas de forma segura.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE14 CT5 CT6
RA5. Coñecer e configurar os dispositivos de protección de redes.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE14 CT5 CT6

RA6. Coñecer e configurar redes privadas de forma segura.	CB6 CB7 CB8 CB9 CB10 CG1 CG3 CG6 CG7 CE14 CT5 CT6

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	56	56
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
*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.

Avaliación

	Description	Qualification	Evaluated Competencess			
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 mediante entregables.	50	CB6 CB7 CB8 CB9 CB10	CG1 CG3 CG6 CG7	CE14	CT5 CT6
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.	50	CB6 CB7 CB8 CB9 CB10	CG1 CG3 CG6 CG7	CE14	CT5 CT6

Other comments on the Evaluation

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.
A fraude ou intento de fraude por parte do alumno no proceso de avaliación (copia ou plaxio ou facilitalo a terceiros) será penalizado outorgándolle directamente unha cualificación de suspenso (0.0) na convocatoria na que se produza
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				
Servizos e aplicacións software				
Subject	Servizos e aplicacións software			
Code	P52M182V01206			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	1	2c
Teaching language	Castelán			
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	A materia de Servizos e Aplicacións Software pretende ofrecer aos alumnos unha visión xeneralizada sobre os conceptos de aplicación distribuída, modelos de cliente-servidor e servizos web, facendo especial fincapé nas metodoloxías de desenvolvemento e xestión vixentes na actualidade.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG1	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.
CG2	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.
CG3	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.
CE17	CISTI3 - Definir e implantar as tecnoloxías e metodoloxías no desenvolvemento de sistemas, aplicacións e servizos software en contornas web, distribuídos, móbiles, etc.
CT4	CT4 - Capacidade de comunicación oral e escrita de coñecementos.
CT5	CT5 - Aprendizaxe e traballo autónomos.

Resultados de aprendizaxe	
Learning outcomes	Competences
RA1 - Coñecer as metodoloxías de enxeñaría web existentes.	CB8 CG1 CG2 CG3 CE17
RA2 - Comprender o funcionamento interno dun servizo web, e as diferentes tecnoloxías existentes na actualidade para implementarlos.	CB7 CG1 CG2 CG3 CE17 CT4 CT5

RA3 - Entender os principios básicos da computación e sistemas distribuídos e as súas diferenzas cos sistemas centralizados.	CG1 CG2 CG3 CE17
RA4 - Entender o concepto de middleware e coñecer os seus principios básicos de funcionamento.	CG1 CG2 CG3 CE17
RA5 - Coñecer os fundamentos da programación de aplicacións distribuída, e as diferentes tecnoloxías existentes.	CB10 CE17 CT4 CT5
RA6 - Coñecer os fundamentos básicos das aplicacións móbiles para os diferentes sistemas operativos existentes.	CB6 CB9 CE17 CT4 CT5

Contidos

Topic	
Tema 1: Introdución á enxeñaría web	- Introdución e características máis destacables - Enxeñaría web vs. Enxeñaría do software - Elementos básicos da Web - Perspectiva histórica
Tema 2: Tecnoloxía e servizos web	- Introdución - Servizos web dinámicos vs. Páxinas web estáticas - Características básicas - Arquitectura dun servizo web - Tecnoloxías máis comúns: frontend y backend
Tema 3: Sistemas distribuídos	- Arquitecturas máis comúns - Modelo Cliente-Servidor - Arquitecturas multicapa - Arquitecturas P2P e Grid
Tema 4: Metodoloxías de desenvolvemento e xestión web	- Características xerais - Metodoloxías tradicionais vs. Metodoloxías áxiles - Fases do proceso de desenvolvemento - Metodoloxías de desenvolvemento
Tema 5: Tecnoloxías de intermediación (middleware)	- Introdución e conceptos fundamentais - Aplicacións - Tipoloxía e características máis relevantes
Tema 6: Tecnoloxías aplicables ao desenvolvemento de aplicacións distribuídas	- Tecnoloxías máis comúns - Outras
Tema 7: Aplicacións en dispositivos móbiles	- Características xenéricas dos sistemas operativos móbiles máis importantes - Aplicacións nativas vs. Aplicacións web - Seguridade - Computación ubicua

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	5	5
Estudo previo	0	36	36
Lección maxistral	10	10	20
Resolución de problemas	1	2	3
Foros de discusión	0	2	2
Autoavaliación	0	3	3
Práctica de laboratorio	5	0	5
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
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.
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
Resolución de problemas	Atención na fase a distancia: Levarase 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.
Tests	**Description**
Práctica de laboratorio	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	Evaluated Competencess			
Autoavaliación	Mecanismo no que, por medio dunha serie de preguntas ou actividades, posibilitase que o alumno/a avalíe de maneira autónoma o seu grado de adquisición de coñecementos e habilidades sobre a materia, permitindo unha autorregulación do proceso de aprendizaxe persoal.	30	CB7	CG1 CG2	CE17	
Práctica de laboratorio	Actividades de aplicación dos coñecementos nun contexto determinado e de adquisición de habilidades básicas e procedimentais en relación coa materia, a través do uso das TIC. Avaliaranse mediante entregables.	20	CB6 CB10	CG2 CG3	CE17	CT4 CT5
Exame de preguntas obxectivas	Proba que avalía o coñecemento e que inclúe preguntas cerradas con diferentes alternativas de resposta (verdadeiro ou falso, elección múltiple, emparexamento de elementos, etc.). Os alumnos/as seleccionan unha resposta de entre un número limitado de posibilidades.	50	CB8 CB9	CG1 CG2	CE17	

Other comments on the Evaluation

Sendo necesario obter unha calificación mínima dun 50% 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) nas datas establecidas a tal efecto pola Comisión Académica de Máster. O proceso de avaliación desta segunda convocatoria realizarase na modalidade a distancia, seguindo o indicado a continuación:

Actividades de autoavaliación (test teoría) - 60%

Actividades de autoavaliación (test prácticas) - 40%

COMPROMISO ÉTICO :

Espérase que os alumnos teñan un comportamento ético axeitado. Si se detecta un comportamento pouco ético (copia, plaxio, uso de dispositivos electrónicos non autorizados ou outros) penalisarase ao alumno cunha calificaciónn en acta de 0.0 para a convocatoria en curso.

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

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

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

Qusay H. Mahmoud, **Middleware for Communications**, 978-0470862063, John Wiley & Sons, 2004

Joseph Ingeno, **Software Architect□s Handbook**, 978-1788624060, 1º, Packt Publishing, 2018

Recomendacións

Subjects that it is recommended to have taken before

Redes e sistemas de telecomunicación/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	Type	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.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG2	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.
CG7	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.
CE18	CISTI4 - Define, analyze and implement security mechanisms throughout the life cycle of information systems.
CT4	CT4 - Oral and written communication skills.
CT6	CT6 - Properly manage information resources.

Learning outcomes	
Learning outcomes	Competences
LO1: Understand the threats and vulnerabilities inherent in software development by showing how software can be made more secure.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG7 CE18

LO2: Describe the problems, threats and solutions used at different levels of a communications system/service.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG7 CE18
LO3: Describe the modern technical foundations of cryptography on which symmetric key and public key systems are based.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG7 CE18
LO4: Study public key infrastructure systems, including in detail how the creation, maintenance, distribution, use, storage and revocation of digital certificates will be addressed.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG7 CE18
LO5: Describe new applications and trends in the field of information systems security.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG7 CE18 CT4 CT6

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	8	8
Previous studies	0	52	52
Lecturing	8	8	16
Problem solving	2	2	4
Practices through ICT	4	0	4
Seminars	3	0	3
Discussion Forum	0	4	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.
Discussion Forum	Activity developed in a virtual environment in which various and 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 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	Evaluated Competencess			
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. They will be evaluated through deliverables.	30	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG7	CE18	CT4
Discussion Forum	Activity developed in a virtual environment in which various and current issues related to the academic and/or professional field are debated. It allows assessing the skills, knowledge and, to a lesser extent, the attitudes of the student. Participation in the forums will be evaluated.	10	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG7	CE18	
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.	10	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG7	CE18	CT4 CT6
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.	30	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG7	CE18	CT4 CT6
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.	20	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG7	CE18	CT4

Other comments on the Evaluation

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.

Fraud or attempted fraud by the student in the evaluation process (copying or plagiarism or its facilitation to third parties) will be penalized by directly awarding a fail grade (0.0) in the call in which it occurs.

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

IDENTIFYING DATA				
Transformación dixital e innovación				
Subject	Transformación dixital e innovación			
Code	P52M182V01301			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	2	1c
Teaching language	Castelán			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros Represas Seoane, Javier			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	A transformación dixital é unha realidade na que estamos inmersos. Trátase dun proceso global e continuo de carácter exponencial: toda aplicación de tecnoloxías dixitais que provoque unha transformación forma parte do mesmo. Iniciamos un camiño do que apenas podemos albiscar os próximos pasos. Transformación pola vía da innovación, práctica. Transformación de carácter dixital. A innovación que tratamos nesta transformación, con novos aplicativos que afectan a produtos, procesos e procedementos e que se realizan cunha clara intención de mellora e aplicación práctica, son parte intrínseca da mesma. O peso da información e o seu tratamento como recurso, son parte indispensable desta. Falamos de big data, intelixencia artificial, machine learning, condución autónoma, impresión 3D e outras novas tecnoloxías dixitais emerxentes que supoñen novos avances e novos retos. Transformación e tecnoloxías que requiren de profesionais capacitados para implementalas e xestionar á súa vez a transformación nas súas organizacións. Transformación dixital que interactúa con organizacións e provoca cambios nas mesmas e na sociedade. Cambios nos hábitos do consumidor, cambios na forma na que as organizacións prestan servizos, cambios na forma de consumilos, na seguridade coa que se prestan, os ritmos de desenvolvemento, as implicacións legais, sociais e mesmo éticas.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG2	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.
CG3	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.
CG5	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.
CG6	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.
CE1	CE1 - Adquirir coñecementos e aptitudes que permitan desenvolver un liderado eficaz para a transformación dixital dunha organización.
CT5	CT5 - Aprendizaxe e traballo autónomos.
CT6	CT6 - Manexar apropiadamente recursos de información.

Resultados de aprendizaxe	
Learning outcomes	Competences
RA1. Coñecer cal é o proceso de innovación e as claves para o seu éxito.	CB6 CB7 CB8 CB10 CE1 CT6
RA2. Coñecer un marco sinxelo e de ámbito xeral para innovar e ser creativo en calquera área da organización.	CB6 CB7 CB8 CB10 CG2 CG6 CE1 CT5 CT6
RA3. Ser capaz de exercer un liderado transformador, capaz de transmitir unha visión.	CB6 CB7 CB8 CB9 CG2 CG3 CG5 CG6 CE1 CT5 CT6
RA4. Coñecer e entender a importancia das ferramentas de xestión de coñecemento, vixilancia tecnolóxica e intelixencia competitiva no proceso innovador.	CB6 CB7 CB8 CB10 CG2 CE1 CT5 CT6

Contidos	
Topic	
Tema 1. Contexto das organizacións TIC	1.1. Introdución 1.2. A cuarta revolución industrial. 1.3. A sociedade dixital
Tema 2. A organización dixital	2.1. Un cambio de modelo disruptivo. 2.2. A transformación dixital das organizacións. 2.3. Estratexia, visión e operativa dixital. 2.4. Competencias e habilidades dixitais. 2.5. Liderando o cambio. Implementación.
Tema 3. Información como recurso estratéxico	3.1. Información. O valor do dato. 3.2. Captura, tratamento e análise masiva de datos. Big Data. 3.3. Como aprenden as máquinas. Machine Learning. 3.4. IA, Intelixencia Artificial. 3.5. Block Chain.
Tema 4. Xestión do coñecemento e a innovación e TIC asociadas	4.1. Modelos de xestión do coñecemento. 4.2. A innovación como proceso. 4.3. Sistemas expertos, sistemas autónomos. 4.4. Industria 4.0. 4.5. Simulación. Contornas virtuais, realidade virtual. Telepresenza. 4.6. Automatización. Robótica. Cobots. 4.7. Fabricación aditiva 4.8. IoT, Internet das cousas.
Tema 5. Retos e oportunidades	5.1. O futuro é dixital. A magnitude do cambio. 5.2. Cidades intelixentes, Smart cities. 5.3. A transformación económica, social e laboral. 5.4. A transformación individual. A persoa dixital. 5.5. Tendencias, aplicacións e liñas de investigación e desenvolvemento. 5.6. Ética e responsabilidade.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Estudo previo	0	45	45
Lección maxistral	11	8	19
Estudo de casos	2	0	2
Foros de discusión	0	3	3
Autoavaliación	0	2	2
Presentación	3	0	3
Exame de preguntas de desenvolvemento	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
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.
Estudo de casos	Análise dun feito, problema ou suceso real coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipótese, contrastar datos, reflexionar, completar coñecementos, diagnosticalo e adestrarse en procedementos alternativos de solución.
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.
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	Evaluated Competencess
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. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase a participación nos foros.	10	CB6 CG2 CE1 CT6 CB7 CG3 CB8 CG5 CB9 CG6 CB10
Autoavaliación	Mecanismo no que, por medio dunha serie de preguntas ou actividades, posibilítase que o alumno/a avalíe de maneira autónoma o seu grao de adquisición de coñecementos e habilidades sobre a materia, permitindo unha autorregulación do proceso de aprendizaxe persoal.	10	CB6 CG2 CE1 CT5 CB7 CG5 CT6 CB8 CG6 CB9 CB10
Presentación	Exposición por parte do alumnado, de maneira individual ou en grupo, dun tema relacionado cos contidos da materia ou dos resultados dun traballo, exercicio, proxecto, etc. A través da presentación pódense avaliar coñecementos, habilidades e actitudes.	40	CB6 CG2 CE1 CT5 CB7 CG3 CT6 CB8 CG5 CB9 CB10
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.	40	CB7 CG2 CE1 CT5 CB8 CG5 CT6 CB9 CG6 CB10

Other comments on the Evaluation

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

Aqueles alumnos que non superen a materia deberán acudir á convocatoria extraordinaria, que se realizará na modalidade a distancia nas datas establecidas para ese efecto pola Comisión Académica de Máster. Para superar a materia en devandita convocatoria, deberán presentar un traballo e superar unha proba escrita, do mesmo xeito que sucede na convocatoria ordinaria. Só se lles eximirá dunha destas dúas partes (traballo ou proba escrita) gardando a nota até a convocatoria extraordinaria a aqueles que superasen unha das dúas partes con nota superior a notable, 7. Cada parte, traballo e proba, cualifican o 50% da avaliación final, e será necesario obter polo menos o 50% da cualificación para superar a materia.
A fraude ou intento de fraude por parte do alumno no proceso de avaliación (copia ou plaxio ou facilitalo a terceiros) será penalizado outorgándolle directamente unha cualificación de suspenso (0.0) na convocatoria na que se produza.

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

Mario Fernández, **INDUSTRIA 4.0: Tecnologías y Gestión en la Transformación Digital de la Industria.**, 1, Autoedición, 2020

Enrique Rodal Montero, **Industria 4.0: Conceptos, tecnologías habilitadoras y retos (Empresa y Gestión)**, Ediciones Pirámide, 2020

Alonso Álvarez García, Sara Aguilera Lobato, et al., **La empresa Ágil: Métodos de trabajo en organizaciones que aprenden a adaptarse a los cambios**, 1, ANAYA Multimedia, 2019

Lasse Rouhiainen, **Inteligencia Artificial: 101 cosas que debes saber hoy sobre nuestro futuro**, 1, Planeta. Colección Alienta, 2018

David Ríos Insua, David Gómez-Ullate Oteiza, **Big Data (¿Qué sabemos de?)**, 1, Consejo Superior de Investigaciones Científicas, 2019

Sergio Jiménez, **Transformación Digital para Administraciones Públicas**, Instituto Nacional de Administración Pública, 2020

Alberto Delgado, **Industria 4.0: Digitalízate. Cómo digitalizar tu empresa.**, 1, Libros de Cabecera, 2016

Recomendacións

IDENTIFYING DATA				
Normativa e lexislación				
Subject	Normativa e lexislación			
Code	P52M182V01302			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Mandatory	2	1c
Teaching language	Castelán			
Department				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Atorrasagasti Morató, Aitor Sabino Fernández García, Isidro Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	A materia Normativa e lexislación pretende ofrecer aos alumnos unha perspectiva xeral sobre o marco xurídico do sector das telecomunicacións e sobre sociedade da información, incidindo nas cuestións problemáticas, controvertidas que se poden expor desde un punto de vista xurídico ao persoal da AXE destinado no Ministerio de Defensa con responsabilidade no ámbito de dirección ou xestión das tecnoloxías da información e as comunicacións e a seguridade da información. Particularmente, e tendo en conta o novo escenario da transformación dixital da Administración Xeral do Estado e os seus organismos públicos, abordaranse os distintos aspectos relativos á utilización das novas tecnoloxías na comunicación cos cidadáns, ben no ámbito dos procedementos administrativos ou á marxe dos mesmos, así como a incidencia que ditas cuestións poden expor nos dereitos fundamentais das persoas ou respecto da normativa e principios sobre política de seguridade da información do Ministerio de Defensa.			

Competencias	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	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.
CG2	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.
CG3	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.
CG5	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.
CG6	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.
CE10	CE10 - Aplicar o coñecemento das normas e a lexislación máis relevantes en materia de telecomunicacións e sociedade da información ao ámbito da xestión e dirección TIC.
CT1	CT1 - Capacidade para comprender o significado e aplicación da perspectiva de xénero nos distintos ámbitos de coñecemento e na práctica profesional co obxectivo de alcanzar unha sociedade máis xusta e igualitaria.

Resultados de aprendizaxe	
Learning outcomes	Competences

RA1: Asumir o proceso de transformación dixital das Administracións e, en particular da Administración Xeral de Estado (AXE) nas súas relacións cos cidadáns.	CB8 CB9 CG5 CE10 CT1
RA2: Coñecer os órganos con competencias en materia de Administración dixital na AXE, e en particular, no MINISDEF, así como os obxectivos estratéxicos da Estratexia TIC da AXE.	CB8 CB9 CG3 CG5 CE10 CT1
RA3: Entrar en contacto coa nova normativa de Procedemento Administrativo Común das Administracións Públicas, en concreto, sobre utilización de medios electrónicos en relación coa tramitación de procedementos e relacións cos cidadáns.	CB6 CB7 CB10 CG2 CG3 CG5 CE10 CT1
RA4: Familiarizarse cos principios da Lei de transparencia, así como os límites no acceso á información: a defensa e seguridade nacional. A protección de datos.	CB6 CB7 CG2 CG3 CG5 CG6 CE10 CT1
RA5: Asumir os principios básicos e a normativa sobre política de seguridade da información do Ministerio de Defensa.	CB6 CB7 CB8 CG2 CG3 CG5 CG6 CE10 CT1
RA6: Coñecer e comprender o papel das novas tecnoloxías da información e comunicación en relación coa imaxe institucional da Administración Xeral do Estado.	CB6 CB7 CB8 CB10 CG2 CG3 CG5 CG6 CE10 CT1
RA7: Ser capaz de ter en conta a incidencia que na xestión dos instrumentos propios das TICs revisten os dereitos fundamentais dos cidadáns.	CB6 CB7 CB8 CB10 CG2 CG3 CG5 CG6 CE10 CT1
RA8: Coñecer a principal normativa do sector das telecomunicacións e sobre sociedade da información.	CB8 CB9 CG5 CG6 CE10 CT1

Contidos
Topic

Tema 1. A transformación dixital da Administración Xeral do Estado e os seus organismos públicos.	- As Tecnoloxías da Información e as Comunicacións (TIC) e a Administración. - Os fitos para a transformación dixital da Administración Xeral do Estado (AGE) e os seus Organismos Públicos. - Órganos con competencias en materia de Administración dixital. - A Axenda España Dixital 2025 e o Plan de Dixitalización das Administracións Públicas 2021 -2025. - O funcionamento electrónico do sector público e o Catálogo de Servizos de Administración Dixital. - Situación actual da implantación dos mecanismos da Administración electrónica.
Tema 2. A lexislación de procedemento administrativo común, a utilización de medios electrónicos no ámbito das relacións administrativas e a seguridade da información.	- A utilización de medios electrónicos no ámbito das relacións administrativas e a seguridade da información. O Esquema Nacional de Seguridade. - A Lei 39/2015, de 1 de outubro, do Procedemento Administrativo Común das Administracións Públicas e a seguridade da información. Os medios electrónicos na tramitación de procedementos administrativos.
Tema 3. O principio de publicidade da actividade dos órganos do Estado. A transparencia, o acceso á información pública e os seus límites: a defensa e seguridade nacional. A protección de datos. A seguridade da información nas Administracións públicas e a súa normativa.	- O principio de transparencia da actividade pública. O acceso á información pública e os seus límites: a defensa e seguridade nacional. A protección de datos: O Regulamento Xeral comunitario de Protección de Datos e a Lei Orgánica 3/2018, de 5 de decembro, de Protección de Datos Persoais e garantía dos dereitos dixitais. - Os límites derivados da defensa e seguridade nacional. - Requisitos da clasificación e tratamento do material clasificado. - Referencia ao Acordo do Consello de Ministros, de 28 de novembro de 1986, polo que se clasifican determinados asuntos e materias con arranxo á Lei de Segredos Oficiais. - A normativa sobre política de seguridade da información do Ministerio de Defensa. - A protección penal e disciplinaria da seguridade da información e as materias clasificadas.
Tema 4. A xestión e utilización polas Administracións públicas das tecnoloxías da información e as comunicacións (TIC): A imaxe institucional da Administración e os dereitos fundamentais dos cidadáns.	- A utilización e presenza das Administracións públicas no ámbito das novas tecnoloxías da información e comunicación á marxe das relacións administrativas. - As novas tecnoloxías da información e comunicación e a imaxe institucional da Administración Xeral do Estado. - A utilización do TIC pola Administración e os dereitos fundamentais das persoas.
Tema 5. A regulación básica do sector das telecomunicacións e sobre sociedade da información.	- O marco xurídico das tecnoloxías da información e as comunicacións. - O dominio de internet: definición e natureza do dereito de dominio, o seu réxime xurídico. - Xestión de incidentes de *ciberseguridad que afecten á rede de Internet. - A Política dos Sistemas e Tecnoloxías da Información e as Comunicacións do Ministerio de Defensa (Política CIS/TIC *MDEF). - As regras especiais na lexislación de contratos do Sector Público sobre competencia para adquirir equipos e sistemas para o tratamento da información e das comunicacións no ámbito do Ministerio de Defensa. A xestión de redes e sistemas no ámbito da Defensa.

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	5	5
Estudo previo	0	43	43
Lección maxistral	9	6	15
Estudo de casos	2	2	4
Foros de discusión	0	2	2
Presentación	5	0	5
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
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 que desenvolver.
Estudo de casos	Análise dun feito, problema ou suceso real coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipótese, contrastar datos, reflexionar, completar coñecementos, diagnosticalo e adestrarse en procedementos alternativos de solución.
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.
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	Evaluated Competencess			
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. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase a participación nos foros.	10	CB7 CB8	CG2 CG3 CG5 CG6	CE10	CT1
Presentación	Exposición por parte do alumnado, de maneira individual ou en grupo, dun tema relacionado cos contidos da materia ou dos resultados dun traballo, exercicio, proxecto, etc. A través da presentación pódense avaliar coñecementos, habilidades e actitudes.	30	CB6 CB7 CB8 CB9 CB10	CG2 CG3 CG5 CG6	CE10	CT1
Exame de preguntas obxectivas	Proba que avalía o coñecemento e que inclúe preguntas pechadas con diferentes alternativas de resposta (verdadeiro ou falso, elección múltiple, emparellamento de elementos, etc.). Os alumnos/as seleccionan unha resposta de entre un número limitado de posibilidades.	60	CB6 CB7 CB8 CB10	CG2 CG3 CG5 CG6	CE10	CT1

Other comments on the Evaluation

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

No caso de que o alumno non consiga aprobar a materia na convocatoria ordinaria, tendrá dereito a unha segunda oportunidade de avaliación (convocatoria extraordinaria) nas datas establecidas para ese efecto pola Comisión Académica de Máster. A avaliación se realizará en modalidade a distancia, e consistirá nunha única proba escrita que suporá o 100% da calificación, sendo necesario obter polo menos o 50% para superar a materia.

Non está permitido falar durante a realización da proba escrita, así como copiar ou utilizar ou facilitar a outro alumno calquera procedemento fraudulento para a realización dos exercicios encomendados. A fraude ou intento de fraude por parte do alumno no proceso de avaliación (copia ou plaxio ou facilitalo a terceiros) será penalizado outorgándolle directamente unha calificación de suspenso (0.0) na convocatoria na que se produza.

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

Agencia Estatal Boletín Oficial del Estado, **Código de Administración Electrónica, Ministerio de Hacienda y Administraciones Públicas**,

Ministerio de Hacienda y Administraciones Públicas, **Guía de Comunicación Digital para la Administración General del Estado**,

Varios autores, **Constitución Española**,

Gamero Casado, E. y Fernández Ramos, S., **Manual Básico de Derecho Administrativo**, 13, Tecnos, 2016

Bastida Freijedo, F.j.; Villaverde Menéndez, I.; Requejo Rodríguez, P.; Presno Linera, M.a.; Aláez C, **Teoría General de los Derechos Fundamentales en la Constitución Española de 1978**, Tecnos, 2004

Fernández García, I., **Los derechos fundamentales de los militares**, Ministerio de Defensa, Secretaría General Técnica, 2015

Recomendacións

Other comments

Recoméndase unha lectura previa dos temas, lexislación básica e documentación (xurisprudencia, resolucións, etc.) facilitados polo profesor para a análise dos problemas expostos.

IDENTIFYING DATA				
Wireless and optical communication systems				
Subject	Wireless and optical communication systems			
Code	P52M182V01303			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Núñez Ortuño, José María			
Lecturers	Núñez Ortuño, José María			
E-mail	jnunez@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The course on Optical and Wireless Communications Systems aims to provide students with a comprehensive and generalist overview of the of the current state-of-the-art of microwave and fiber based communication systems. The course details the technologies involved, regulatory and safety aspects of this type of systems.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG2	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.
CG6	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.
CE12	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.
CE13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
CT5	CT5 - Autonomous learning and work.
CT6	CT6 - Properly manage information resources.

Learning outcomes	
Learning outcomes	Competences
LO1. To know the management of the electromagnetic spectrum and the basic elements of a communications system.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE12 CT5 CT6

LO2. To know the operation and the characteristic parameters of a radio link.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CE12 CE13 CT5 CT6
LO3. To understand the basic operation of wireless networks, as well as the different technologies, existing topologies and standards for the implementation of such networks.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CE12 CE13 CT5 CT6
LO4. To understand the operation and main characteristics of mobile and optical networks.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CE12 CE13 CT5 CT6
LO5. To understand the operation of software defined radio (SDR), as well as the concepts of interoperability, modes of operation, upgrading and cost associated with this type of technology..	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CE12 CE13 CT5 CT6
LO6. To know the different radiocommunication systems existing in the military field, as well as their most outstanding characteristics..	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CE12 CE13 CT5 CT6

Contents	
Topic	
Subject 1: Introduction to the wireless technologies	- Basic concepts - Classification of the wireless communications systems - Standardization and regulation

Subject 2: Radio links	- Bands and channeling - Planning - Devices - Link protection - Link budget - Availability, quality and interferences
Subject 3: PAN and LAN wireless networks and technologies	- Historical evolution - WPAN vs WLAN networks - Existing technologies - Network topologies - Remarkable characteristics - Components
Subject 4: MAN and WAN wireless networks and technologies	- WMAN networks: WiMAX and WiMAX-2 - WMAN networks: cellular and satellite networks - Networks convergence: IMT-Advanced (4G)
Subject 5: Mobile networks	- PMR systems - GSM, GPRS and EDGE systems - UMTS and LTE networks - HSPA and 4G (LTE-A and WiMAX-2) networks - 5G networks - Network security
Subject 6: Optical networks	- Wireless optical networks - Wired optical networks - Advantages and disadvantages compared to other systems - Existing technologies - Network topologies - Remarkable characteristics - Components
Subject 7: Software Defined Radio (SDR)	- Evolution of radio systems - Introduction and basic concepts - Architecture and technologies used - SDR market - SDR in the military environment: JTRS and ESSOR - Cognitive radio - White spaces and efficient use of the spectrum - Cognitive radio networks - Architectures and applications

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 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 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	Research, 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 done before lectures, laboratory practices and/or evaluation tests. It 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, through the use of ICT.
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 doubts related to the teacher's exposition of the contents of the subject matter, theoretical bases and/or guidelines for a work or exercise that the student has to develop.
Problem solving	Personalized comments on the resolution of problems and/or exercises related to the subject matter.
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**
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.
Laboratory practice	Guidance in the realization of the different laboratory practices related to the syllabus of the course.

Assessment

	Description	Qualification	Evaluated Competencess
Self-assessment	There will be two intermediate tests, one hour long, to control the follow-up of the subject. Each control test has a weight of 20%.	40	CB6 CG1 CE12 CT6 CB7 CG2 CE13 CB8 CG6 CB9
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.	20	CB6 CG1 CE12 CT5 CB7 CG2 CE13 CT6 CB8 CG6 CB9 CB10
Problem and/or exercise solving	Resolution of different exercises proposed in class about applicable to each of the topics of the syllabus.	20	CB6 CG1 CE12 CT5 CB7 CG2 CE13 CT6 CB8 CG6 CB9 CB10
Laboratory practice	Evaluation of different laboratory practices related to the subject the syllabus of the course by means of deliverable reports.	20	CB6 CG1 CE12 CT5 CB7 CG2 CE13 CT6 CB8 CG6 CB9 CB10

Other comments on the Evaluation

It is 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. The evaluation of the second call will be carried out in distance mode, through the evaluation of a deliverable (work) that 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..

Assessment systems		
Denomination	**Qualification (%)**	**Competences**

Evaluation of deliverables (work)	60	CB6, CB7, CB8, CB9, CB10 CG1, CG2, CG6 CT5, CT6 CE12, CE13
Written test	40	CB6, CB7, CB8, CB9, CB10 CG1, CG2, CG6 CT5, CT6 CE12, CE13

Fraud or attempted fraud by the student in the evaluation process (copying or plagiarism or its facilitation to third parties) will be penalized by giving the student a failing grade (0.0) in the exam session in which it occurs.
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

Miscellaneous, **Transparencies, notes, readings, activity statements, etc. (provided by teaching staff)**,

Complementary Bibliography

J. M. Hernando-Rábanos, J. M. Riera y L. Mendo, **Transmisión por Radio**, 7ª Edición, Editorial Universitaria Ramón Areces, 2013

C. A. Balanis, **Antenna Theory: Analysis and Design**, 4ª Edición, John Wiley & Sons Inc., 2016

Sigfredo Pagel, **Introducción a los radioenlaces**, 1ª Edición, Tórculo Ediciones, 1997

P. Morreale & K. Terplan, **CRC Handbook of Modern Telecommunications**, 2ª Edición, CRC Press, 2009

J. L. Olenewa, **Guide to Wireless Communications**, 4ª Edición, Cengage Learning, 2017

E. Dahlman, S. Parkvall & J. Skold, **4G: LTE/LTE-Advanced for Mobile Broadband**, 2ª Edición, Academic Press, 2013

Peter B. Kenington, **RF and Baseband Techniques for Software Defined Radio**, Artech House, 2005

Recommendations

Subjects that it is recommended to have taken before

Networks and telecommunication systems/P52M182V01104
Satellite communication systems, positioning, remote sensing and radionavigation/P52M182V01204

IDENTIFYING DATA				
Broadband networks				
Subject	Broadband networks			
Code	P52M182V01304			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Gil Castiñeira, Felipe José			
Lecturers	Fondo Ferreiro, Pablo Gil Castiñeira, Felipe José			
E-mail	felipe@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The subject "Broadband Networks" seeks to provide students with an understanding of the nature of multimedia information and the requirements it imposes on the networks that must support its transmission. It intends to show students the general principles of the architecture of broadband networks (local area, access in residential and business environments and WAN) that are used to transmit information with strict requirements (e.g. in terms of bandwidth and latency) such as multimedia traffic. Students are also expected to know the main protocols for sending voice and video, the mechanisms to ensure quality of service (QoS) even when there are interruptions in communication and, in addition, to know examples of current implementations.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG2	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.
CG3	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.
CE12	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.
CE13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences
LO1. Know the characteristics that differentiate multimedia information.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE13 CT5

LO2. Understand the mechanisms for the encoding and compression of multimedia information.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE12 CT5
LO3. Know and be able to apply bandwidth management mechanisms.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE12 CE13 CT5
LO4. Know and be able to design architectures to offer integrated and differentiated services.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG3 CE12 CE13 CT5
LO5. Be able to analyze the network performance to ensure quality of service.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE12 CE13 CT5
LO6. Understand the operation of delay tolerant networks.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE12 CE13 CT5

Contents	
Topic	
Introduction	- Types of broadband networks - Introduction to multimedia networks - Multimedia network applications
Requirements and coding	- Multimedia content requirements: throughput, jitter, delay and bandwidth - Encoding: audio and video (introduction and standards)
Network architecture	- Networks: broadband local area networks, access networks (residential, enterprise) and WAN networks - Tunnels and VPNs - SDN - CDN
Protocols	- Network: RTP, multicast, and QoS - Session: SIP, H.323, VoLTE, and WebRTC

Streaming	- OTT - DVB - Home
Delay and interruption tolerant networks	- Use cases - Architecture - Protocols

Planning			
	Class hours	Hours outside the classroom	Total hours
Discussion Forum	0	3	3
Previous studies	0	20	20
Lecturing	6	6	12
Presentation	3	24	27
Seminars	2	0	2
Practices through ICT	5	2	7
Self-assessment	0	3	3
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
Discussion Forum	Activity developed in the virtual forum environment with debates on: - News related to the subject - Technological novelties - Academic articles
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, evaluation tests and during the completion of work to be presented later.
Lecturing	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.
Presentation	Presentation by the students of the results of a class work related to the subject.
Seminars	Activity focused on working on a specific topic, which allows deepening or complementing the contents of the subject.
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, through the use of ICT. Practical exercises on simulators on broadband networks, multimedia technologies, delay tolerant networks, etc. will be completed.

Personalized assistance	
Methodologies	**Description**
Lecturing	Students will be able to solve their doubts during the session or later during office hours (using a video call tool).
Discussion Forum	Participation in the forums will be monitored by the faculty, who will act as moderators and facilitators.
Practices through ICT	The faculty will resolve any doubts that may arise during the practices or during the office hours.
Presentation	Students will be able to resolve doubts, using telematic means, during the preliminary study phase of the topic they will present.
Seminars	Students will receive personalized attention during the seminars.

Assessment			
	Description	Qualification	Evaluated Competencess
Discussion Forum	An 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 the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be evaluated.	5	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG3 CE12 CE13 CT5

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. Through the presentation, knowledge, skills and attitudes can be evaluated.	40	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG3	CE12 CE13	CT5
Practices through ICT	Report on simulator exercises on broadband networks, multimedia technologies, delay tolerant networks, etc.	5	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG3	CE12 CE13	CT5
Self-assessment	Mechanism in which, by means of a series of questions or activities, it is possible for the student to evaluate autonomously his/her degree of acquisition of knowledge and skills on the subject, allowing a self-regulation of the personal learning process.	20	CB6 CB7 CB8 CB9 CB10	CG1 CG2	CE12 CE13	CT5
Objective questions exam	(*)Proba que avalía o coñecemento e que inclúe preguntas pechadas con diferentes alternativas de resposta (verdadeiro ou falso, elección múltiple, emparellamento de elementos, etc.). Os alumnos/as seleccionan unha resposta de entre un número limitado de posibilidades.	30	CB6 CB7 CB8 CB9 CB10	CG1 CG2	CE12 CE13	CT5

Other comments on the Evaluation

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

In case of detection of plagiarism or unethical behavior in any of the works/tests, the grade for the course will be "fail (0)" and the faculty will communicate the matter to the academic authorities so that they can take the appropriate measures.

Extraordinary call: In case the student fails to pass the course in the ordinary call, he/she will have the right to a second opportunity for evaluation (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 remotely. To pass the course it will be necessary to pass the different parts in which the subject is divided: tutored work, practices (to be carried out by the student on his or her computer and a report of results will be delivered) and questionnaires and written test on the contents presented in the lectures.
In the case of any difference between the Galician/Spanish/English guides related to the evaluation, the Spanish guide will always prevail.
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

Hans W. Barz y Gregory A. Bassett, **Multimedia Networks: Protocols, Design and Applications.**, 1, John Wiley & Sons, 2016

James F. Kurose y Keith W. Ross, **Computer Networking: A Top-Down Approach**, 7, Pearson, 2017

Gorshe, S., Raghavan, A., Galli, S. y Starr, T., **Broadband access: wireline and wireless-alternatives for internet services**, 1, John Wiley & Sons, 2014

Complementary Bibliography

William Stallings, **Redes e Internet de Alta Velocidad: Rendimiento y Calidad de Servicio**, 1, Pearson, 2004

Paul Bedell, **Gigabit Ethernet for Metro Area Networks**, 1, McGraw-Hil, 2003

Aura Ganz, Zvi Ganz y Kitti Wongthavarawat, **Multimedia Wireless Networks: Technologies, Standards and QoS**, 1, Pearson, 2003

Franklin F. Kuo, Wolfgang Effelsberg, and J. J. Garcia-Luna-Aceves, **Multimedia Communications Protocols and Applications**, 1, Prentice-Hall, 1997

Recommendations

Subjects that it is recommended to have taken before

Service management and service quality/P52M182V01103
Networks and telecommunication systems/P52M182V01104
Information systems/P52M182V01105

IDENTIFYING DATA				
Computer Systems				
Subject	Computer Systems			
Code	P52M182V01305			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	González Coma, José Pablo			
Lecturers	González Coma, José Pablo			
E-mail	jose.gcoma@cud.uvigo.es			
Web	http://campus.defensa.gob.es o https://moovi.uvigo.gal			
General description	This subject aims to provide students with training on the fundamental concepts associated with the architecture, design, administration, analysis, monitoring and deployment of advanced computing infrastructures such as computing clusters, virtualized systems, cloud computing, high integrity systems, real time systems and embedded systems. Classroom lectures will be used for the introduction of theoretical concepts, which will be complemented with research work to deepen specific aspects of the course.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG2	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.
CE15	CISTI1 - Define and implement different computing systems in line with technological evolution and deployment environments.
CT4	CT4 - Oral and written communication skills.
CT5	CT5 - Autonomous learning and work.

Learning outcomes	
Learning outcomes	Competences
LO1 - Know the fundamental concepts associated with the architecture, design, management, and deployment of advanced computing infrastructures, such as computing clusters, high integrity systems, virtualized systems, and cloud computing.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE15 CT4 CT5

LO2 - Be able to analyze the performance of computer systems.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE15 CT4 CT5
LO3 - Know the main concepts related to the design and implementation of hardware and software computer systems with specific requirements, such as embedded systems and real-time systems.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CE15 CT4 CT5

Contents	
Topic	
Introduction to computing	- Introduction to computing - Historical development - Algorithms and computational theory - Computer architecture - Planning policies
Quality parameters and system performance analysis	- Computer characteristics - Performance analysis
Computer clusters	- Types of clusters - Cluster components
Virtualization	- Virtualization mechanisms - Types of hypervisors - Advantages of virtualization
Cloud computing	- Reference models - Types of deployments - Products and suppliers - Advantages and disadvantages
Fault-tolerant and high-availability systems	- Introduction: Reliability, failures, faults, and errors - Failure prevention - Fault tolerance - Redundancy
Real-time architectures	- Types of systems - Hardware architectures - Software architectures - Real-time operating systems
Embedded systems	- Characteristics of embedded systems - Architecture - Platforms

Planning			
	Class hours	Hours outside the classroom	Total hours
Previous studies	0	25	25
Lecturing	8	8	16
Seminars	1	0	1
Discussion Forum	0	5	5
Presentation	6	0	6
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 before classes and/or evaluation tests.
Lecturing	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.
Seminars	Activity focused on working on a specific topic, which allows to deepen 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 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 him, which will be held by videoconference.
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	Evaluated Competencess			
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of work, exercise, project, etc. Through the presentation, knowledge, skills, and aptitudes can be evaluated.	10	CB6 CB7 CB8 CB9 CB10	CG1 CG2	CE15	CT4 CT5
Objective questions exam	A test that evaluates 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.	70	CB6 CB7 CB8 CB9 CB10	CG1 CG2	CE15	CT4 CT5
Essay	Text or document elaborated on a topic that must be written following established rules of style and length. It allows the evaluation of the student's skills, knowledge, and, to a lesser extent, aptitudes.	20	CB6 CB7 CB8 CB9 CB10	CG1 CG2	CE15	CT4 CT5

Other comments on the Evaluation

It will be necessary to reach 50% of the qualification in order to pass the course.

A continuous evaluation mechanism will be used, with which it is intended to monitor the evolution of the student throughout the course, assessing their effort globally.

There will be two written tests: one at the beginning of the face-to-face phase, in which the contents taught in the distance phase will be evaluated, which will represent 30% of the grade; and one at the end of the face-to-face phase, in which all the contents of the course will be evaluated (including the contents of the distance phase and the presential practices), which will represent 40% of the grade.

In the event that the student does not manage to pass the course in the ordinary evaluation, he/she will have the right to a second evaluation opportunity (extraordinary evaluation) which will be performed 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.

Fraud or attempted fraud on the part of the student in the evaluation process (copying or plagiarism or its facilitation to third parties) will be penalized by giving the student a grade of 0 in the exam session in which it occurs.

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

Buyya, Rajkumar, Christian Vecchiola, y S. Thamarai Selvi., **Mastering cloud computing: foundations and applications programming.**, 1ª Ed., Newnes, 2013

Rauber, Thomas, y Gudula Rünger, **Parallel programming: For multicore and cluster systems.**, 2ª Ed., Springer Science & Business Media, 2013

Wolf, Marilyn, **Computers as components: principles of embedded computing system design**, 3ª Ed., Elsevier, 2012

Joyanes Aguilar, Luis, **Computación en la Nube: estrategias de cloud computing en las empresas**, 1ª Ed., Marcombo, 2012

Recommendations

Other comments

It is advisable for students taking this course to have a basic knowledge of the operation of computer systems.

IDENTIFYING DATA				
Storage and information management				
Subject	Storage and information management			
Code	P52M182V01306			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	3	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Fernández García, Norberto			
Lecturers	Fernández García, Norberto			
E-mail	norberto@cud.uvigo.es			
Web	http://https://moovi.uvigo.gal			
General description	The Storage and Information Management course aims to offer students a comprehensive and general overview of the current state of the models, techniques and tools for data storage, analysis, presentation and management.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG5	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.
CE16	CISTI2 - Manage information as a strategic asset in the storage, volumetric and intelligence aspects of the data.
CT4	CT4 - Oral and written communication skills.
CT5	CT5 - Autonomous learning and work.
CT6	CT6 - Properly manage information resources.

Learning outcomes	
Learning outcomes	Competences
LO1: Know the persistent data storage systems and infrastructures, their typology, structure and basic operation.	CB6 CB10 CG1 CG5 CE16 CT4 CT5 CT6
LO2: Distinguish structured and unstructured data and know the techniques and tools that allow the storage and management of each type, such as relational databases and information retrieval systems.	CB6 CB10 CG1 CG5 CE16 CT4 CT5 CT6

LO3: Know the techniques and tools that allow the efficient storage and processing of large volumes of data.	CB6 CB10 CG1 CG5 CE16 CT4 CT5 CT6
LO4: Understand the data mining process, its main stages and the techniques used in it to extract knowledge from the information provided by data.	CB6 CB7 CB10 CG1 CG5 CE16 CT4 CT5 CT6
LO5: Know the basic principles on which data visualization techniques are based and their use when designing user interfaces that allow information to be presented effectively.	CB6 CB9 CB10 CG1 CG5 CE16 CT4 CT5 CT6
LO6: Assess the importance for the organization of adequate data management and the elements that are involved in it.	CB7 CB8 CB9 CG1 CG5 CE16 CT4 CT5 CT6

Contents

Topic	
Persistent data storage	- Types of persistent storage systems - Data storage infrastructures
Databases and information retrieval systems	- Structured and unstructured data - Relational data model - Query languages - Information retrieval techniques - Tools
Management of large volumes of data (Big data)	- Definition and motivation - Paradigms of distributed data processing - Tools
Data mining	- Stages of the data mining process - Data analysis techniques - Tools
Data visualization	- Basic principles of data visualization - User interfaces

Planning

	Class hours	Hours outside the classroom	Total hours
Previous studies	0	42	42
Lecturing	12	8	20
Discussion Forum	0	4	4
Presentation	4	0	4
Objective questions exam	1	0	1
Self-assessment	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.
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.

Assessment

	Description	Qualification	Evaluated Competencess			
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 will be evaluated.	10	CB9	CG1 CG5	CE16	CT4 CT5
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.	40	CB6 CB7 CB8 CB9 CB10	CG1 CG5	CE16	CT4 CT5 CT6
Objective questions exam	Test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, pairing of elements, etc.). Students select an answer from a limited number of possibilities.	30	CB6 CB10	CG1 CG5	CE16	CT5
Self-assessment	Mechanism in which, through a series of questions or activities (in this case, through a series of objective tests) it is possible for the student to independently evaluate their degree of acquisition of knowledge and skills on the subject, allowing a self-regulation of the personal learning process.	20	CB6 CB10	CG1 CG5	CE16	CT5

Other comments on the Evaluation

It will be necessary to obtain at least 50% of the grade to pass the subject in ordinary call.
In the event that the student fails to pass the subject in the ordinary call, they will have the right to a second evaluation opportunity (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 remotely, through the evaluation of a deliverable that will account for 60% of the grade and the completion of a written test (with written questions and / or multiple choice) using the e-learning platform, which will mean the remaining 40%. It will be necessary to obtain at least 50% of the grade to pass the course.
Fraud or attempted fraud by the student in the evaluation process (copying or plagiarism or its facilitation to third parties) will be penalized by directly granting a failure grade (0.0) in the call in which it occurs.
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

Raghu Ramakrishnan, Johannes Gehrke, **Database Management Systems**, 3, McGraw Hill, 2002

Christopher D. Manning, Prabhakar Raghavan, Hinrich Schütze, **Introduction to Information Retrieval**, Cambridge University Press, 2008

Eric. A. Vanderburg, **SCSP SNIA Certified Storage Professional All-in-One Exam Guide (Exam S10-110)**, McGraw-Hill Education, 2017

Ian H. Witten, Eibe Frank, Mark A. Hall, Christopher J. Pal, **Data Mining: Practical Machine Learning Tools and Techniques**, 4, Morgan Kaufmann, 2016

Jenifer Tidwell, Charles Brewer, Aynne Valencia, **Designing Interfaces: Patterns for Effective Interaction Design**, 3, O'Reilly, 2020

Recommendations

Subjects that it is recommended to have taken before

Information systems/P52M182V01105

IDENTIFYING DATA				
Master's final dissertation				
Subject	Master's final dissertation			
Code	P52M182V01307			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Type	Year	Quadmester
	6	Mandatory	2nd	1st
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	Preparation and defence of an individual, original work of sufficient level and complexity, in which the student applies the knowledge acquired during the course of the master's degree. The subject of the work may be proposed by the student or defined by his/her academic tutor and, in any case, it must be related to the contents of the master's degree, either with the common module or with the specialised module selected by the student. Its definition and contents are explained more extensively in the regulations for the Master's Final Dissertation (TFM) approved by the Master's Academic Committee (CAM) and ratified by the Centre Board, the content of which can be consulted on the website of the Defense University Center, in the section dedicated to the DIRETIC Master's Degree.			

Skills	
Code	
CB6	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.
CB7	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.
CB8	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.
CB9	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.
CB10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
CG1	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.
CG2	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.
CG4	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.
CG6	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.
CE11	CE11 - Prepare, present and publicly defend before a committee an individual and original work in which the competences acquired in the master are synthesized.
CT1	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.
CT4	CT4 - Oral and written communication skills.
CT5	CT5 - Autonomous learning and work.
CT6	CT6 - Properly manage information resources.

Learning outcomes	
Learning outcomes	Competences

LO1. Be able to produce an individual and original work in which the competences acquired in the master's degree are synthesised.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG4 CG6 CE11 CT1 CT4 CT5 CT6
LO2. Present and publicly defend the work carried out before a university examining board.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG4 CG6 CE11 CT1 CT4 CT5 CT6
LO3. Demonstrate the degree of knowledge, understanding and handling of the basic tools of professional practice in the field of ICT management and information security.	CB6 CB7 CB8 CB9 CB10 CG1 CG2 CG6 CE11

Contents	
Topic	
Master's Final Dissertation	Preparation and defence of a project in which the student integrates and applies the knowledge acquired during the course of the master's degree. The subject of the work must be related to the contents previously covered in one or more subjects of the programme, either from the common module or from the intensification that the student has taken. Thus, the work may correspond to one of the following thematic profiles: 1) Management and direction: Technical, organisational and/or economic studies relating to equipment, systems, services, etc., dealing with any of the aspects of design, planning, management and/or operation of ICT systems, including aspects of security management. 2) Technical: theoretical/practical, computational or experimental work, related to any of the technological aspects dealt with in the master's degree programme, whether in the field of telecommunications systems, information systems or security. The contents of each project will be defined in individual proposals formulated by students or offered by lecturer-directors, as stated in article 10 of the regulations for the Master's Thesis. Each project will have a different content.

Planning			
	Class hours	Hours outside the classroom	Total hours
Presentation	1	0	1
Mentored work	9	140	149

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

Methodologies	
	Description
Presentation	Presentation by the students in front of an examining board of the content of the tutored work.
Mentored work	Work tutored by one or more directors, in which the student integrates and applies the knowledge acquired during the course of the master's degree. The subject of the work must be related to the contents previously covered in one or more subjects of the programme, either from the common module or from the intensification that the student has taken.

Personalized assistance	
Methodologies	**Description**
Mentored work	The supervised work of the TFM involves tutoring meetings both in the distance and face-to-face phases, if possible, on a regular basis. These meetings will allow the correct orientation and monitoring of the work carried out by the student.
Presentation	In order to prepare for the defence of the supervised dissertation in front of an examining board, meetings will be held to prepare for the defence of the dissertation.

Assessment						
	Description	Qualification	Evaluated Competencess			
Presentation	Presentation of the TFM by the students, individually. Knowledge, skills and attitudes can be assessed through the presentation.	30	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG4 CG6	CE11	CT1 CT4 CT5 CT6
Mentored work	Text or document prepared on the assigned topic of the dissertation that must be written following established rules of style and length. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes.	70	CB6 CB7 CB8 CB9 CB10	CG1 CG2 CG4 CG6	CE11	CT1 CT4 CT5 CT6

Other comments on the Evaluation

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 in it the student will have the opportunity to re-submit the report of his work and make (via videoconference) the presentation of this, being the weight of each activity in the final grade, and the minimum required to pass the subject as indicated above for the ordinary call.

In the event of awarding a failing final grade, the assessment panel will attach a report with the appropriate recommendations to the student and the directors for the improvement of the work in a subsequent assessment.

ETHICAL COMMITMENT:

As indicated in the current regulations, the TFM must be an individual and original work. For this reason, work carried out by third parties, or whose content reproduces directly, in a significant percentage, work carried out by third parties or by the student him/herself in any other subject of any degree or university, may not be presented as such. If this type of behaviour is detected, the student will be penalised with a grade of 0.0.

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

UNED, **¿Cómo presentar trabajos académicos?**,

Biblioteca universitaria de la Universidad de Málaga, **Cómo elaborar un trabajo de investigación**,

Biblioteca de la Universidad Carlos III de Madrid, **Cómo citar bibliografía: UNES-ISO 690**,

Biblioteca de la Universidad de Alcalá., **Uso ético de la información**,

Complementary Bibliography

Recommendations

Other comments

Students must have successfully passed the other subjects on the programme (including those in their chosen speciality) before proceeding to the defence of the dissertation.

The preparation and defence of the TFM may be carried out in Spanish or Galician, at the student's choice. In addition to these, the preparation and defence of the TFM in English will be allowed to those students who wish to do so and who can prove that they have a level equivalent to B2 of the Common European Framework of Reference for Languages.

The evaluation of the TFM (both the report and the presentation and defence) will be carried out by a panel appointed by the Master's Academic Committee and made up of lecturers from the programme and/or professionals from outside the programme who work in the thematic area of the Master's degree.

It is recommended to consult the Master's Thesis Regulations, which specify other aspects of interest regarding enrolment, the nature of the proposal, mechanisms for submission and assessment of the work, etc.