



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

Master Universitario en Dirección TIC para la defensa

Subjects

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				
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				
Coordinator	Fernández Gavilanes, Milagros			
Lecturers	Carrera González, Jesús Fernández Gavilanes, Milagros Represas Seoane, Javier			
E-mail	mfgavilanes@ cud.uvigo.es			
Web	http://campus.defensa.gob.es https://moovi.uvigo.gal			
General description	A transformación dixital é unha realidade na que estamos inmersos. Trátase dun proceso global e continuo de carácter exponencial: toda aplicación de tecnoloxías dixitais que provoque unha transformación forma parte do mesmo. Iniciamos un camiño do que apenas podemos albiscar os próximos pasos. Transformación pola vía da innovación, práctica. Transformación de carácter dixital. A innovación que tratamos nesta transformación, con novos aplicativos que afectan a produtos, procesos e procedementos e que se realizan cunha clara intención de mellora e aplicación práctica, son parte intrínseca da mesma. O peso da información e o seu tratamento como recurso, son parte indispensable desta. Falamos de big data, intelixencia artificial, machine learning, conducción 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. Introducción 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.

- 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, resolvolo, xerar hipótese, contrastar datos, reflexionar, completar coñecementos, diagnosticarlo 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 B2 C1 D5 A7 B3 D6 A8 B5 A9 A10
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 B2 C1 D5 A8 B5 D6 A9 B6 A10

Other comments on the Evaluation

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

$$\text{MED_CON} = 0.1 \cdot F + 0.4 \cdot T + 0.25 \cdot PP + 0.25 \cdot PE$$

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.

COMPROMISO ÉTICO:

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

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

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

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

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

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

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

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

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

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

Recomendacións

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

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.
C10	CE10 - Aplicar o coñecemento das normas e a lexislación máis relevantes en materia de telecomunicacións e sociedade da información ao ámbito da xestión e dirección TIC.
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.

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

RA1: Asumir o proceso de transformación dixital das Administracións e, en particular da Administración Xeral de Estado (AXE) nas súas relacións cos cidadáns.	A8 A9 B5 C10 D1
RA2: Coñecer os órganos con competencias en materia de Administración dixital na AXE, e en particular, no MINISDEF, así como os obxectivos estratéxicos da Estratexia TIC da AXE.	A8 A9 B3 B5 C10 D1
RA3: Entrar en contacto coa nova normativa de Procedemento Administrativo Común das Administracións Públicas, en concreto, sobre utilización de medios electrónicos en relación coa tramitación de procedementos e relacións cos cidadáns.	A6 A7 A10 B2 B3 B5 C10 D1
RA4: Familiarizarse cos principios da Lei de transparencia, así como os límites no acceso á información: a defensa e seguridade nacional. A protección de datos.	A6 A7 B2 B3 B5 B6 C10 D1
RA5: Asumir os principios básicos e a normativa sobre política de seguridade da información do Ministerio de Defensa.	A6 A7 A8 B2 B3 B5 B6 C10 D1
RA6: Coñecer e comprender o papel das novas tecnoloxías da información e comunicación en relación coa imaxe institucional da Administración Xeral do Estado.	A6 A7 A8 A10 B2 B3 B5 B6 C10 D1
RA7: Ser capaz de ter en conta a incidencia que na xestión dos instrumentos propios das TICs revisten os dereitos fundamentais dos cidadáns.	A6 A7 A8 A10 B2 B3 B5 B6 C10 D1
RA8: Coñecer a principal normativa do sector das telecomunicacións e sobre sociedade da información.	A8 A9 B5 B6 C10 D1

Contidos

Topic

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

Planificación

	Class hours	Hours outside the classroom	Total hours
Resolución de problemas de forma autónoma	0	5	5
Estudo previo	0	43	43
Lección maxistral	9	6	15
Estudo de casos	2	2	4
Foros de discusión	0	2	2
Presentación	5	0	5
Exame de preguntas obxectivas	1	0	1

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

Metodoloxía docente

	Description
Resolución de problemas de forma autónoma	Actividade na que o alumnado analiza e resolve problemas e/ou exercicios relacionados coa materia de forma autónoma.

Estudo previo	Procura, lectura, traballo de documentación e/ou realización de forma autónoma de calquera outra actividade que o alumno/a considere necesaria para permitirle a adquisición de coñecementos e habilidades relacionadas coa materia. Adóitase levar a cabo con anterioridade ás clases, prácticas de laboratorio e/ou probas de avaliación.
Lección maxistral	Exposición por parte dun profesor/a de os contidos da materia obxecto de estudo, bases teóricas e/ou directrices dun traballo ou exercicio que o/a estudante ten que desenvolver.
Estudo de casos	Análise dun feito, problema ou suceso real coa finalidade de coñecelo, interpretalo, resolvolo, 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 tutorías 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 tutoría 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 tutorías 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 tutoría 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. Esta actividade de foro de discusión (F) realizarase durante a fase a distancia.	10	A7 B2 C10 D1 A8 B3 B5 B6
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. Esta actividade de presentación (P) realizarase na fase a distancia.	30	A6 B2 C10 D1 A7 B3 A8 B5 A9 B6 A10
Exame de preguntas obxectivas	Proba que avalía o coñecemento e que inclúe preguntas pechadas con diferentes alternativas de resposta (verdadeiro ou falso, elección múltiple, emparellamento de elementos, etc.). Os alumnos/as seleccionan unha resposta de entre un número limitado de posibilidades. Prevense dúas probas obxectivas (E1 e E2) que resulten susceptibles de comprender os contidos que se especifican a continuación: E1 comprenderá os temas 1 e 2, mentras que E2 comprenderá os temas 2 a 5. Ambas probas realizaranse durante a fase presencial e tendrá unha ponderación de 30% cada unha.	60	A6 B2 C10 D1 A7 B3 A8 B5 A10 B6

Other comments on the Evaluation

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

$$\text{MED_CON} = 0.1 \cdot F + 0.3 \cdot P + 0.3 \cdot E1 + 0.3 \cdot E2$$

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

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

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

COMPROMISO ÉTICO:

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

No caso de que exista algunha diferenza 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

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

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

Varios autores, **Constitución Española**,

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

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

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

Recomendacións

Other comments

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

IDENTIFYING DATA**Wireless and optical communication systems**

Subject	Wireless and optical communication systems			
Code	P52M182V01303			
Study programme	Master Universitario en Dirección TIC para la defensa			
Descriptors	ECTS Credits	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

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
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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:

$$\text{MED_CON} = 0.2 \cdot \text{PE1} + 0.2 \cdot \text{PE2} + 0.2 \cdot \text{T} + 0.25 \cdot \text{E} + 0.15 \cdot \text{PL}$$

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 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

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	xil@gti.uvigo.es			
Web	http://moovi.uvigo.gal			
General description	The subject "Broadband Networks" seeks to provide students with an understanding of the nature of multimedia information and the requirements it imposes on the networks that must support its transmission. It intends to show students the general principles of the architecture of broadband networks (local area, access in residential and business environments and WAN) that are used to transmit information with strict requirements (e.g. in terms of bandwidth and latency) such as multimedia traffic. Students are also expected to know the main protocols for sending voice and video, the mechanisms to ensure quality of service (QoS) even when there are interruptions in communication and, in addition, to know examples of current implementations.			

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 - Tunnels and VPNs - SDN - CDN
Protocols	- Network: RTP, multicast, and QoS - Session: SIP, H.323, VoLTE, and WebRTC

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

Planning

	Class hours	Hours outside the classroom	Total hours
Discussion Forum	0	3	3
Previous studies	0	20	20
Lecturing	6	6	12
Presentation	3	24	27
Seminars	2	0	2
Practices through ICT	5	2	7
Self-assessment	0	3	3
Objective questions exam	1	0	1

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

Methodologies

	Description
Discussion Forum	Activity developed in the virtual forum environment with debates on: - News related to the subject - Technological novelties - Academic articles
Previous studies	Search, reading, documentation work and / or autonomously performing any other activity that the student considers necessary to enable the acquisition of knowledge and skills related to the subject.
	It is usually carried out prior to classes, laboratory practices, evaluation tests and during the completion of work to be presented later.
Lecturing	Presentation by a lecturer of the contents of the subject of study, theoretical bases and/or guidelines of a work or exercise that the student has to develop.
Presentation	Presentation by the students of the results of a class work related to the subject.
Seminars	Activity focused on working on a specific topic, which allows deepening or complementing the contents of the subject.
Practices through ICT	Activities for the application of knowledge in a given context and the acquisition of basic and procedural skills related to the subject, through the use of ICT.
	Practical exercises on simulators on broadband networks, multimedia technologies, delay tolerant networks, etc. will be completed.

Personalized assistance

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

Assessment

	Description	Qualification	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 B1 C12 D5 A7 B2 C13 A8 B3 A9 A10

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 have appropriate ethical behavior, 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, as well as point 6 of the fifth rule of Order DEF/711/2022, of July 18, which establishes the rules for evaluation, progress and permanence in military training centers for incorporation into the ranks of the Armed Forces, the use of fraudulent procedures in evaluation tests, as well as the cooperation in them, it will involve the qualification of zero (fail) in the report of the corresponding call, regardless of the value that the test in question had on the overall qualification and without prejudice to the possible consequences of a disciplinary nature that may occur.

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-Hill, 2003

Aura Ganz, Zvi Ganz y Kittu 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@ud.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	CIST11 - 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	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	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

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 2 presentations (P1 and P2) that will be evaluated during the face-to-face phase: P1 will cover the 4 first subjects of the subject and P2 will cover the 4 following subjects.	20	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 2 works (T1 and T2) that will be evaluated during the online stage: T1 will cover the 4 first subjects of the subject and T2 will cover the 4 following subjects.	40	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:

$$EV_CON = 0.2 \cdot T1 + 0.1 \cdot P1 + 0.2 \cdot T2 + 0.1 \cdot P2 + 0.4 \cdot PE.$$

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 case of any difference between the guides in Galician/Spanish/English related to the evaluation, what is indicated in the teaching guide in Spanish will always prevail.

Sources of information

Basic Bibliography

Complementary Bibliography

Buyya, Rajkumar, Christian Vecchiola, y S. Thamarai Selvi., **Mastering cloud computing: foundations and applications programming.**, ISBN: 978-0124114548, 1ª Ed., Newnes, 2013

Rauber, Thomas, y Gudula Rünger, **Parallel programming: For multicore and cluster systems.**, ISBN: 978-3642378003, 2ª Ed., Springer Science & Business Media, 2013

Wolf, Marilyn, **Computers as components: principles of embedded computing system design**, ISBN: 978-0123884367, 3ª Ed., Elsevier, 2012

Joyanes Aguilar, Luis, **Computación en la Nube: estrategias de cloud computing en las empresas**, ISBN: 978-8426718938, 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@ud.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	CIST12 - 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 tutorials 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.
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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	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:

$$\text{MED_CON} = 0.1 * \text{Forum} + 0.3 * \text{Self-assessment} + 0.3 * \text{Presentation} + 0.3 * \text{Exam}$$

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 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 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	Fernández Gavilanes, Milagros			
Lecturers	Fernández Gavilanes, Milagros			
E-mail	mfgavilanes@tud.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		Qualification Training and Learning Results					
	Description						
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.

ETHICAL COMMITMENT:

As indicated by current regulations, the Master's Thesis must be an individual and original work. Therefore, works carried out by third parties or with content that directly reproduces a significant percentage of works done by third parties or by the student themselves in any other subject, degree, or university cannot be submitted. It is expected that students behave ethically, committing to act with honesty. According to Article 42.1 of the Regulation on evaluation, grading, and quality of teaching and the learning process for students at the University of Vigo, the use of fraudulent procedures in assessment tests, as well as cooperation in them, will result in a grade of zero (fail) in the corresponding examination record, regardless of the value that the specific test may have on the overall grade, and without prejudice to possible disciplinary consequences that may arise.

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

Sources of information
Basic Bibliography
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 ,

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.
