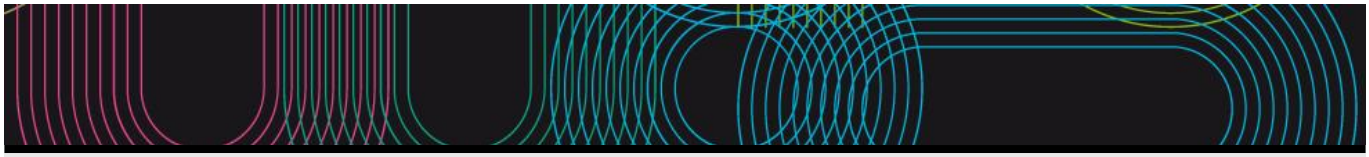

(*)Centro Universitario da Defensa da Escola Naval Militar de Marín

Master Universitario en Dirección TIC para la defensa

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

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 thesis	1st	6

IDENTIFYING DATA

Goberno, dirección e xestión TIC

Subject	Goberno, dirección e xestión TIC			
Code	P52M182V01101			
Study programme	Master Universitario en Dirección TIC para a defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1	1c
Teaching language	Castelán			
Department	Departamento do Centro Universitario da Defensa da Escola Naval Militar de Marín Dpto. Externo			
Coordinator	González Coma, José Pablo			
Lecturers	Gómez Romero, Víctor Manuel González Coma, José Pablo Rodríguez Rodríguez, Francisco Javier			
E-mail	jose.gcoma@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	A materia pretende ofrecer unha visión xeral sobre a dirección Estratéxica da empresa e o aliñamento estratéxico do TIC. Seguindo o proceso da planificación, tratarase o goberno do TIC e os estándares relacionados: *ISO 38.500 e *COBIT 5. Para avaliar o rendemento do goberno e a xestión explicaranse os cadros de mando integral e os indicadores de rendemento do TIC. Como parte imprescindible no rendemento dunha organización, e na base da estrutura organizativa, tratarase a xestión de recursos humanos.			

Resultados de Formación e Aprendizaxe

Code	
A6	CB6 - Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación.
A7	CB7 - Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A8	CB8 - Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A9	CB9 - Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüidades.
A10	CB10 - Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en gran medida autodirixido ou autónomo.
B1	CG1 - Posuír coñecementos avanzados e altamente especializados e demostrar unha comprensión detallada e fundamentada dos aspectos teóricos e prácticos tratados nas diferentes áreas de estudo.
B3	CG3 - Dirixir, planificar, coordinar, organizar e/ou supervisar tarefas, proxectos e/ou grupos humanos. Traballar cooperativamente en equipos multidisciplinares actuando, no seu caso, como integrador/a de coñecementos e liñas de traballo.
B6	CG6 - Ser capaz de tomar decisións en contornas caracterizadas pola complexidade e incerteza, avaliando as distintas alternativas existentes co obxectivo de seleccionar aquela cuxo resultado esperado sexa máis favorable, xestionando adecuadamente o risco asociado á decisión.
C1	CE1 - Adquirir coñecementos e aptitudes que permitan desenvolver un liderado eficaz para a transformación dixital dunha organización.
C2	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.
C3	CE3 - Definir, implementar, dirixir e xestionar os procesos organizativos, operativos e soporte na obtención de recursos TIC e para a xestión e calidade do servizo; con garantía da seguridade para as persoas e bens, a calidade final dos produtos e a súa homologación.
C4	CE4 - Planificar estratexicamente, dirixir, coordinar e xestionar técnica e economicamente proxectos no ámbito das TIC e a seguridade da información, aplicando o marco normativo e regulatorio vixente nos ámbitos técnico-económico-xurídico.
D1	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.
D3	CT3 - Incorporar no exercicio profesional criterios de sustentabilidade e compromiso ambiental. Adquirir habilidades no uso equitativo, responsable e eficiente dos recursos.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results
RA1: Coñecer unha visión completa da dirección estratéxica da empresa.	A10 B1 B3 B6 C1 D1 D3
RA2: Entender o concepto de aliñamento estratéxico das TIC.	A10 B1 B3 B6 C1 C2 C4 D1 D3
RA3: Goberno das TIC e estándares relacionados: ISO 38.500, COBIT 5.	A6 A7 A10 B1 B3 B6 C4 D1 D3
RA4: Entender o funcionamento da cadea de valor e a súa xeración e o uso da tecnoloxía como apoio e aos procesos.	A7 A10 B1 B3 B6 C1 C3 D1 D3
RA5: Comprender o uso dos cadros de mando integral e os indicadores de rendemento das TIC.	A7 A9 A10 B1 B3 B6 C1 C2 D1 D3
RA6: Entender como a xestión de recursos humanos contribúe aos obxectivos estratéxicos.	A7 A8 A10 B1 B3 B6 C1 D1 D3

Contidos	
Topic	
Tema 1. Introdución á planificación estratéxica da empresa	1.1. Introdución. Funcións directivas básicas. 1.2. O proceso de dirección estratéxica. 1.3. Conceptualización estratéxica: visión, filosofía, misión. 1.4. Análise estratéxica. 1.5. Cultura organizativa e proceso de establecemento de obxectivos. 1.6. Selección de estratexias.

Tema 2. Goberno, dirección e xestión TIC: Norma ISO/IEC 38500 e COBIT 5	2.1. Goberno do TIC. 2.2. Implementación de Goberno de TIC. 2.3. Marcos de referencia para o goberno e a xestión do TIC. 2.4. ISO/IEC 38500. Introdución. 2.5. ISO/IEC 38500. Principais obxectivos e principios básicos. 2.6. ISO/IEC 38500. Obxectivos da implantación. 2.7. COBIT, Obxectivos de Control para a Información e Tecnoloxías Relacionadas: Introdución. 2.8. COBIT. Marco de referencia. 2.9. COBIT. Principios. 2.10. COBIT. Procesos habilitadores. 2.11. COBIT. Familia de produtos. 2.12. COBIT 5 e outros estándares e marcos de traballo. 2.13. Política dos STIC do Ministerio de Defensa. 2.14. Información complementaria.
Tema 3. Visión e misión do director TIC	3.1. Introdución. 3.2. Competencias do CIO. 3.3. Relacións crave do CIO. 3.4. Lecturas complementarias e actividades.
Tema 4. Xeración de valor e xestión do rendemento	4.1. Introdución. 4.2. O valor dunha máquina de facer exercicio. 4.3. Valor de TI no contexto de Negocio. 4.4. Como comunicar valor. 4.5. Novas formas de crear valor. O modelo de 4 fontes de creación de valor desde TI. 4.6. Análise de valor en distintos escenarios TI, marcos de traballo, metodoloxías e novas tendencias en TI. 4.7. Referencias.
Tema 5. Cadros de mando integral e xestión do rendemento	5.1. O Cadro de Mando Integral. Introdución e conceptos. 5.2. Mapas estratéxicos. 5.3. Enfoque baseado en procesos. 5.4. Indicadores clave do rendemento, KPI. 5.5. Iniciativas estratéxicas. 5.6. Información complementaria. Links.
Tema 6. Xestión de recursos humanos e materiais	6.1. Elementos teórico-técnicos da xestión e cambio estratéxico: Dos recursos humanos á dirección de persoas baseada no talento (DPT). 6.2. Xestión de persoas e talento como factor estratéxico. 6.3. Enfoque motivacional e creativo do comportamento humano.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	6	6
Estudo previo	0	35	35
Lección maxistral	5	5	10
Resolución de problemas	3	3	6
Prácticas con apoio das TIC	4	0	4
Seminario	2	0	2
Foros de discusión	0	3	3
Presentación	3	6	9
*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 (individual e/ou grupal).
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 (individual e/ou grupal).
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 (individual e/ou grupal).
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 (individual e/ou grupal).

Avaliación

	Description	Qualification	Training and Learning Results
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. Realizaranse 6 entregables na fase a distancia (subiranse á plataforma os enunciados por parte do profesor e o alumno terá que subir a resolución) pertencentes aos siguintes temas: - E1: exercicio de aplicación das 5 forzas de Porter (tema 1) (10%), - E2: actividades 1, 2 e 3 (tema 2) (15%), - E3: exercicio (tema 3). Discusión CIO / modelo de franquicia (5%), - E4: actividades 1, 2 e 3 (tema 4) (15%), - E5: exercicio (tema 5). Mapa de procesos (15%) e - E6: cuestionario de preguntas sobre RRHH-gestión do talento (tema 6) (10%).	70	A7 B1 C1 D1 A8 B3 C2 D3 A9 B6 C3 A10 C4
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. Abordarase a exposición por parte do alumno dos siguintes exercicios na fase presencial (pertencentes ao tema 5): - P1: Traballo final: Cadro de Mando Integral: 30%	30	A7 B1 C1 D1 A8 B3 C3 D3 A9 B6 A10

Other comments on the Evaluation

Denominamos MED_CON á nota media de avaliación continua, que se calcula como:

MED_CON = 0.1 * E1 + 0.15 * E2 + 0.05 * E3 + 0.15 * E4 + 0.15 * E5 +0.1 * E6 + 0.3 * P1

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

INTEGRIDADE ACADÉMICA:

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

Na realización das actividades académicas desta materia **permítese o uso de ferramentas de Intelixencia Artificial Xerativa (IAX), empregadas de forma ética, crítica e responsable.** Se utilizou IAX, debe avaliar críticamente os resultados que proporciona, verificar coidadosamente as citas ou referencias xeradas e declarar o uso das ferramentas utilizadas. Non é necesario declarar o uso de IAX en tarefas que non producen contido (revisión da linguaxe - ortografía ou gramática- nun documento, tradución de texto, obtención de suxestións para reorganizar o contido ou modificar o estilo dun documento ou adaptar o formato de referencias bibliográficas). Cando se deba facer referencia a contidos producidos por IAX (texto, imaxes, etc.), especificaranse polo menos os seguintes elementos: contido xerado, *prompt* empregado na consulta, ferramenta utilizada, versión, empresa autora do software, data na que foi realizada a consulta e enlace ao sitio web da ferramenta. **A detección dunha situación de non declaración de uso de IAX terá a consideración de fraude académica e aplicaranse as medidas descritas no parágrafo anterior.**

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

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

Recomendacións

Subjects that are recommended to be taken simultaneously

Xestión de procesos TIC e mellora continua/P52M182V01102

IDENTIFYING DATA

IT process management and continuous improvement

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

Training and Learning Results

Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
C1	CE1 - Acquire knowledge and skills to develop effective leadership for the digital transformation of an organization.
C2	CE2 - Have capacities in relation to the ICT Government and the Management, Operation and Maintenance Services of Information and Communication Systems and Technologies and Information Security.
C3	CE3 - Define, implement, direct and manage the organizational, operational and support processes in obtaining ICT resources and for the management and quality of the service; with a guarantee of safety for people and goods, the final quality of the products and their homologation.
C5	CE5 - Define and implement standard models, establishment of standards and reference methodologies and taxonomy of ICT services and information security.
D5	CT5 - Autonomous learning and work.

Expected results from this subject

Expected results from this subject	Training and Learning Results

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

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

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

Presentation	3	0	3

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

Methodologies

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

Personalized assistance

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

Assessment

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

Discussion Forum	Activity carried out in a virtual environment in which diverse and current topics related to the academic and/or professional field are debated. It allows evaluating the skills, knowledge and, to a lesser extent, the attitudes of the student. There will be three discussion or debate activities (D1, D2 and D3) which will be assessed during the distance phase: D1 and D2 will cover topic 1, and will have a weighting of 1.5% and 4.5% of the mark, respectively; and D3 will cover topic 3 and will have a weighting of 9% of the mark.	15	A6 A10	B1 C1 D5 B4
Self-assessment	Mechanism in which, by means of a series of questions or activities, it is possible for the student to evaluate in an autonomous way his/her degree of acquisition of knowledge and skills on the subject, allowing a self-regulation of the personal learning process. There will be five self-assessment activities (A1, A2, A3, A4 and A5) which will be assessed during the distance phase: A1, A2 and A3 will cover topic 1, 2 and 3, respectively and will all have a weighting of 6.25%; A4 will cover topic 4 and will have a weighting of 1.25%; and A5 will cover topic 5 and will have a weighting of 5%.	25	A6 A7	B1 C1 D5 B4 C3
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc. Knowledge, skills and attitudes can be evaluated through the presentation. The presentation (P) will be assessed during the face-to-face phase.	20	A9	B1 C1 B3 B4

Other comments on the Evaluation

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

MED_CON = 0.09* AO1 + 0.06*AO2+ 0.25*AP3 + 0.015* D1 + 0.045*D2 + 0.09*D3 + 0.0625*A1+ 0.0625*A2 + 0.0625*A3 + 0.0125*A4 + 0.05*A5 + 0.2*P

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

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

Claudio Pires, **Gestión Por Procesos En La Práctica**, Independently Published, 2021

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Complementary Bibliography

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

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

Alejandro Vázquez Chávez y Yohannia López Vargas, **Alineación de estándares para la gestión de proyectos de servicios TI**, KS OmniScriptum Publishing,

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

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

Recommendations

Subjects that are recommended to be taken simultaneously

Government, management and ITC management/P52M182V01101

Other comments

Bizagi Modeler software will be used for the practical sessions:

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

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

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
C2	CE2 - Have capacities in relation to the ICT Government and the Management, Operation and Maintenance Services of Information and Communication Systems and Technologies and Information Security.
C5	CE5 - Define and implement standard models, establishment of standards and reference methodologies and taxonomy of ICT services and information security.
D4	CT4 - Oral and written communication skills.

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

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

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Previous studies	0	50	50
Lecturing	12	10	22
Case studies	7	0	7
Discussion Forum	0	10	10
Essay questions exam	1	4	5
Presentation	2	0	2
Objective questions exam	0	4	4
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

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

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

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

Assessment			
	Description	Qualification	Training and Learning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be assessed.	20	A6 A7 A8 A9 A10 B3 C2 D4 B4 C5
Essay questions exam	Assessment test which includes open questions and/or exercises on a topic. Students must develop, relate, organise and present their knowledge of the subject in a reasoned response. It can be used to assess knowledge and skills.	10	A6 A7 A8 A9 A10 B3 C2 D4 B4 C5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Knowledge, skills and attitudes can be assessed through the presentation.	10	A6 A7 A8 A9 A10 B3 C2 D4 B4 C5
Objective questions exam	Tests that assess knowledge and include closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. There will be two written tests of multiple-choice questions (PT and PE). PT will be taken during the distance learning phase on topics 1, 2 and 3 of the subject and will be weighted 30%. PE will take place at the end of the classroom phase, in which all the topics and contents of the subject will be evaluated (including the contents of the distance and classroom phase) and will be weighted 30%.	60	A6 A7 A8 A10 B3 C2 B4

Other comments on the Evaluation

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

MED_CON = 0.2*D + 0.3*PT+ 0.3*PE + 0.1*P + 0.1*PD

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

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

ACADEMIC INTEGRITY:

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

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information
Basic Bibliography
Complementary Bibliography
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Recommendations

IDENTIFYING DATA				
Networks and telecommunication systems				
Subject	Networks and telecommunication systems			
Code	P52M182V01104			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Troncoso Pastoriza, Francisco Manuel			
Lecturers	Fernández Gavilanes, Milagros Troncoso Pastoriza, Francisco Manuel			
E-mail	ftroncoso@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	This subject provides fundamental concepts of communication networks and telematic services: the technological basis of data transmission, the architecture of communication networks and services, the main components of ICT infrastructures, network management and planning methods and the basic aspects of security in computer networks. Classroom lectures will be used for the introduction of theoretical concepts, which will be complemented with various laboratory practices.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
C7	CE7 - Analyze and model the architecture of a communications system, including its different components and access, transport and transmission services, both in local and wide-area environments.
D4	CT4 - Oral and written communication skills.

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

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

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

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

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

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

Methodologies

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

Personalized assistance

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

Assessment

	Description	Qualification	Training and Learning Results
Practices through ICT	Activities involving the application of knowledge in a specific context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT. They allow the student's knowledge and skills to be assessed. They will be assessed by means of deliverables. They will be assessed by means of deliverables (PT) and will be carried out in the face-to-face phase.	15	A6 A7 A8 B1 B3 B6 C7
Self-assessment	A mechanism in which, by means of a series of questions or activities, it is possible for the student to autonomously evaluate his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. Three questionnaires (AV1, AV2 and AV3) will be carried out and assessed during the distance phase.	10	A6 A7 A8 A9 B1 B3 C7
Essay	Delivery of a report by the students, individually or in groups, about a topic related to the contents of the subject or about the results of a work, exercise, project, etc. This work (T) will be assessed during the distance phase.	30	A6 A7 A8 A9 B1 B3 B6 C7 D4
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc. Knowledge, skills and attitudes can be assessed through the presentation. This presentation (P) will be assessed during the face-to-face phase.	15	A6 A7 A8 A9 A10 B1 B3 C7 D4
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. This written examination (PE) will take place at the end of the face-to-face phase.	30	A6 A7 A8 A9 A10 B1 B3 C7

Other comments on the Evaluation

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

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

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

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

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

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

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

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

Recommendations

Other comments

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

IDENTIFYING DATA				
Information systems				
Subject	Information systems			
Code	P52M182V01105			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	1st
Teaching language	Spanish			
Department				
Coordinator	Álvarez Sabucedo, Luis Modesto			
Lecturers	Álvarez Sabucedo, Luis Modesto			
E-mail	externo.lsabucedo@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The Information Systems subject aims to offer students an integrated vision of the different elements necessary to make the holistic concept of Information Systems possible from a technological perspective. To this end, the different technologies and paradigms that are used in the different layers involved in the design and development of Information Systems will be examined. The proposed approach, far from seeking to show low-level descriptions, seeks a high-level approach concerned with the advantages and disadvantages of the different possibilities.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B5	CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.
C8	CE8 - Analyze and model the architecture of an information system, including its main components and functions, as well as the mechanisms that enable these components to be articulated, especially in distributed environments.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.

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

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

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

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

Planning

	Class hours	Hours outside the classroom	Total hours
Discussion Forum	0	3	3
Autonomous problem solving	0	6	6
Previous studies	0	38	38
Lecturing	7	7	14
Presentation	6	0	6
Problem solving	1	1	2
Self-assessment	0	3	3
Essay questions exam	1	0	1

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

Methodologies

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

Personalized assistance

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

Assessment

	Description	Qualification	Training and Learning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be assessed during the online part of the course.	5	A8 A10 C8 D5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Knowledge, skills and attitudes will be assessed through the presentation. It will take place during the face-to-face phase of the course. It will be based on the work done during the online phase of the course.	20	A6 A7 A9 B1 B5 C8 D4

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

Other comments on the Evaluation

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

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Teaching staff, **Slides from class**, 2022

Complementary Bibliography

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

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

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

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

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

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

Recommendations

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

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
B7	CG7 - Assess the importance of security aspects in the management of systems and information, identifying security needs, analyzing possible threats and risks and contributing to the definition and evaluation of security criteria and policies.
C9	CE9 - Manage information security in regulatory, technical and methodological aspects.
D5	CT5 - Autonomous learning and work.

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

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

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

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

Lecturing	8	8	16
Practices through ICT	6	0	6
Seminars	1	0	1
Discussion Forum	0	5	5
Objective questions exam	2	0	2
Essay	0	20	20

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

Methodologies

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

Personalized assistance

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

Assessment

	Description	Qualification	Training and Learning Results
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. During the distance phase, three scoreable self-assessment questionnaires (P1, P2, and P3) will be conducted that will cover Block I (topics 1 and 2), II (topics 3 and 4), and III (topics 5, 6 and 7), respectively, and a specific questionnaire on social engineering (SE). At the end of the face-to-face phase, a final exam (FE) will be conducted that covers all the theoretical topics and practical contents of the subject.	75	A6 A7 A8 A9 A10 B1 B6 B7 C9 D5
Essay	An essay or document prepared on a topic that must be written according to established rules of style and length. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. An essay (E) will be carried out that will be evaluated during the distance phase: the E activity covers Block I (topics 1 and 2).	25	A6 A7 A8 A9 A10 B1 B3 B7 C9 D5

Other comments on the Evaluation

If we denote MED_CON as the average score of continuous assessment, it is calculated as:

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

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

William, Stallings, **Computer Security: Principles and Practice**, 4ª Ed., Pearson Education India, 2017

White, Gregory, et al., **CompTIA Security+ all-in-one exam guide**, 5ª Ed., McGraw-Hill, Inc., 2018

Centro Criptológico Nacional, **CCN-STIC guides**,

Recommendations

Other comments

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

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

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
B7	CG7 - Assess the importance of security aspects in the management of systems and information, identifying security needs, analyzing possible threats and risks and contributing to the definition and evaluation of security criteria and policies.
C9	CE9 - Manage information security in regulatory, technical and methodological aspects.
D6	CT6 - Properly manage information resources.

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

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

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

Topic 5: The importance of the human factor in information security.	- Aspects to consider regarding the human factor and security. - Social Engineering techniques. - Phishing attacks. - Definition of policies for safe and acceptable use of computer resources.

Planning

	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	5	5
Previous studies	0	55	55
Lecturing	16	8	24
Problem solving	2	2	4
Discussion Forum	0	5	5
Self-assessment	0	3	3
Presentation	3	0	3
Essay questions exam	1	0	1

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

Methodologies

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

Personalized assistance

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

Assessment

	Description	Qualification	Training and Learning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the assessment of skills, knowledge and, to a lesser extent, attitudes of the learner. A forum activity (F) will be carried out and assessed during the distance phase: activity F will cover topic 1 of the subject.	10	A6 A7 A10 C9 D6
Self-assessment	Mechanism in which, by means of a series of questions or activities, the student is able to autonomously assess his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. A questionnaire (AV) covering subjects 1, 2 and 3 will be carried out during the distance learning phase.	30	B1 C9 D6

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

Other comments on the Evaluation

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

MED_CON = 0.1*F + 0.3*AV + 0.3*P + 0.3*PE

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

Fernández, C. Manuel., Piattini, M., y Peso, E., **Auditoría Informática: Un enfoque práctico**, 2, Ra-Ma, 2000

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Talabis, M. y Martin, J., **Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis**, 1, Syngress, 2012

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

Recommendations

Subjects that are recommended to be taken simultaneously

Information systems/P52M182V01105

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

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
B5	CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.
C4	CE4 - Strategically plan, direct, coordinate and technically and economically manage projects in the field of ICTs and information security, applying the current normative and regulatory framework in the technical-economic-legal fields.
D3	CT3 - Incorporate criteria of sustainability and environmental commitment into professional practice. Acquire skills in the equitable, responsible and efficient use of resources.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.

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

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

Contents	
Topic	
Topic 1: 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 2: Project planning, monitoring and control	- Key processes of project management - Case studies and exercises
Topic 3: Methodologies and Standards related to Project Management	- Predictive methodologies: PMBoK, Prince2 - AGILE practices and methodologies. Scrum
Topic 4: Risk Management	- Introduction - Plan Risk Management - Identify Risks - Risk Analysis - Plan Risk Responses - Implement Risk Responses - Monitor Risks - Exercises and case studies
Topic 5: Computer Systems Engineering	- Introduction - Life Cycle / Models - Validation versus Verification - Structure / Processes: specification, design, development, testing, operation - Integral Life Cycle. Case Study - Site Reliability engineering (SRE)
Topic 6: Project Management Tools	- Classic techniques and tools - Computer tools, such as Microsoft Project, Project Libre, Redmine, etc - Case studies

Planning			
	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	14	14
Previous studies	0	40	40
Lecturing	12	10	22
Problem solving	2	2	4
Presentation	5	0	5

Seminars	2	0	2
Discussion Forum	0	4	4
Self-assessment	0	4	4
Objective questions exam	1	0	1
Essay	0	4	4

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

Methodologies	
	Description
Autonomous problem solving	Activity in which students analyse and solve problems and/or exercises related to the subject in an autonomous way.
Previous studies	Research, reading, documentation work and/or autonomously carrying out any other activity that the student considers necessary to enable him/her to acquire knowledge and skills related to the subject. This is usually carried out prior to the classes, laboratory practices and/or assessment tests.
Lecturing	Lecturer's presentation of the contents of the subject being studied, theoretical bases and/or guidelines for a project or exercise to be carried out by the student.
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the appropriate and correct solutions through the exercise of routines, application of formulas or algorithms, application of transformation procedures of the available information and interpretation of the results.
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.
Presentation	While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.
Seminars	While the use of telematics student support is still possible, face-to-face tutoring mechanisms will also be used during this phase.

Assessment						
	Description	Qualification	Training and Learning Results			
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or of the results of a work, exercise, project, etc. A presentation (P) will be given and assessed during the face-to-face phase: activity P will cover all the topics of the subject. Knowledge, skills and attitudes can be assessed by means the presentation.	10	A9 A10	B4	C4	D4 D5

Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It assesses the skills, knowledge and, to a lesser extent, attitudes of the student. A discussion or debate activity (D) will be carried out in a virtual environment and will be assessed during the distance phase: activity D will cover all the topics of the subject.	10	A8	B5	C4	D5
Objective questions exam	Test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). There will be a written test (PE) at the end of the face-to-face phase, in which all the topics and contents of the subject will be evaluated (including the contents of the distance and face-to-face phases).	60	A6	B2	C4	D4 D5
Essay	A text or document on a topic which must be written according to established rules of style and length. It allows the assessment of the student's skills, knowledge and, to a lesser extent, attitudes. A report (T) will be produced and assessed during the distance learning phase: the T activity covers all the topics of the subject.	20	A9 A10	B4	C4	D4 D5

Other comments on the Evaluation

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

MED_CON = 0.1*P + 0.1*D + 0.2*T + 0.2*PE1 +0.4*PE2

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.

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Sources of information

Basic Bibliography

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

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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

Pressman, Roger, **Ingeniería del Software. Un enfoque práctico**, 10ª Edición, McGraw Hill, 2010

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

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

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

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

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	Choose	Year	Quadmester
	3	Mandatory	1	2c
Teaching language	Castelán			
Department	Informática			
Coordinator	Rodríguez Martínez, Francisco Javier			
Lecturers	Otero Cerdeira, Lorena Rodríguez Martínez, Francisco Javier			
E-mail	externo.franjrm@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	A arquitectura é a estrutura fundamental sobre a que se asintan os sistemas software. A arquitectura dun sistema software está formada polos seus elementos fundamentais, as propiedades visibles dos mesmos e as relacións que existen entre eles. Dentro das arquitecturas software empresariais destacan, entre outros, conceptos como as arquitecturas orientadas a servizos (SOA), os servizos web ou a xestión de procesos de negocio BPM (Business Proccess Management), como solución aos problemas de integración en sistemas cada vez máis heteroxéneos e de carácter distribuído. Nesta materia estudaranse devanditos conceptos e a súa aplicación en contornas empresariais sendo o alumno capaz de tomar decisións estratéxicas que integren os mesmos.			

Resultados de Formación e Aprendizaxe	
Code	
A6	CB6 - Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación.
A7	CB7 - Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A8	CB8 - Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A9	CB9 - Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüidades.
A10	CB10 - Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en gran medida autodirixido ou autónomo.
B1	CG1 - Posuír coñecementos avanzados e altamente especializados e demostrar unha comprensión detallada e fundamentada dos aspectos teóricos e prácticos tratados nas diferentes áreas de estudo.
B2	CG2 - Integrar e aplicar os coñecementos adquiridos, e posuír capacidade de resolución de problemas en contornas novas ou definidas de forma imprecisa, incluíndo contextos de carácter multidisciplinar relacionados co seu ámbito de estudo.
B5	CG5 - Avaliar de maneira crítica a estrutura e validez dos razoamentos, analizando, interpretando e cuestionando os fundamentos de ideas, accións e xuízos propios ou alleos, antes de aceptalos como válidos.
B6	CG6 - Ser capaz de tomar decisións en contornas caracterizadas pola complexidade e incerteza, avaliando as distintas alternativas existentes co obxectivo de seleccionar aquela cuxo resultado esperado sexa máis favorable, xestionando adecuadamente o risco asociado á decisión.
C5	CE5 - Definir e implantar modelos normalizados, establecemento de estándares e metodoloxías de referencia e taxonomía de servizos TIC e de seguridade da información.
C6	CE6 - Planificar e xestionar infraestruturas TIC.
D5	CT5 - Aprendizaxe e traballo autónomos.
D6	CT6 - Manexar apropiadamente recursos de información.

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

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

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

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

Planificación			
	Class hours	Hours outside the classroom	Total hours
Foros de discusión	0	3	3
Resolución de problemas de forma autónoma	0	6	6
Resolución de problemas	2	2	4
Prácticas de laboratorio	4	0	4
Seminario	2	0	2
Estudo previo	0	39	39
Lección maxistral	6	6	12
Autoavaliación	0	2	2
Presentación	2	0	2
Exame de preguntas obxectivas	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

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

Atención personalizada	
Methodologies	**Description**
Lección maxistral	1. Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. 2. Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).
Foros de discusión	1. Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. 2. Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).

Resolución de problemas	1. Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. 2. Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).
Prácticas de laboratorio	1. Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. 2. Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).
Seminario	1. Atención na fase a distancia: levará a cabo mediante o uso de medios telemáticos. Os alumnos que o desexen poderán expor dúbidas ao profesorado en foros ou mediante correo electrónico. Tamén poderán concertar titorías individuais co profesor, que se desenvolverán mediante videoconferencia. 2. Atención na fase presencial: aínda que segue sendo posible o uso de mecanismos telemáticos de atención ao alumno, durante esta fase empregaranse tamén mecanismos de titoría presencial (individual e/ou grupal).

Avaliación

	Description	Qualification	Training and Learning Results			
Foros de discusión	Participación con achegas orixinais e fundamentadas nos foros da materia. Se realizarán 2 actividades de discusión o debate (D1 e D2) nun entorno virtual que será evaluada durante a fase a distancia: estas actividades abarcarán os temas 1 (D1) e 2 (D2) da asignatura.	10	A6 A7 A8 A9 A10	B2 B5 B6	C6	D5 D6
Autoavaliación	Tarefas, resolución de exercicios, preguntas e tests autoavaliables na aula virtual que deben ser realizadas polos estudantes de forma individual, autónomo e non presencial, sempre cunha data límite. Realizaránse 4 actividades entregables (AE1, AE2, AE3 e AE4) que serán avaliadas durante a fase a distancia: cada actividade abarcará un tema correspondente da materia.	30	A6 A7 A8 A9	B1 B2 B5	C6	D5 D6
Presentación	Inclúe a preparación dun tema e a súa exposición oral (sempre que o tempo en presencial o permita). Será unha única actividade e abarcará toda a materia vista en clase. Realizarase un traballo TP co seu correspondente defensa e presentación. (en presencial e dependente do tempo dispoñible)	20	A6 A7 A8 A9 A10	B1 B2 B5	C6	D5 D6
Exame de preguntas obxectivas	Preguntas directas que o alumnado debe responder de maneira breve en base aos coñecementos que ten sobre a materia. Realizarase unha proba escrita (PE) o final da fase presencial, na que se avaliarán todolos temas e contidos da materia (incluindo os contidos da fase a distancia e da fase presencial).	40	A6 A7 A8 A9 A10	B1 B2 B5	C5 C6	D5 D6

Other comments on the Evaluation

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

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

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

Segunda oportunidade

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

Sistemas de evaluación

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

INTEGRIDADE ACADÉMICA:

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

Na realización das actividades académicas desta materia permítese o emprego de ferramentas de Intelixencia Artificial Xenerativa (IAX), usadas de forma ética, crítica e responsable. No caso de ter utilizado IAX, débese avaliar criticamente calquera resultado que proporcione, verificar coidadosamente calquera cita ou referencia xerada e declarar o uso das ferramentas utilizadas. Non é necesario declarar o uso de IAX en tarefas que non producen contido (revisión de linguaxe - ortográfica ou gramatical - nun documento, tradución de texto, obtención de suxestións para reorganizar contido ou modificar estilo dun documento ou adaptar o formato de referencias bibliográficas). Cando se deba referenciar contido producido por IAX (texto, imaxes, etc.), especificaranse, polo menos, os seguintes elementos: contido xerado, prompt empregado na consulta, ferramenta utilizada, versión, compañía autora do software, data na que se realizou a consulta e ligazón ao sitio web da ferramenta. A detección dunha situación de non declaración de uso de IAX será considerada como fraude académico e aplicaranse as medidas descritas no parágrafo anterior.

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				
Planning and management of ICT infrastructures				
Subject	Planning and management of ICT infrastructures			
Code	P52M182V01203			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Mandatory	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	González Coma, José Pablo			
Lecturers	González Coma, José Pablo Suárez Lorenzo, Fernando			
E-mail	jose.gcoma@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	This course enables students to learn the knowledge and application of the processes required to manage an ICT infrastructure aligned with business requirements. Define the processes, interfaces and dependencies associated with the ICT infrastructure management lifecycle, including strategic planning, design, implementation, operations, support and maintenance. Knowledge of project organisation and management will be acquired to complement knowledge of system and network integration, storage systems, parallel architectures and basic IT installation environments. In this subject, these concepts and their application in business environments will be studied and the student will be able to make strategic decisions that integrate them.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
C6	CE6 - Plan and manage ICT infrastructures.
D3	CT3 - Incorporate criteria of sustainability and environmental commitment into professional practice. Acquire skills in the equitable, responsible and efficient use of resources.
D4	CT4 - Oral and written communication skills.

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

LO1: Know how to implement, configure and maintain virtualisation services on servers.	A6 A7 A8 B1 B2 B3 B6 C6 D3 D4
LO2: Understand the main architectures of high availability systems.	A6 B1 B2 B3 B6 C6 D3 D4
LO3: Know how to implement and configure high availability systems based on standard servers.	A6 A7 A8 A9 B1 B2 B3 B6 C6 D3 D4
LO4: To know the basics of hardware planning in large installations, as well as its integration with communications systems.	A7 A8 A9 B1 B2 B3 B6 C6 D3 D4
LO5: Know how to deal with the management of large system infrastructures	A6 A8 A10 B1 B2 B3 B6 C6 D3 D4
LO6: To learn about real examples of large ICT infrastructures in companies and/or administrations.	A7 A9 A10 B1 B2 B3 B6 C6 D3 D4
LO7: Saber aplicar eficientemente un soporte de comunicaciones a una infraestructura hardware	A6 A8 B1 B2 B3 B6 C6 D3 D4

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	8	8
Previous studies	0	53	53
Lecturing	8	8	16
Problem solving	2	2	4
Studies excursion	4	0	4
Seminars	3	0	3
Discussion Forum	0	4	4
Self-assessment	0	3	3
Presentation	3	0	3
Objective questions exam	2	0	2
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

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

Personalized assistance	
Methodologies	**Description**

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

Assessment

	Description	Qualification	Training and Learning Results
Discussion Forum	An activity carried out in a virtual environment in which a variety of current topics related to the academic and/or professional sphere are debated. It allows the evaluation of the student's skills, knowledge and, to a lesser extent, attitudes. Participation in the forums will be assessed. This discussion forum activity (F) will be carried out during the distance phase.	20	A6 A7 A8 A10 B1 B2 B6 C6 D4
Self-assessment	A mechanism in which, by means of a series of questions or activities, the student is able to autonomously assess his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. This self-assessment activity (SA) will be carried out during the distance learning phase.	20	A7 B1 C6 D3
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the subject or the results of a work, exercise, project, etc. Through the presentation, knowledge, skills and attitudes can be assessed. This presentation activity (P) will be carried out during the face-to-face phase.	30	A6 A7 A8 A9 B1 B2 B3 B6 C6 D4
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. This developmental questions (E) examination activity will be carried out during the face-to-face phase.	30	A6 A7 A8 A9 B1 B2 B3 B6 C6 D3 D4

Other comments on the Evaluation

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

MED_CON = 0.2*F + 0.2*AV+ 0.3*P + 0.3*ED

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is**

allowed, used in an ethical, critical and responsible manner. In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

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

Maurizio Portolani, **Data Center Fundamentals**, CiscoPress, 2003

Complementary Bibliography

Christopher Poelker, Alex Nikitin, **Storage Area Networks for Dummies**, 2, John Wiley & Sons Inc, 2008

Josep Ros, **Virtualización Corporativa con VMware**, 2011

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

Recommendations

Other comments

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

IDENTIFYING DATA				
Satellite communication systems, positioning, remote sensing and radionavigation				
Subject	Satellite communication systems, positioning, remote sensing and radionavigation			
Code	P52M182V01204			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Nocelo López, Rubén			
Lecturers	Nocelo López, Rubén Núñez Ortuño, José María			
E-mail	rubennocelo@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The course of Satellite Communications Systems, Positioning, Remote Sensing and Radionavigation aims to provide students with an overview of the main satellite communications systems. Radionavigation Systems aims to provide students with an overview of the main remote positioning and communication systems. communication and remote positioning systems. The course details the technologies involved, regulatory and safety aspects of this type of systems. regulatory and safety aspects of this type of systems.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B5	CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.
C12	CISTT1 - Deepen the knowledge of telecommunications systems based on different technologies applicable to the tactical, operational and strategic fields; to fixed and mobile environments; with different types and volumes of data.
C13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.

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

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

Contents

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

Planning

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

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

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

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

Assessment				
	Description	Qualification	Training and Learning Results	
Self-assessment	Mechanism in which, by means of a series of questions or activities, the learner is activities, it is possible for the student to evaluate autonomously his or her autonomously their degree of acquisition of knowledge and skills about the the subject, allowing a self-regulation of the personal learning process. personal learning process. There will be two intermediate tests (PE1 and PE2), one hour long, to control the follow-up of the subject. Each test of control has a weight of 20%. The first test that covers topics 1 and 2 will be carried out in the distance phase, while the second test that will cover topics 3 and 4 will be carried out in the face-to-face phase.	40	A6 A7 A8 A9	B1 C12 D4 B2 C13 B5
Presentation	Presentation by the students, individually or in groups, of a work (T1 and T2) related to the contents of the topic 1 and 2 of the subject . Each task has a weight of 10% and will be evaluated in the distance phase.	20	A6 A7 A8 A9 A10	B1 C12 D4 B2 C13 D5 B5

Problem and/or exercise solving	Resolution of different exercises (E1 and E2) proposed in class on assumptions applicable to each of the topics 3 and 4 of the syllabus. Each exercise has a weight of 10% and will be carried out in the distance phase.	20	A6 A7 A8 A9 A10	B1 C12 D4 B2 C13 D5 B5
Laboratory practice	Evaluation of two laboratory practices (PL1 and PL2) related to the course syllabus by means of deliverable reports that will be carried out in the face-to-face phase. Each practice has a weight of 10%.	20	A6 A7 A8 A9 A10	B1 C12 D4 B2 C13 D5 B5

Other comments on the Evaluation

If the average grade of continuous assessment, called MED_CON, is calculated as:

MED_CON=0.4*(PE1+PE2)/2+0.2*(T1+T2)/2+0.2*(E1+E2)/2+0.2*(PL1+PL2)/2

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

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

Richard Curry, **Radar Essentials**, Scitech Publishing Inc., 2012
M. L. Skolnik, **Radar Handbook**, McGraw Hill, 2008

Recommendations

Subjects that it is recommended to have taken before

Networks and telecommunication systems/P52M182V01104

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

Resultados de Formación e Aprendizaxe	
Code	
A6	CB6 - Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación.
A7	CB7 - Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A8	CB8 - Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A9	CB9 - Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüidades.
A10	CB10 - Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en gran medida autodirixido ou autónomo.
B1	CG1 - Posuír coñecementos avanzados e altamente especializados e demostrar unha comprensión detallada e fundamentada dos aspectos teóricos e prácticos tratados nas diferentes áreas de estudo.
B3	CG3 - Dirixir, planificar, coordinar, organizar e/ou supervisar tarefas, proxectos e/ou grupos humanos. Traballar cooperativamente en equipos multidisciplinares actuando, no seu caso, como integrador/a de coñecementos e liñas de traballo.
B6	CG6 - Ser capaz de tomar decisións en contornas caracterizadas pola complexidade e incerteza, avaliando as distintas alternativas existentes co obxectivo de seleccionar aquela cuxo resultado esperado sexa máis favorable, xestionando adecuadamente o risco asociado á decisión.
B7	CG7 - Valorar a importancia dos aspectos de seguridade na xestión de sistemas e información, identificando necesidades de seguridade, analizando posibles ameazas e riscos e contribuíndo á definición e avaliación de criterios e políticas de seguridade.
C14	CISTT3 - Definir, analizar e implantar as medidas de seguridade en sistemas de telecomunicacións en función do dominio da información manexada.
D5	CT5 - Aprendizaxe e traballo autónomos.
D6	CT6 - Manexar apropiadamente recursos de información.

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results

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

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

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

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	8	8
Estudo previo	0	45	45
Lección maxistral	5	5	10
Resolución de problemas	5	5	10
Prácticas con apoio das TIC	8	0	8
Seminario	2	0	2
Foros de discusión	0	4	4
Exame de preguntas de desenvolvemento	2	0	2
Traballo	0	6	6
Estudo de casos	0	5	5

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

Metodoloxía docente

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

Atención personalizada

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

Avaliación

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

Prácticas con apoio das TIC	Actividades de aplicación dos coñecementos nun contexto determinado e de adquisición de habilidades básicas e procedementais en relación coa materia, a través do uso do TIC. Permiten avaliar os coñecementos e habilidades do alumno/a. Avaliaranse (P) mediante entregables durante a fase presencial.	10	A6 A7 A8 A9 A10 B1 B3 B6 B7 C14 D5 D6
Exame de preguntas de desenvolvemento	Proba de avaliación que inclúe preguntas abertas e/ou exercicios, sobre un tema. Os alumnos/as deben desenvolver, relacionar, organizar e presentar os coñecementos que teñan sobre a materia nunha resposta argumentada. Pódese utilizar para avaliar coñecementos e habilidades. Esta proba (PD) realizarase durante a fase presencial.	40	A6 A7 A8 A9 A10 B1 B3 B6 B7 C14 D5 D6
Traballo	Texto ou documento elaborado sobre un tema que debe redactarse seguindo unhas normas establecidas de estilo e lonxitude. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Avaliarase (T) durante a fase a distancia.	20	A6 A7 A8 A9 B1 B6 B7 C14 D5 D6
Estudo de casos	Feito, problema ou suceso real que será analizado coa finalidade de coñecelo, interpretalo, resolvelo, xerar hipóteses, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo e entrenarse nos procedimentos alternativos de solución. Avaliarase (EC) sobre tódolos contidos da materia por medio dun entregable na fase presencial.	10	A6 A7 A8 A9 A10 B1 B3 B6 B7 C14 D5 D6

Other comments on the Evaluation

Se denominamos MED_CON á nota media de avaliación continua, que se calcula como:

MED_CON = 0.2*RP + 0.1*P+ 0.4*PD + 0.2*T + 0.1*EC

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

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

INTEGRIDADE ACADÉMICA:

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

Na realización das actividades académicas desta materia **permítese o uso de ferramentas de Intelixencia Artificial Xerativa (IAX), empregadas de forma ética, crítica e responsable**. Se utilizou IAX, debe avaliar críticamente os resultados que proporciona, verificar coidadosamente as citas ou referencias xeradas e declarar o uso das ferramentas utilizadas. Non é necesario declarar o uso de IAX en tarefas que non producen contido (revisión da linguaxe -ortografía ou gramática- nun documento, tradución de texto, obtención de suxestións para reorganizar o contido ou modificar o estilo dun documento ou adaptar o formato de referencias bibliográficas). Cando se deba facer referencia a contidos producidos por IAX (texto, imaxes, etc.), especificaranse polo menos os seguintes elementos: contido xerado, prompt empregado na consulta, ferramenta utilizada, versión, empresa autora do software, data na que foi realizada a consulta e enlace ao sitio web da ferramenta. **A detección dunha situación de non declaración de uso de IAX terá a consideración de fraude académica e aplicaranse as medidas descritas no parágrafo anterior.**

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, D. Wetherall, **Computer Networks: International Version**, 5, Prentice Hall, 2010

Dr. Wm. Arthur Conklin, Dr. Gregory White, Chuck Cothren, Roger L. Davis, Dwayne Williams, **CompTIA Security+ (All-in-One Exam Guide)**, 5, McGraw-Hill, 2018

Mike Meyers, **CompTIA Network+ Certification (All-in-One Exam Guide)**, 7, McGraw-Hill Education, 2018

Recomendacións

Subjects that it is recommended to have taken before

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

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

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
C17	CISTI3 - Define and implement technologies and methodologies in the development of systems, applications and software services in web, distributed, mobile environments, etc.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
LO1: Know the existing web engineering methodologies.	A8 B1 B2 B3 C17
LO2: Understand the inner workings of a web service, and the different technologies currently available to implement them.	A7 B1 B2 B3 C17 D4 D5
LO3: Understand the basic principles of distributed computing and systems and their differences with centralised systems.	B1 B2 B3 C17

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

Contents

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

Planning

	Class hours	Hours outside the classroom	Total hours
Previous studies	0	40	40
Lecturing	8	10	18
Discussion Forum	0	2	2
Practices through ICT	4	0	4
Self-assessment	0	2	2
Objective questions exam	1	0	1
Presentation	4	3	7
Essay questions exam	1	0	1

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

Methodologies

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

Practices through ICT	Activities involving the application of knowledge in a given context and the acquisition of basic and procedural skills in relation to the subject, through the use of ICT.

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

Assessment				
	Description	Qualification	Training and Learning Results	
Discussion Forum	Activity carried out in a virtual environment where a variety of current issues related to the academic and / or professional field are debated. It allows evaluating the skills, knowledge and, to a lesser extent, the attitudes of the student. Participation in the forums (F) carried out during the distance phase will be evaluated.	10	A6 A7 A8 A9 A10	B1 B2 C17 D4 D5
Self-assessment	A mechanism in which, by means of a series of questions or activities, it is possible for the student to autonomously evaluate his/her degree of acquisition of knowledge and skills on the subject, allowing self-regulation of the personal learning process. To be assessed (AV) during the distance phase.	30	A7	B1 B2 C17
Objective questions exam	A test that assesses knowledge and includes closed questions with different answer alternatives (true or false, multiple choice, item matching, etc.). Students select an answer from a limited number of possibilities. This test (EO) will take place during the face-to-face phase.	25	A6 A8 A9 A10	B1 B2 B3 C17 D4 D5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the course or the results of a work, exercise, project, etc. Through the presentation, knowledge, skills and attitudes can be evaluated. Esta actividad de presentación (P) se realizará en la fase a distancia.	20	A6 A7 A8 A9 A10	B1 D4 D5
Essay questions exam	Test (EP) that assesses knowledge and includes open-ended essay questions about the practices carried out during the face-to-face phase.	15	A6 A7 A8 A9 A10	B1 B2 B3 C17 D4 D5

Other comments on the Evaluation

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

MED_CON = 0.1 * F+ 0.3 * AV + 0.25 * EO + 0.2 * P + 0.15 * EP

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

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/presentation 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.

ACADEMIC INTEGRITY:

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

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

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

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

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

Recommendations

Subjects that it is recommended to have taken before

Networks and telecommunication systems/P52M182V01104

IDENTIFYING DATA				
Security in information systems				
Subject	Security in information systems			
Code	P52M182V01207			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	González Coma, José Pablo			
Lecturers	González Coma, José Pablo Vales Alonso, Javier			
E-mail	jose.gcoma@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The subject of Security in information systems will show the techniques, protocols and architectures related to security that exist at the different levels of implementation of a modern information system, with a particular emphasis on the communications part. The subject will focus on the clear exposition of these problems, and their practical resolution through practical study cases.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B7	CG7 - Assess the importance of security aspects in the management of systems and information, identifying security needs, analyzing possible threats and risks and contributing to the definition and evaluation of security criteria and policies.
C18	CISTI4 - Define, analyze and implement security mechanisms throughout the life cycle of information systems.
D4	CT4 - Oral and written communication skills.
D6	CT6 - Properly manage information resources.

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

LO2: Describe the problems, threats and solutions used at different levels of a communications system/service.	A6 A7 A8 A9 A10 B1 B2 B7 C18
LO3: Describe the modern technical foundations of cryptography on which symmetric key and public key systems are based.	A6 A7 A8 A9 A10 B1 B2 B7 C18
LO4: Study public key infrastructure systems, including in detail how the creation, maintenance, distribution, use, storage and revocation of digital certificates will be addressed.	A6 A7 A8 A9 A10 B1 B2 B7 C18
LO5: Describe new applications and trends in the field of information systems security.	A6 A7 A8 A9 A10 B1 B2 B7 C18 D4 D6

Contents	
Topic	
Topic 1. Introduction to security in information systems.	- Introduction to Data Centres. - Typical structure - Administration of Data Processing Centres
Topic 2. Security in software development.	- sSDLC - Vulnerabilities - Countermeasures
Topic 3. Symmetric key encryption.	- Mathematical principles - Block coders (DES, Triple-DES, AES) - Stream coders (RC4)
Topic 4. Public key cryptography.	- Motivation - Mathematical principles - Diffie-Hellman - RSA - Elliptic Curve Cryptography (ECC)
Topic 5. Digital signatures.	- MAC and Hash systems - MD5 - SHA - HMAC
Topic 6. Key distribution systems and authentication.	- Introduction - Kerberos - X509 - Public key infrastructure (PKI)
Topic 7. Transport and web security.	- Motivation - SSL - TLS - SSH

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

Planning			
	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	9	9
Previous studies	0	52	52
Lecturing	8	8	16
Problem solving	3	3	6
Practices through ICT	4	0	4
Seminars	4	0	4
Presentation	4	0	4
Essay questions exam	1	4	5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

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

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

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

Assessment

	Description	Qualification	Training and Learning Results
Practices through ICT	Activities of application of knowledge in a specific context and acquisition of basic and procedural skills in relation to the subject, through the use of ICT. They allow evaluating the knowledge and skills of the student. There will be four deliverable activities (AE1, AE2, AE3 and AE4). The first three will be assessed during the distance learning phase: AE1 and AE2 will cover topic 3, while AE3 will cover topic 4 of the subject. In the case of deliverable AE4 this will be done during the face-to-face phase. Each deliverable will score 10% of the final mark.	40	A6 A7 A8 A9 A10 B1 B2 B7 C18 D4
Presentation	Exhibition by the students, individually or in groups, of a topic related to the contents of the subject or the results of a job, exercise, project, etc. Through the presentation you can assess knowledge, skills and attitudes. This exhibition task (T) will be assessed during the face-to-face phase.	20	A6 A7 A8 A9 A10 B1 B2 B7 C18 D4 D6
Essay questions exam	Assessment test that includes open questions and/or exercises on a topic. Students must develop, relate, organize and present the knowledge they have on the subject in an argued response. It can be used to assess knowledge and skills. There will be a written test (PE) at the end of the face-to-face phase, in which all the topics and contents of the subject will be all the subjects and contents of the course (including the contents of the distance and face-to-face contents of the distance and face-to-face phases).	40	A6 A7 A8 A9 A10 B1 B2 B7 C18 D4

Other comments on the Evaluation

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

MED_CON = 0.1*AE1 + 0.1*AE2+ 0.1*AE3 + 0.1*AE4 + 0.2*T + 0.4*PE

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

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

- Deliverables (practices)
- Presentations and/or expositions
- Exam

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

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is**

allowed, used in an ethical, critical and responsible manner. In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information
Basic Bibliography
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	Choose	Year	Quadmester
	3	Mandatory	2	1c
Teaching language	Castelán			
Department	Departamento do Centro Universitario da Defensa da Escola Naval Militar de Marín Dpto. Externo			
Coordinator	González Coma, José Pablo			
Lecturers	Carrera González, Jesús González Coma, José Pablo Represas Seoane, Javier			
E-mail	jose.gcoma@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.			

Resultados de Formación e Aprendizaxe	
Code	
A6	CB6 - Posuír e comprender coñecementos que aporten unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, a miúdo nun contexto de investigación.
A7	CB7 - Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornas novas ou pouco coñecidas dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
A8	CB8 - Que os estudantes sexan capaces de integrar coñecementos e enfrontarse á complexidade de formular xuízos a partir dunha información que, sendo incompleta ou limitada, inclúa reflexións sobre as responsabilidades sociais e éticas vinculadas á aplicación dos seus coñecementos e xuízos.
A9	CB9 - Que os estudantes saiban comunicar as súas conclusións e os coñecementos e razóns últimas que as sustentan a públicos especializados e non especializados dun modo claro e sen ambigüidades.
A10	CB10 - Que os estudantes posúan as habilidades de aprendizaxe que lles permitan continuar estudando dun modo que haberá de ser en gran medida autodirixido ou autónomo.
B2	CG2 - Integrar e aplicar os coñecementos adquiridos, e posuír capacidade de resolución de problemas en contornas novas ou definidas de forma imprecisa, incluíndo contextos de carácter multidisciplinar relacionados co seu ámbito de estudo.
B3	CG3 - Dirixir, planificar, coordinar, organizar e/ou supervisar tarefas, proxectos e/ou grupos humanos. Traballar cooperativamente en equipos multidisciplinares actuando, no seu caso, como integrador/a de coñecementos e liñas de traballo.
B5	CG5 - Avaliar de maneira crítica a estrutura e validez dos razoamentos, analizando, interpretando e cuestionando os fundamentos de ideas, accións e xuízos propios ou alleos, antes de aceptalos como válidos.
B6	CG6 - Ser capaz de tomar decisións en contornas caracterizadas pola complexidade e incerteza, avaliando as distintas alternativas existentes co obxectivo de seleccionar aquela cuxo resultado esperado sexa máis favorable, xestionando adecuadamente o risco asociado á decisión.
C1	CE1 - Adquirir coñecementos e aptitudes que permitan desenvolver un liderado eficaz para a transformación dixital dunha organización.
D5	CT5 - Aprendizaxe e traballo autónomos.

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results
RA1. Coñecer cal é o proceso de innovación e as claves para o seu éxito.	A6 A7 A8 A10 C1 D6
RA2. Coñecer un marco sinxelo e de ámbito xeral para innovar e ser creativo en calquera área da organización.	A6 A7 A8 A10 B2 B6 C1 D5 D6
RA3. Ser capaz de exercer un liderado transformador, capaz de transmitir unha visión.	A6 A7 A8 A9 B2 B3 B5 B6 C1 D5 D6
RA4. Coñecer e entender a importancia das ferramentas de xestión de coñecemento, vixilancia tecnolóxica e intelixencia competitiva no proceso innovador.	A6 A7 A8 A10 B2 C1 D5 D6

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	31	31
Lección maxistral	13	8	21
Estudo de casos	2	0	2
Foros de discusión	0	3	3
Exame de preguntas de desenvolvemento	1	3	4
Traballo	0	10	10
Exame de preguntas obxectivas	1	3	4

*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	Training and Learning Results
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. Realizaranse actividades de discusión ou debate (D) nun entorno virtual que serán avaliadas durante a fase a distancia.	10	A6 B2 C1 D6 A7 B3 A8 B5 A9 B6 A10
Exame de preguntas de desenvolvemento	Proba de avaliación que inclúe preguntas abertas e/ou exercicios, sobre un tema. Os alumnos/as deben desenvolver, relacionar, organizar e presentar os coñecementos que teñan sobre a materia nunha resposta argumentada. Pódese utilizar para avaliar coñecementos e habilidades. Realizarase unha proba escrita de desenvolvemento (PP) ao final da fase presencial, na que se avaliarán os temas e contidos da asignatura.	25	A7 B2 C1 D5 A8 B5 D6 A9 B6 A10

Traballo	Texto ou documento elaborado sobre un tema que debe redactarse seguindo unhas normas establecidas de estilo e lonxitude. Permite avaliar as habilidades, os coñecementos e, en menor medida, as actitudes do alumno/a. Realizarase un traballo (T) que será avaliado durante a fase a distancia.	40	A6 A7 A8 A9 A10	B2 B3 B5	C1	D5 D6
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 una resposta de entre un número limitado de posibilidades. Realizarase unha proba escrita (PE) ao final da fase presencial, na que se avaliarán os temas e contidos da asignatura.	25	A7 A8 A9 A10	B2 B5 B6	C1	D5 D6

Other comments on the Evaluation

Se denominamos MED_CON á nota media de avaliación continua, que se calcula como:

MED_CON = 0.1*F + 0.4*T + 0.25*PP + 0.25*PE

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.

INTEGRIDADE ACADÉMICA:

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

Na realización das actividades académicas desta materia **permítese o uso de ferramentas de Intelixencia Artificial Xerativa (IAX), empregadas de forma ética, crítica e responsable**. Se utilizou IAX, debe avaliar críticamente os resultados que proporciona, verificar coidadosamente as citas ou referencias xeradas e declarar o uso das ferramentas utilizadas. Non é necesario declarar o uso de IAX en tarefas que non producen contido (revisión da linguaxe -ortografía ou gramática- nun documento, tradución de texto, obtención de suxestións para reorganizar o contido ou modificar o estilo dun documento ou adaptar o formato de referencias bibliográficas). Cando se deba facer referencia a contidos producidos por IAX (texto, imaxes, etc.), especificaranse polo menos os seguintes elementos: contido xerado, prompt empregado na consulta, ferramenta utilizada, versión, empresa autora do software, data na que foi realizada a consulta e enlace ao sitio web da ferramenta. **A detección dunha situación de non declaración de uso de IAX terá a consideración de fraude académica e aplicaranse as medidas descritas no parágrafo anterior.**

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

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

Recomendacións

IDENTIFYING DATA				
Regulations and legislation				
Subject	Regulations and legislation			
Code	P52M182V01302			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	González Coma, José Pablo			
Lecturers	Atorrasagasti Morató, Aitor Sabino Fernández García, Isidro González Coma, José Pablo			
E-mail	jose.gcoma@cud.uvigo.es			
Web	http://campus.defensa.gob.es | https://moovi.uvigo.gal			
General description	The course Regulations and legislation aims to provide students with a general perspective on the legal framework of the telecommunications sector and the information society, focusing on the problematic and controversial issues that may arise from a legal point of view to the personnel of the AGE assigned to the Ministry of Defense with responsibility in the field of direction or management of information and communication technologies and information security. Particularly, and taking into account the new scenario of the digital transformation of the General State Administration and its public bodies, the different aspects related to the use of new technologies in communication with citizens will be addressed, either in the field of administrative procedures or outside them, as well as the impact that such issues may raise in the fundamental rights of individuals or with respect to the regulations and principles on information security policy of the Ministry of Defense.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
B5	CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
C10	CE10 - Apply knowledge of the most relevant regulations and legislation in the field of telecommunications and information society to the field of ICT management and direction.
D1	CT1 - Ability to understand the meaning and application of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more egalitarian society.

Expected results from this subject	Training and Learning Results

LO1: Assume the process of digital transformation of the Administrations and, in particular, of the General State Administration (AGE) in its relations with citizens.	A8 A9 B5 C10 D1
LO2: To be familiar with the bodies responsible for digital administration in the NSA, and in particular in the MINISDEF, as well as the strategic objectives of the NSA's ICT Strategy.	A8 A9 B3 B5 C10 D1
LO3: To become familiar with the new regulations on the Common Administrative Procedure of Public Administrations, specifically on the use of electronic media in relation to the processing of procedures and relations with citizens.	A6 A7 A10 B2 B3 B5 C10 D1
LO4: Familiarise yourself with the principles of the Law on Transparency, as well as the limits on access to information: defence and national security. Data protection.	A6 A7 B2 B3 B5 B6 C10 D1
LO5: Adopt the basic principles and regulations on information security policy of the Ministry of Defence.	A6 A7 A8 B2 B3 B5 B6 C10 D1
LO6: Know and understand the role of the new information and communication technologies in relation to the institutional image of the General State Administration.	A6 A7 A8 A10 B2 B3 B5 B6 C10 D1
LO7: Be able to take into account the impact of citizens' fundamental rights in the management of ICT tools.	A6 A7 A8 A10 B2 B3 B5 B6 C10 D1
LO8: To know the main regulations in the telecommunications sector and on the information society.	A8 A9 B5 B6 C10 D1

Contents
Topic

Transformation of the State and its dependent entities/Organisms into e digital basis	- Information and Communication Technologies (ICT) and the Administration. - The milestones for the digital transformation of the State Government and its dependent organisms. - Competent Bodies for digital administration. - The Digital Spain Agenda 2025 and the Public Administration Digitalisation Plan 2021-2025. - The electronic functioning of the public sector and the Catalogue of Digital Administration Services. - Current status of the implementation of e-Government mechanisms.
Common administrative procedure legislation, the use of electronic media in the filed of administrative relations and information security	- The use of electronic media in the field of governmental relations and information security. The National Security Scheme. - Ley 39/2015, de 1 de octubre, de Procedimiento Administrativo Común de las Administraciones Públicas (Law on Common Administrative Procedure of Public Administrations) and the security of information. Electronic media in the processing of administrative procedures.
The principle of publicity of the activity of state bodies. Transparency, access to public information and its limits: Defence and national security. Data protection. Security of information in public administrations and their regulations.	- The principle of transparency of public activity. Access to public information and its limits: defence and national security. Data protection: The Community General Data Protection Regulation and Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales (Law on Protection of Personal Data and guarantee of digital rights). - The limits derived from national defence and security. - Requirements for the classification and processing of classified material. - Reference to the Agreement of the Council of Ministers of 28 November 1986, classifying certain matters and subjects in accordance with the Official Secrets Act. - The regulations on the Ministry of Defence's information security policy. - Criminal and disciplinary protection of information security and classified matters.
The management and use of information and communication technologies (ICTs) by public administrations: the institutional image of the administration and the fundamental rights of citizens.	- The principle of transparency of public activity. Access to public information and its limits: defence and national security. Data protection: The Community General Data Protection Regulation and Ley Orgánica 3/2018, de 5 de diciembre, de Protección de Datos Personales y garantía de los derechos digitales (Law on Protection of Personal Data and guarantee of digital rights). - The limits derived from national defence and security. - Requirements for the classification and processing of classified material. - Reference to the Agreement of the Council of Ministers of 28 November 1986, classifying certain matters and subjects in accordance with the Official Secrets Act. - The regulations on the Ministry of Defence's information security policy. - Criminal and disciplinary protection of information security and classified matters.
Telecommunications sector regulation and the information society.	- The legal framework of information and communications technologies. - The Internet domain: definition and nature of domain rights, its legal regime. - Management of cybersecurity incidents affecting the Internet network. - The Ministry of Defence's Policy on Information and Communications Technologies (CIS/ICT MDEF Policy). - The special rules in the legislation on public sector contracts on competence to acquire equipment and systems for information processing and communications within the Ministry of Defence. The management of networks and systems in the field of defence.

Planning			
	Class hours	Hours outside the classroom	Total hours
Autonomous problem solving	0	5	5
Previous studies	0	43	43
Lecturing	9	6	15
Case studies	2	2	4
Discussion Forum	0	2	2
Presentation	5	0	5
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 analyze and solve problems and/or exercises related to the subject autonomously.
Previous studies	Search, reading, documentation work and / or autonomous development of any other activity that the student considers necessary to allow him / her to acquire knowledge and skills related to the subject. It is usually carried out before classes, laboratory practices and / or evaluation tests.
Lecturing	Presentation by a lecturer of the contents of the subject under study, theoretical bases and / or guidelines of a work or exercise that the student has to develop.
Case studies	Analysis of a fact, problem or real event with the aim of knowing it, interpreting it, solving it, generating hypotheses, contrasting data, reflecting, completing knowledge, diagnosing it and training in alternative solution procedures.
Discussion Forum	Activity carried out in a virtual environment where a variety of current issues related to the academic and / or professional field are debated.

Personalized assistance	
Methodologies	**Description**
Lecturing	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: it will be carried out through the use of telematic means. Students who wish to do so may raise questions to the faculty in forums or by email. They will also be able to arrange individual tutories with the lecturer, which will take place via videoconference. (2) Attention in the face-to-face phase: although the use of telematic mechanisms is still possible, during this phase face-to-face tutoring mechanisms will also be used.
Case studies	Given the blended nature of the course, we will distinguish two cases: (1) Attention in the distance phase: 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	Training and Learning Results
Discussion Forum	Activity carried out in a virtual environment where a variety of current issues related to the academic and / or professional field are debated. It allows evaluating the skills, knowledge and, to a lesser extent, the attitudes of the student. Participation in the forums will be evaluated during the online phase of the course. Participation in the forums will be assessed. This discussion forum activity (F) will be carried out during the distance phase.	10	A7 A8 B2 B3 B5 B6 C10 D1
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. The presentation will be exposed and evaluated during the attendance phase of the course. This presentation activity (P) will be carried out in the distance phase.	30	A6 A7 A8 A9 A10 B2 B3 B5 B6 C10 D1
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. The exam will be carried out during the attendance phase of the course, covering all the subjects of the syllabus. Two objective tests (E1 and E2) are foreseen which are likely to cover the contents specified below: E1 will comprise topics 1 and 2, while E2 will comprise topics 2 to 5. Both tests will take place during the face-to-face phase and will have a weighting of 30% each.	60	A6 A7 A8 A10 B2 B3 B5 B6 C10 D1

Other comments on the Evaluation

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

MED_CON = 0.1*F + 0.3*P+ 0.3*E1 + 0.3*E2

It will be necessary to obtain at least 50% of the grade 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 evaluation will be carried out in distance mode, and 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 subject.

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner**. In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

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

Recommendations

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	Choose	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.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
C12	CISTT1 - Deepen the knowledge of telecommunications systems based on different technologies applicable to the tactical, operational and strategic fields; to fixed and mobile environments; with different types and volumes of data.
C13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
D5	CT5 - Autonomous learning and work.
D6	CT6 - Properly manage information resources.

Expected results from this subject	Training and Learning Results
LO1. To know the management of the electromagnetic spectrum and the basic elements of a communications system.	A6 A7 A8 A9 A10 B1 B2 C12 D5 D6

LO2. To know the operation and the characteristic parameters of a radio link.	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6
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.	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6
LO4. To understand the operation and main characteristics of mobile and optical networks.	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6
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..	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6
LO6. To know the different radiocommunication systems existing in the military field, as well as their most outstanding characteristics..	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6

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	Training and Learning Results
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. There will be two intermediate tests (PE1 and PE2) to control the follow-up of the subject. Each control test has a weight of 20%. The first test, which will cover topics 1 to 4, will be carried out in the on-line phase and will have a duration of 1 hour. The second test, which will cover topics 5 and 6, will take place during the on-site phase and will last 30 minutes.	40	A6 A7 A8 A9 B1 B2 B6 C12 C13 D6
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. The work will be evaluated in the on-site phase (T).	20	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6
Problem and/or exercise solving	Resolution of different exercises (E) proposed in class on assumptions applicable to each of the topics of the syllabus that will be evaluated during the on-line phase.	25	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6
Laboratory practice	Evaluation of different laboratory practices related to the course syllabus by means of deliverable reports (PL).	15	A6 A7 A8 A9 A10 B1 B2 B6 C12 C13 D5 D6

Other comments on the Evaluation

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

MED_CON = 0.2*PE1 + 0.2*PE2 + 0.2*T + 0.25*E + 0.15*PL

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

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

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	Choose	Year	Quadmester
	3	Optional	2nd	1st
Teaching language	Spanish			
Department				
Coordinator	Gil Castiñeira, Felipe José			
Lecturers	Gil Castiñeira, Felipe José			
E-mail	felipe@uvigo.gal			
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.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B3	CG3 - Direct, plan, coordinate, organize and/or supervise tasks, projects and/or human groups. Work cooperatively in multidisciplinary teams acting, where appropriate, as an integrator of knowledge and lines of work.
C12	CISTT1 - Deepen the knowledge of telecommunications systems based on different technologies applicable to the tactical, operational and strategic fields; to fixed and mobile environments; with different types and volumes of data.
C13	CISTT2 - Analyze and optimize the deployment of communication systems in military operating environments.
D5	CT5 - Autonomous learning and work.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
LO1. Know the characteristics that differentiate multimedia information.	A6 A7 A8 A9 A10 B1 B2 C13 D5

LO2. Understand the mechanisms for the encoding and compression of multimedia information.	A6 A7 A8 A9 A10 B1 B2 C12 D5
LO3. Know and be able to apply bandwidth management mechanisms.	A6 A7 A8 A9 A10 B1 B2 C12 C13 D5
LO4. Know and be able to design architectures to offer integrated and differentiated services.	A6 A7 A8 A9 A10 B1 B2 B3 C12 C13 D5
LO5. Be able to analyze the network performance to ensure quality of service.	A6 A7 A8 A9 A10 B1 B2 C12 C13 D5
LO6. Understand the operation of delay tolerant networks.	A6 A7 A8 A9 A10 B1 B2 C12 C13 D5

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 - SDN
Protocols	- Network - Session
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	Training and Learning Results	
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. The evaluation will be online.	5	A6 A7 A8 A9 A10	B1 C12 D5 B2 C13 B3

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. The evaluation will take place in person.	40	A6 A7 A8 A9 A10 B1 B2 B3 C12 C13 D5
Practices through ICT	Report on simulator exercises on broadband networks, multimedia technologies, delay tolerant networks, etc. The evaluation will take place in person.	5	A6 A7 A8 A9 A10 B1 B2 B3 C12 C13 D5
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. The evaluation will be online.	20	A6 A7 A8 A9 A10 B1 B2 C12 C13 D5
Objective questions exam	Test that evaluates the knowledge gained by the students and that includes questions with different answer alternatives (true or false, multiple choice, matching items, etc.). Students select an answer from a limited number of possibilities. The evaluation will take place in person.	30	A6 A7 A8 A9 A10 B1 B2 C12 C13 D5

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.

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

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	Choose	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 matter pursues to endow the students with training on the fundamental concepts associated with the architecture, design, administration, analysis, monitoring and deployment of computer infrastructures advanced as clusters of computation, systems virtualized, computation in the cloud, systems of high integrity, systems of real-time and systems bedded. The lesson of the classroom will use for the introduction of the theoretical concepts, which will complement works of investigation that allow deepening in concrete topics.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
C15	CISTI1 - Define and implement different computing systems in line with technological evolution and deployment environments.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
RA1 - Know the fundamental concepts associated with the architecture, design, administration, and deployment of computer infrastructures advanced, like clusters of computation, systems of high integrity, systems virtualized, and computation in the cloud.	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5

RA2 - Be able to analyze the performance of computer systems.	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5
RA3 - 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.	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5

Contents

Topic	
Introduction to computation	- Introduction to computation - Historical development - Algorithms and computational theory - Architecture of a computer - Scheduling
Parameters of quality and analysis of the performance of systems	- Characteristics of the computers - Analysis of performance
Computation cluster	- Types of clusters - Components of a cluster
Virtualization	- Mechanisms of virtualization - Types of hypervisors - Advantages of virtualization
Cloud computing	- Models of reference - Types of deployments - Products and providers - Advantages and inconvenients
Fault-tolerant and high-integrity systems	- Introduction: reliability, faults, failures, and errors - Prevention of failures - Tolerance of failures - Redundancy
Architectures for real-time	- Types of systems - Architectures hardware - Architectures software - Operating systems for real-time
Embedded systems	- Characteristic of the embedded system - Architectures - 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	10	10
Problem and/or exercise solving	0	10	10

*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, work of documentation and/or realization of the autonomous form of any other activity that the student considers necessary to allow him the acquisition of knowledge and skills related to the matter. It is used to carry out prior to the classes, practices of laboratory and/or proofs of evaluation.
Lecturing	Exposition by part of a professor of the contents of the topics to be studied, theoretical bases and/or guidelines of a work or exercise that the student has to develop.
Seminars	Activity focused to the work on a specific subject, that allows to deepen or complement in the contents of the matter.
Discussion Forum	Activity developed in some virtual surroundings in which debate on diverse topics or current developments related to the subject.

Personalized assistance

Methodologies	Description
Lecturing	Will carry out by means of the use of telematic means. The students that wish it will be able to pose doubts to the professors in forums or by means of email. Also, they will be able to concert individual sessions with the professor, which will develop by means of videoconference.
Seminars	Although it keeps on being possible the use of telematic mechanisms of attention to the student, in this case, will employ also mechanisms of mentoring face-to-face.

Assessment

	Description	Qualification	Training and Learning Results
Presentation	Exhibition by part of the students, in an individual way or in the group, of a subject related to the contents of the matter or of the results of a work, exercise, project, etc. Through the presentation can evaluate knowledge, skills, and aptitudes. There will be 1 presentation (P) that will be evaluated during the face-to-face phase: it will cover all the contents of the subject.	10	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5
Objective questions exam	Proof that evaluates the knowledge and that includes enclosed questions with different alternative answers (true or false, multiple elections, the pairing of elements, etc.). The students/ace select an answer from among a number limited of possibilities. It will consist in a written exam (PE) at the end of the in-person stage, in which all the contents of the subject will be assessed (including the contents of the phase to distance and the face-to-face)	40	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5
Essay	Text or document elaborated on a subject that has to draft following some norms established of style and length. It allows us to evaluate the skills, the knowledge, and, in lower measure, the aptitudes of the student. There will be 1 work (T) that will be evaluated during the online stage: it will cover all the contents of the subject.	20	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5
Problem and/or exercise solving	Resolution of different exercises (E1, E2, and E3) proposed in class about assumptions applicable to different aspects of the subject matter. Each exercise has a weight of 10% and will be completed in the distance phase.	30	A6 A7 A8 A9 A10 B1 B2 C15 D4 D5

Other comments on the Evaluation

It is necessary to reach 50% of the mark in order to pass the course.

A continuous evaluation mechanism will be used, which it is intended to monitor the student's progress throughout the course, assessing their effort globally. Denoted as EV_CON, the continuous evaluation mark is calculated as follows:

EV_CON = 0.2*T + 0.1*P + 0.1*E1 + 0.1*E2 + 0.1*E3 + 0.4*PE.

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) that will take place in the distance mode on the dates established for that purpose by the Master's Academic Committee. The evaluation will consist in that case in a single written test that will account for 100% of the grade, being necessary to obtain at least 50% to pass the subject.

ACADEMIC INTEGRITY:

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

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

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

Students are encouraged to have basic knowledge of the operation of computer systems before starting this course.

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	Choose	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.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B5	CG5 - Critically evaluate the structure and validity of reasoning, analyzing, interpreting, and questioning the foundations of ideas, actions, and judgments of oneself or others, before accepting them as valid.
C16	CISTI2 - Manage information as a strategic asset in the storage, volumetric and intelligence aspects of the data.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.
D6	CT6 - Properly manage information resources.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
LO1: Know the persistent data storage systems and infrastructures, their typology, structure and basic operation.	A6 A10 B1 B5 C16 D4 D5 D6
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.	A6 A10 B1 B5 C16 D4 D5 D6

LO3: Know the techniques and tools that allow the efficient storage and processing of large volumes of data.	A6 A10 B1 B5 C16 D4 D5 D6
LO4: Understand the data mining process, its main stages and the techniques used in it to extract knowledge from the information provided by data.	A6 A7 A10 B1 B5 C16 D4 D5 D6
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.	A6 A9 A10 B1 B5 C16 D4 D5 D6
LO6: Assess the importance for the organization of adequate data management and the elements that are involved in it.	A7 A8 A9 B1 B5 C16 D4 D5 D6

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	Training and Learning Results			
Discussion Forum	Activity carried out in a virtual environment where a variety of current issues related to the academic and / or professional field are debated. It allows evaluating the skills, knowledge and, to a lesser extent, the attitudes of the student. Participation in the forums will be evaluated during the online phase of the course.	10	A9	B1 B5	C16	D4 D5
Presentation	Presentation by the students, individually or in groups, of a topic related to the contents of the course or the results of a work, exercise, project, etc. Through the presentation, knowledge, skills and attitudes can be evaluated. The presentation will be exposed and evaluated during the attendance phase of the course.	30	A6 A7 A8 A9 A10	B1 B5	C16	D4 D5 D6
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. The exam will be carried out during the attendance phase of the course, covering all the subjects of the syllabus.	30	A6 A10	B1 B5	C16	D5
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. Self-assessment will be carried out during the online phase of the course, covering the first three subjects of the syllabus.	30	A6 A10	B1 B5	C16	D5

Other comments on the Evaluation

MED_CON represents the average student grade in ordinary call. It will be calculated as:

MED_CON = 0.1 * Forum + 0.3 * Self-assessment + 0.3 * Presentation + 0.3 * Exam

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/presentation 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.

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

Sources of information

Basic Bibliography

Complementary Bibliography

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

John D. Kelleher, **Deep Learning (The MIT Press Essential Knowledge series)**, 1, MIT Press, 2019

Martin Kleppmann, **Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems**, 1, O'Reilly, 2019

Recommendations

Subjects that it is recommended to have taken before

Information systems/P52M182V01105

IDENTIFYING DATA				
Master's thesis				
Subject	Master's thesis			
Code	P52M182V01307			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	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 | 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.			

Training and Learning Results	
Code	
A6	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
A7	CB7 - That students know how to apply the acquired knowledge and their ability to solve problems in new or poorly understood environments within broader (or multidisciplinary) contexts related to their area of study.
A8	CB8 - That students are able to integrate knowledge and face the complexity of formulating judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
A9	CB9 - That students know how to communicate their conclusions and the knowledge and ultimate reasons that support them to a specialized and unspecialized public in a clear and unambiguous way.
A10	CB10 - That students possess the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B1	CG1 - Possess advanced and highly specialized knowledge and demonstrate a detailed and well-founded understanding of the theoretical and practical aspects dealt with in the different areas of study.
B2	CG2 - Integrate and apply the knowledge acquired, and possess the ability to solve problems in new or imprecisely defined environments, including multidisciplinary contexts related to their field of study.
B4	CG4 - Being a professional committed to quality, deadlines and the adequacy of solutions, not only in the exercise of the profession but also in the social field, including a commitment to economic, ethical and environmental sustainability.
B6	CG6 - Be able to make decisions in environments characterized by complexity and uncertainty, evaluating the different existing alternatives in order to select the one with the most favorable expected result, appropriately managing the risk associated with the decision.
C11	CE11 - Prepare, present and publicly defend before a committee an individual and original work in which the competences acquired in the master are synthesized.
D1	CT1 - Ability to understand the meaning and application of the gender perspective in the different fields of knowledge and in professional practice with the aim of achieving a fairer and more egalitarian society.
D4	CT4 - Oral and written communication skills.
D5	CT5 - Autonomous learning and work.
D6	CT6 - Properly manage information resources.

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

LO1. Be able to produce an individual and original work in which the competences acquired in the master's degree are synthesised.	A6 A7 A8 A9 A10 B1 B2 B4 B6 C11 D1 D4 D5 D6
LO2. Present and publicly defend the work carried out before a university examining board.	A6 A7 A8 A9 A10 B1 B2 B4 B6 C11 D1 D4 D5 D6
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.	A6 A7 A8 A9 A10 B1 B2 B6 C11

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	Training and Learning Results			
Presentation	Presentation of the TFM by the students, individually. Knowledge, skills and attitudes can be assessed through the presentation.	30	A6 A7 A8 A9 A10	B1 B2 B4 B6	C11	D1 D4 D5 D6
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	A6 A7 A8 A9 A10	B1 B2 B4 B6	C11	D1 D4 D5 D6

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.

ACADEMIC INTEGRITY:

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

In the academic activities and assignments of this course, **the use of Generative Artificial Intelligence (GAI) tools is allowed, used in an ethical, critical and responsible manner.** In case you have used GAI, you should critically evaluate any results it provides, carefully verify any citations or references generated, and declare the use of these tools. It is not necessary to disclosure the use of GAI in tasks that do not produce content (proofreading language - spelling or grammar - in a document, translating text, obtaining suggestions to reorganize content or modify the style of a document, or to adapt the format of bibliographic references). AI-generated content (text, images, etc.) must be disclosured and correctly referenced, providing, at least, the following elements: generated content, prompt used in the query, tool used, version, company authoring the software, date on which the query was made and the link to the tool's website. **The detection of situations involving non-disclosure of GAI will be considered academic fraud and the measures described in the previous paragraph will be applied.**

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

always prevail.

Sources of information

Basic Bibliography

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.