



(*)Escola de Enxeñaría Industrial

Information

For additional information about the centre and its degrees visit the centre's website <https://eei.uvigo.es/>

Grado en Ingeniería en Química Industrial

Subjects

Year 4th

Code	Name	Quadmester	Total Cr.
V12G350V01701	Product optimisation	1st	6
V12G350V01702	Simulation and optimisation of chemical processes	1st	6
V12G350V01902	Electrical components in vehicles	2nd	6
V12G350V01903	Technical english 1	2nd	6
V12G350V01904	Technical english 2	2nd	6
V12G350V01905	Methodology for the preparation, presentation and management of technical projects	2nd	6
V12G350V01906	Advanced programming for engineering	2nd	6
V12G350V01907	Safety and industrial hygiene	2nd	6
V12G350V01908	Laser technology	2nd	6
V12G350V01911	Plant integration in business management	1st	9
V12G350V01912	Management and implementation of chemical plants and processes	1st	9
V12G350V01913	Heating and cooling in the process industry	2nd	6
V12G350V01914	Design of chemical and processing plants	2nd	6
V12G350V01921	Bioelectrochemistry	1st	6
V12G350V01922	Biotechnological processes and products	1st	6
V12G350V01923	Industrial organic chemistry	1st	6
V12G350V01924	Modelling of biotechnological processes	2nd	6
V12G350V01925	Environmental management techniques	2nd	6

V12G350V01981	Internships: Internships in companies	2nd	6
V12G350V01991	Final Year Dissertation	2nd	12
V12G350V01999	Internships/elective	2nd	6

IDENTIFYING DATA				
Optimización de productos				
Subject	Optimización de productos			
Code	V12G350V01701			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4	1c
Teaching language	Castellano			
Department				
Coordinator	Sánchez Vázquez, Pablo Breogán			
Lecturers	Orge Álvarez, Beatriz Prudencia Sánchez Vázquez, Pablo Breogán			
E-mail	pabsanchez@uvigo.es			
Web				
General description				

Resultados de Formación y Aprendizaje

Code	
B3	CG3 Conocimiento en materias básicas y tecnológicas, que les capacite para el aprendizaje de nuevos métodos y teorías, y les dote de versatilidad para adaptarse a nuevas situaciones.
B4	CG4 Capacidad de resolver problemas con iniciativa, toma de decisiones, creatividad, razonamiento crítico y de comunicar y transmitir conocimientos, habilidades y destrezas en el campo de la Ingeniería Industrial en la mención de Química Industrial.
B8	CG8 Capacidad para aplicar los principios y métodos de la calidad.
C20	CE20 Capacidad para el análisis, diseño, simulación y optimización de procesos y productos.
D2	CT2 Resolución de problemas.
D6	CT6 Aplicación de la informática en el ámbito de estudio.
D9	CT9 Aplicar conocimientos.
D10	CT10 Aprendizaje y trabajo autónomos.
D17	CT17 Trabajo en equipo.

Resultados previstos en la materia

Expected results from this subject	Training and Learning Results		
Identificar los puntos críticos y de control en una planta	B3 B4	C20	D6 D9 D17
Diseñar un sistema de control estadístico de proceso.	B3 B4 B8	C20	D6 D9 D10
Realizar estudios de capacidad del proceso desde el punto de vista de la calidad del producto	B3 B4 B8	C20	D2 D6 D9 D17

Contenidos

Topic	
Introducción al control integral de calidad de materias primas, productos semielaborados y terminados. Diseño, producción, venta y postventa.	Introducción al control integral de calidad de materias primas, productos semielaborados y terminados. Diseño, producción, venta y postventa.
Inspección, aceptación y calidad concertada. Trazabilidad. Control e identificación de puntos críticos de las principales industrias químicas y de proceso.	Trazabilidad y puntos críticos de riesgo asociados a la calidad y variables características de calidad de las principales industrias químicas y de proceso. Inspección, aceptación y calidad concertada. Métricas de medida de calidad.
Estudio de la capacidad. Gráficos de control SPC, análisis y mejora.	Estudio de capacidad. Gráficos de control predictivos, SPC. Análisis y toma de decisiones de mejora de la calidad de los productos en la industria química y de proceso. Diseño de un sistema experto.

Ejemplos prácticos de aplicación en industrias químicas y de proceso, orientados al control de calidad de productos.

Trazabilidad.
Muestreo de aceptación.
Determinación de la capacidad y gráficos SPC.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección magistral	18	34.92	52.92
Estudio de casos	30	62.08	92.08
Resolución de problemas y/o ejercicios	2	0	2
Resolución de problemas y/o ejercicios	3	0	3

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

Metodologías

	Description
Lección magistral	Exposición en clase de los conceptos y procedimientos claves para el aprendizaje del contenido del temario. Se fomentará la participación activa del alumno
Estudio de casos	Resolución de casos prácticos y ejercicios de aplicación de los conocimientos relacionados con la materia con la ayuda del profesor y de forma autónoma

Atención personalizada

Methodologies Description

Estudio de casos	Atención para la resolución de dudas y seguimiento del trabajo diario del alumno
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Evaluación

	Description	Qualification	Training and Learning Results		
Estudio de casos	Resolución de problemas concretos que describan situaciones reales en la industria química y de proceso.	20	B3 B4 B8	C20	D2 D6 D9 D10 D17
Resolución de problemas y/o ejercicios	Resolución de cuestiones y/o ejercicios teórico-prácticos aplicando los conocimientos adquiridos a realizar en la semana 9.	40	B3 B4 B8	C20	D2 D6 D9 D10 D17
Resolución de problemas y/o ejercicios	Resolución de cuestiones y/o ejercicios teórico-prácticos aplicando los conocimientos adquiridos a realizar en la fecha fijada por el centro.	40	B3 B4 B8	C20	D2 D6 D9 D10 D17

Other comments on the Evaluation

Alumnos con evaluación continua:

Aquellos alumnos que obtengan al menos el 50% de la nota de la prueba práctica que se realizará a mitad del cuatrimestre (semana 9) pueden optar por liberar esa materia en el examen final.

-En la segunda convocatoria no se conserva la nota de la primera prueba de evaluación continua.

Alumnos con renuncia oficial a la evaluación continua:

-Para aquellos alumnos con renuncia a la evaluación continua concedida oficialmente por el centro el examen final incluirá una parte específica de los casos prácticos y valdrá el 100% de la nota.

Compromiso ético:

Se espera que el alumno presente un comportamiento ético adecuado. En el caso de detectar un comportamiento no ético (copia, plagio, utilización de aparatos electrónicos no autorizados, y otros) se considerará que el alumno no reúne los requisitos necesarios para superar la materia. En este caso la calificación global en el presente curso académico será acorde a la normativa vigente.

Fuentes de información

Basic Bibliography

D.C. Montgomery, **Control Estadístico de la Calidad**, 2004

Complementary Bibliography

Warren D. Seider, J.D. Seader, D.R. Lewin, **Product and Process Design Principles Synthesis, Analysis, and Evaluation**, 2010

J.M. Juran, **Juran y la Calidad por el Diseño**, 1996

Xie, Ngee, Kuralmani, **Statistical Models and Control Charts for High-Quality Processes [Hardcover]**, 2002

A.J. Gutierrez, **Diseño de Procesos en Ingeniería Química**, 2003

Recomendaciones

Subjects that it is recommended to have taken before

Química industrial/V12G350V01504

Other comments

En caso de discrepancias, prevalecerá la versión en castellano de esta guía.

IDENTIFYING DATA				
Simulación e optimización de procesos químicos				
Subject	Simulación e optimización de procesos químicos			
Code	V12G350V01702			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4	1c
Teaching language	Galego Inglés			
Department				
Coordinator	Sánchez Bermúdez, Ángel Manuel			
Lecturers	Sánchez Bermúdez, Ángel Manuel			
E-mail	asanchez@uvigo.gal			
Web	http://http://eqea.uvigo.es			
General description	Asignatura obrigatoria que se imparten no 7º cuadrimestre do Grao en Química Industrial, unha vez que o alumno estudou as materias nas que deben demostrar os coñecementos necesarios sobre: - Métodos numéricos empregados na enxeñaría química. - Deseño de reactores químicos. - Deseño de equipos para operacións de separación. - Deseño de equipos de transferencia de calor empregados en procesos químicos. - Control e seguridade dos procesos químicos. Esta materia impártese no último ano. O alumno accede despois de adquirir e desenvolver habilidades para xestionar facilmente as ferramentas informáticas da informática dixital, nas que o uso seguirá funcionando e afondar.			

Resultados de Formación e Aprendizaxe	
Code	
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
C20	CE20 Capacidade para a análise, deseño, simulación e optimización de procesos e produtos.
D2	CT2 Resolución de problemas.
D6	CT6 Aplicación da informática no ámbito de estudo.
D8	CT8 Toma de decisións.
D9	CT9 Aplicar coñecementos.
D10	CT10 Aprendizaxe e traballo autónomos.
D17	CT17 Traballo en equipo.

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Simular un diagrama de fluxo dun proceso en réxime estacionario. Coñecer os métodos mais importantes de simulación de procesos (modular e baseado en ecuacións). Analizar as características estruturais dun proceso químico e determinar o orde de cálculo das unidades, establecer o fluxo de información e seleccionar as variables ou correntes de corte de forma axeitada. Resolver problemas de gran escala modelados por sistemas de ecuacións alxebraicas (sistemas dispersos).	B3 B4	C20	D6 D8 D9 D10 D17
Analizar un proceso, determinar os seus graos de liberdade e escoller as mellores variables para a súa optimización. Coñecer os fundamentos básicos dos algoritmos mais importantes de optimización determinista, tanto en variable continua como discreta. Modelar axeitadamente un problema de optimización e/ou síntese de procesos e utilizar as ferramentas axeitadas para resolverlo.	B3 B4	C20	D6 D9 D17
Coñecer os fundamentos básicos do deseño de procesos mediante simuladores de proceso. A descomposición xerárquica e os fundamentos do deseño baseado en superestructuras. Aplicar os conceptos de integración de enerxía para o deseño de redes de intercambio de calor. Saber adquirir y utilizar información bibliográfica y técnica referida a esta materia. Coñecemento e aplicación da terminoloxía inglesa empregada para describer os conceptos correspondientes a esta materia.	B3 B4	C20	D2 D6 D9 D10

Contidos	
Topic	
BLOCK 1: SIMULACIÓN	TEMA 1. SIMULACIÓN DE PROCESOS. DIAGRAMAS DE FLUXO. Simulacións por computador. Tipos de simuladores. Optimización. TEMA 2. SIMULACIÓN SECUENCIAL MODULAR. Descomposición de sistemas a gran escala. Algoritmos de particionamento. Descomposición de Redes Cíclicas Máximas. TEMA 3. SIMULACIÓN ORIENTADA A ECUACIONES. Método de factorización local (criterio de Markowitz). Reordenación "a priori" de matrices dispersas. Fase numérica. TEMA 4. GRAOS DE LIBERDADE DUN DIAGRAMA DE FLUXO. Graos de liberdade. Solución de ecuacións Sistemas de ecuacións non lineais. Selección das variables de deseño. TEMA 5. PROPIEDADES FÍSICAS EN SIMULADORES DE PROCESOS QUÍMICOS. Obtención e uso de propiedades físicas. Uso dos sistemas de cálculo de propiedades físicas. TEMA 6. DISEÑO CONCEPTUAL DE PROCESOS. Síntese xerárquica. Síntese baseada na programación matemática. Exemplos de aplicación: Síntese de redes de cambiadores de calor (método de deseño "pinch"). Extensiones do método de "pinch".
BLOQUE 2: OPTIMIZACIÓN	TEMA 7. OPTIMIZACIÓN DE PROCESOS QUÍMICOS. Conceptos básicos sobre optimización. Optimización non liñal sin restriccións. Conceptos básicos da optimización non liñal con restriccións (igualdade e desigualdade). TEMA 8. MÉTODOS NUMÉRICOS DE OPTIMIZACIÓN. OPTIMIZACIÓN SIN RESTRICCIÓNES. Optimización multivariable sen restriccións. Método de gradiente. Método de Newton. Métodos da secante. TEMA 9. PROGRAMACIÓN LIÑAL (LP). Definicións e teoremas básicos da programación liñal. Resolución do problema. O algoritmo Simplex. Programación cuadrática. TEMA 10. MÉTODOS NUMÉRICOS PARA A OPTIMIZACIÓN DE PROBLEMAS NON LIÑAIS CON RESTRICCIÓNES. Métodos de penalización, barreira e Lagrangiana aumentada. Programación cuadrática sucesiva. Método do gradiente reducido.
ESTUDO DE CASOS	Exemplos prácticos de aplicación en industrias químicas e de proceso, utilizando software de simulación e optimización de procesos.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Actividades introductorias	2	8	10
Lección maxistral	6	0	6
Aprendizaxe baseado en proxectos	12	36	48
Estudo de casos	6	0	6
Simulación	0	18	18
Prácticas con apoio das TIC	24	0	24
Resolución de problemas de forma autónoma	0	25	25
Metodoloxías baseadas en investigación	0	10	10
Exame de preguntas de desenvolvemento	0	3	3

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Metodoloxía docente	
	Description
Actividades introductorias	Presentación e introducción ó uso dos programas de simulación e optimización: Matlab, Python-Cantera, COCO SIMULATOR, CHEMPSEP, DWSIM, HYSYS e ASPEN PLUS

Lección maxistral	Presentación verbal organizada de temas referidos ós contidos da asignatura, impartidos polo profesor con axudas visuais. Este método didáctico didáctico, implica a comunicación unidireccional do presentador activo ós estudantes.
Aprendizaxe baseado en proxectos	Os estudantes traballarán nun proxecto durante un período de tempo prolongado (o cuatrimestre) que os involucre na resolución dun problema do mundo real ou na resposta a unha pregunta complexa. Demostran os seus coñecementos e habilidades creando un produto público ou unha presentación para un público real.
Estudo de casos	Se plantexan escenarios baseados en situacións nas que os alumnos observan, analizan, rexistran, implementan, conclúen, resumen ou recomendan. Os estudos de casos créanse e utilízanse como ferramenta de análise e discusión.
Simulación	O alumno ten que preparar, e documentar, unha simulación que implique un proceso orixinal, a mellora de un proceso documentado ou a optimización dun proceso ou planta existente, así como crear unha presentación pública do seu traballo.
Prácticas con apoio das TIC	Se plantexarán simulacións de parte de procesos ou unidades de operación para resolver coas distintas ferramentas informáticas que se contemplan na materia (simuladores de proceso, linguaxes de programación, etc.).
Resolución de problemas de forma autónoma	Se plantexará a resolución de problemas de libros tradicionais da enxeñaría química que serán resoltos mediante as ferramentas propostas na materia, como alternativa ós métodos tradicionais de resolución.
Metodoloxías baseadas en investigación	O alumno deberá documentar o uso de sistemas de busca bibliográfica así como de datos de interese na web (fontes de información tutoriais, etc.).

Atención personalizada

Methodologies	Description
Simulación	O alumno propondrá unha simulación de un proceso novo, mellora de un existente ou optimización de un proceso ou planta ou, no seu caso, debe adoptar o asignado polo profesor que titorará de xeito individualizado ou por grupo cada unha das simulacións da clase.
Aprendizaxe baseado en proxectos	O profesor propondrá pequenos proxectos que os alumnos han de resolver mediante as ferramentas que se lles indiquen na clase e entregar para a súa puntuación d'acordo á rúbrica correspondente que será publicada na plataforma de e-learning. Cada alumno debe entregar o traballo realizado en clase ó finalizar a mesma. Os proxectos recibirán unha puntuación acorde á rúbrica que se publicará na plataforma de e-learning.
Estudo de casos	Se plantexan escenarios baseados en situacións nas que os alumnos observan, analizan, rexistran, implementan, conclúen, resumen ou recomendan. Non haberá probas.
Prácticas con apoio das TIC	Na aula informática ou na aula de teoría se farán simulacións e resolución de problemas mediante ferramentas informáticas que han de ser entregados no memo día polos alumnos. cualificación estará rubricada por rúbrica publicada na plataforma de e-learning.

Avaliación

	Description	Qualification	Training and Learning Results
Aprendizaxe baseado en proxectos	Se realizará durante todo o semestre e se entregará ó concluír as clases presenciais e antes do exame final. A cualificación estará rubricada por rúbrica publicada na plataforma de e-learning.	20	
Simulación	O alumno debe realizar e entregar unha simulación que contribúe á avaliación continua e que debe ser realizada de xeito tutelado durante todo o semestre. A cualificación estará rubricada por rúbrica publicada na plataforma de e-learning.	20	
Resolución de problemas de forma autónoma	Periódicamente o alumno debe entregar resoltos os problemas que se lle plantexan.	20	
Exame de preguntas de desenvolvemento	Corresponde ó exame final da asignatura que, no caso de renuncia á avaliación continua, será o total da nota. Está constituído por un ou varios casos, ou simulacións e a súa corrección estará asemesmo rubricada.	40	

Other comments on the Evaluation

Alumnos con avaliación continua: A avaliación continua aplicaráse na primeira convocatoria.

Para os alumnos con renuncia concedida oficialmente polo centro á avaliación continua o exame final valerá o 100%.

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o

alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0,0).

Bibliografía. Fontes de información

Basic Bibliography

Kamal I.M. Al-Malah, **Aspen Plus: Chemical Engineering Applications**, 1st Edition, Wiley, 2016

Juma Haydary, **Chemical Process Design and Simulation: Aspen Plus and Aspen Hysys Applications**, 1st Edition, AIChE, 2019

D.M. Himmelblau, K.B. Bischoff, **Análisis y Simulación de Procesos**, Reverté, 2004

Simant Ranjan Upreti, **PROCESS MODELING AND SIMULATION FOR CHEMICAL ENGINEERS**, 1st Edition, Wiley, 2017

Complementary Bibliography

David. M. Himmelblau, **Optimization of Chemical Processes**, 2nd Edition, McGraw-Hill Higher Education, 2001

Recomendacións

Subjects that continue the syllabus

Control e instrumentación de procesos químicos/V12G350V01603

Diseño de plantas químicas e de proceso/V12G350V01914

Modelaxe de procesos biotecnolóxicos/V12G350V01924

Subjects that are recommended to be taken simultaneously

Xestión e posta en servizo de plantas químicas e de proceso/V12G350V01912

Optimización de produtos/V12G350V01701

Procesos e produtos biotecnolóxicos/V12G350V01922

Química orgánica industrial/V12G350V01923

Subjects that it is recommended to have taken before

Enxeñaría química I/V12G350V01405

Termodinámica e transmisión de calor/V12G350V01301

Experimentación en química industrial I/V12G350V01505

Experimentación en química industrial II/V12G350V01602

Enxeñaría química II/V12G350V01503

Reactores e biotecnoloxía/V12G350V01601

Calor e frío na industria de proceso/V12G350V01913

Técnicas e xestión medioambientais/V12G350V01925

Other comments

Os pilares que sustentan esta materia concréntanse no uso das técnicas de cálculo numérico, aplicado ós contidos propios da enxeñaría química: balances de materia i enerxía , fenómenos de transporte, termodinámica, fluidodinámica, termotecnia, operacións de separación, reactores , control de procesos , etc.).

IDENTIFYING DATA				
Componentes eléctricos en vehículos				
Subject	Componentes eléctricos en vehículos			
Code	V12G350V01902			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department				
Coordinator	López Fernández, Xosé Manuel			
Lecturers	López Fernández, Xosé Manuel			
E-mail	xmlopez@uvigo.es			
Web				
General description				

Resultados de Formación e Aprendizaxe

Code				
A2	Que os estudantes saiban aplicar os seus coñecementos ó seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo.			
A3	Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitir xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética.			
A5	Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores cun alto grao de autonomía.			
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.			
B7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.			
B10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.			
D1	CT1 Análise e síntese.			
D3	CT3 Comunicación oral e escrita de coñecementos.			
D5	CT5 Xestión da información.			
D7	CT7 Capacidade para organizar e planificar.			
D8	CT8 Toma de decisións.			
D10	CT10 Aprendizaxe e traballo autónomos.			
D15	CT15 Obxectivación, identificación e organización.			
D16	CT16 Razoamento crítico.			
D17	CT17 Traballo en equipo.			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Coñecer el desenvolvemento histórico e retos futuros de la red eléctrica de abordó utilizada nos vehículos (*Kfz *Bornetz)	A2	B3	D1
	A3	B7	D3
	A5	B10	D5
			D7
			D8
			D10
			D15
Coñecer as variantes de rede eléctrica de abordó co aumento de tensión.			D16
			D17
	A2	B3	D1
	A3	B7	D3
	A5	B10	D5
			D7
			D8
			D10
			D15
			D16
			D17

Coñecer propiedades, funcionamento e compoñentes que proceden de a rede eléctrica de bordo tradicional en vehículos.	A2	B3	D1
	A3	B7	D3
	A5	B10	D5
			D7
			D8
			D10
			D16
			D17

Contidos

Topic

Introducción.	Introducción. Tipos de vehículo. Historia do vehículo eléctrico. Perspectivas de futuro.
Esquemas eléctricos en vehículos.	Introducción. Instalación eléctrica. Esquemas eléctricos. Localización dos compoñentes eléctricos no esquema eléctrico. Principais circuitos que compoñen o esquema.
Compoñentes eléctricos de bordo.	Introducción. Sistemas eléctricos principais. Sistemas eléctricos auxiliares. Accionamiento. Tracción. Dispositivos auxiliares. Equipos de bordo. Sensores.
Tracción en vehículos eléctricos.	Introducción. Requisitos para a tracción eléctrica. Motor asíncrono. Motor síncrono. Motor de reluctancia. Motor de imáns permanentes. Control e accionamiento. Aplicacións.
Sistemas de control e comunicación.	Introducción. Sistemas de comunicación: Elementos; Configuracións; Buses Sistemas de control: Estáticos; Dinámicos; Seguridade; Motor
Sistemas de almacenamento de enerxía.	Introducción. Baterías. Células de combustión. Supercondensadores. Volante de inercia Tendencias. Integración na red eléctrica
Sistemas de recarga e infraestrutura de soporte.	Introducción. Modos de recarga. Tipos de conectores. Infraestructura de soporte. Tipos de redes de alimentación. Enerxías alternativas. Arquitectura de un xestor de carga. Redes intelixentes.
Prácticas de laboratorio	Achegamento aos diferentes compoñentes eléctricos, análises e identificación dos mesmos.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	12	36	48
Saídas de estudo	10	10	20
Traballo tutelado	10	30	40
Presentación	10	32	42

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

Metodoloxía docente	
	Description
Lección maxistral	Exposición dos núcleos dos temas, seguida da explicación conveniente para favorecer a súa comprensión. Motivación do interese polo coñecemento da materia.
Saídas de estudo	Coñecemento dos procesos de fabricación de compoñentes relacionados coa materia e a súa diferenciación dentro do sector.
Traballo tutelado	Profundización no contido detallado da materia adoptando un enfoque estruturado e de rigor. Promover o debate e a confrontación de ideas.
Presentación	Exercitar recursos de análises e sínteses dos traballos tutelados elaborados. Promover a adopción de aptitudes autocríticas e a aceptación de enfoques contrarios.

Atención personalizada

Methodologies	Description
Saídas de estudo	
Traballo tutelado	
Presentación	

Avaliación

Description		Qualification Training and Learning Results		
Traballo tutelado	Valoración dos traballos individuais e/ou en equipo, materializados nunha memoria, onde se avaliará: Implicación coa *temática. Claridade e *síntesis do contido. *Rigor da información e datos. Medios utilizados. Resposta ás dúbidas e suxestións presentadas. Claridade de conceptos. Precisión da información. Achegas. Orixinalidade dos contidos. Resultados. Conclusións. Bibliografía e referencias a libros e artigos contrastados (non web). *Entregables *entempo e forma segundo planificación.	40	B3	D3 D5 D10 D17
Presentación	Presentación individual e/*oen equipo, dos resultados dos traballos tutelados, onde se avaliará: Motivación polo tema. Claridade da exposición. *Rigor da información e datos. Medios utilizados. Resposta ás dúbidas e suxestións presentadas. Claridade de conceptos. Precisión da información. Orixinalidade dos contidos. Resultados. Conclusións. Bibliografía e referencias a libros e artigos contrastados (non web). *Entregables *entempo e forma segundo planificación.	60	B3	D3 D5 D10 D17

Other comments on the Evaluation

O alumno/a poderá escoller entre unha das dúas opcións, Opción A (Avaliación global) ou Opción *B (Avaliación continua), para a súa avaliación, segundo detállase a continuación. Opción A /*strong A esta Opción A poderá optar calquera alumno/a matriculado/a en a materia. A avaliación dos coñecementos adquiridos polo alumno/a farase de forma individual, e sen a utilización de ningún tipo de fonte de información, nun único exame escrito que englobará toda a materia recollida no Temario relativa á Aula, Laboratorio e Saídas de estudos ou Prácticas de campo, Contidos e Bibliografía indicados en *nbsp;&esta *guía docente. Os exames coincidirán coas convocatorias oficiais correspondentes. Para superar a materia, será necesario obter unha puntuación igual ou superior ao 50% da puntuación asignada, é dicir, cinco puntos sobre dez (5/10). Opción *B A esta Opción *B poderán optar só os/*as alumnos/*as que asistan e

participen obrigatoriamente de forma presencialmente en todos os exercicios e actividades que se propoñan na aula, para realizar tanto de forma individual e/ou en equipo, e que ademais asistan e participen en todas e cada unha das actividades de Laboratorio e Saídas de estudo ou Prácticas de campo propostas. Devanditos exercicios e actividades enmarcaranse en: Traballos tutelados individuais e/ou en equipo, avaliados a través dunha memoria escrita, cun peso total de 40%, é dicir, seis puntos sobre dez (4/10). Presentacións individuais e/ou en equipo en PowerPoint dos resultados dos traballos tutelados. Realizaranse dúas probas de Presentación, unha en equipo cun peso máximo de 30%, é dicir, tres puntos sobre dez (3/10), e unha Presentación individual cun peso máximo de 30%, é dicir, tres puntos sobre dez (3/10). Para superar a materia, é condición necesaria, pero non suficiente, obter como mínimo o 40% da nota máxima asignada a cada unha das partes: Traballos tutelados cun mínimo dun con seis puntos sobre dez (1,6/10); Presentación en equipo cun mínimo dun con dous puntos sobre dez (mínimo 1,2/10); Presentación individual cun mínimo dun con dous puntos sobre dez (mínimo 1,2/10) e A materia estará superada cando a puntuación total (Traballos tutelados + Presentacións) resulte unha nota final mínima do 50%, é dicir, un mínimo de cinco puntos sobre dez (5/10). Naqueles casos nos que a pesar de non superar o 40% da nota máxima asignada dalgunha das partes (Traballos tutelados e/ou Presentacións), resulte unha nota igual ou maior a cinco puntos sobre dez (5/10), a nota final traducirase nun tres sobre dez (3/10), o que significará un suspenso. Dadas as competencias fixadas nesta materia, a Opción B é a recomendada para a/a alumna/ou. As/vos alumnas/vos que queiran optar á Opción B, ten que asistir a todas as Presentacións. E o incumprimento de calquera dos requisitos indicados na Opción B empraza automaticamente á/a alumna/ou á Opción A. COMPROMISO ÉTICO: Espérase do alumno unha aptitude de comportamento adecuada ao lugar que lle corresponde en relación ao profesor, aos seus compañeiros e en base ás pautas de conduta, tanto explícitas como implícitas de respecto, todo o cal se considerará tamén á hora de fixar a nota de avaliación para poder superar a materia. Representará un comportamento non ético: copiar, plagiar, utilizar dispositivos electrónicos ou telemáticos, ou métodos non explicitamente autorizados, entre outros. Nestas circunstancias indicadas considérase que a/a alumna/ou non reúne requisitos para superar esta materia, implicarao que a cualificación global neste curso académico é de suspenso (0.00).

Bibliografía. Fontes de información

Basic Bibliography

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Eli Emadi, **Advanced Electric Drive Vehicles**, 2015, CRC Press Taylor & Francis Group,

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Johneric LEACH, **Automotive 48-volt Technology**, ‎ SAE International, 2016

K. T. Chau, **ELECTRIC VEHICLE MACHINES AND DRIVES DESIGN, ANALYSIS AND APPLICATION**, 2015, Wiley,

Kevin Jost, **48-Volt Developments**, SAE International, 2015

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Complementary Bibliography

Sánchez Fernández, Enrique, **Circuitos Eléctricos Auxiliares del Vehículo**, 2012,

Bruno Scrosati, J. Garche, W. Tillmetz, **Advances in Battery Technologies for Electric Vehicles**, Elsevier Ltd., 2015

Nicolas Navet, F. Simonot-Lion, **Automotive Embedded Systems Handbook**, CRC Press Taylor & Francis Group, 2009

Esteban José Domínguez y Julián Ferrer, **Circuitos eléctricos auxiliares del vehículo**, 2012,

José Domínguez, Esteban, **Sistemas de Carga y arranque**, 2011,

Recomendacións

Subjects that continue the syllabus

Traballo de Fin de Grao/V12G360V01991

Subjects that it is recommended to have taken before

Fundamentos de teoría de circuitos e máquinas eléctricas/V12G360V01302

Other comments

Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso en que está situada esta materia.

En caso de discrepancia, prevalecerá a versión en castelán desta guía.

IDENTIFYING DATA				
Technical english 1				
Subject	Technical english 1			
Code	V12G350V01903			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	English			
Department				
Coordinator	García de la Puerta, Marta			
Lecturers	García de la Puerta, Marta			
E-mail	mpuerta@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	This course aims at providing students with a systematic adequacy to develop the appropriate skills for communicating in Technical English at level A2 according to the Common European Framework of Reference for Languages (CEFR). As far as possible, students will be monitored so as to accommodate to each individual needs.			

Training and Learning Results	
Code	
B10	CG10 Ability to work in a multidisciplinary and multilingual environment.
D1	CT1 Analysis and synthesis.
D4	CT4 Oral and written proficiency in a foreign language.
D7	CT7 Ability to organize and plan.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.
D18	CT18 Working in an international context.

Expected results from this subject		
Expected results from this subject	Training and Learning Results	
To encourage students to use the English language within the engineering context, and the benefits and usefulness of the English language when applying their grammatical, lexical, and cultural knowledge.	B10	D1 D4 D7 D10 D17 D18
To improve students' sense of linguistic awareness of English as a second language, the grammatical and lexical mechanisms and types of expressions.	B10	D1 D4 D7 D10 D17 D18
Improving students' listening and reading skills, as well as their speaking and writing skills.	B10	D1 D4 D7 D10 D17 D18
To upgrade students' grammatical and lexical notions of the English language, and the comprehension of basic Technical English structures.	B10	D1 D4 D7 D10 D17 D18
Promoting students' critical autonomy for the comprehension and understanding of texts, dialogues and oral presentations.	B10	D1 D4 D7 D10 D17 D18

Contents

UNIT 1: NUMBERS AND TRENDS

Skills

- Writing, reading, and presenting facts and numbers correctly in a professional setting.
- Understanding symbols and abbreviations.
- Presenting data: Interpreting and describing graphs, charts, and diagrams.

Language

- Expressing numbers and calculations.
- Expressing measurement and technical specifications.
- Saying temperatures.
- Saying dates, websites and email addresses.
- Language for talking about trends.
- Adjectives and adverbs.
- Prepositions.
- Describing timelines.

UNIT 2: DESIGN AND INNOVATION: DESCRIBING PRODUCTS AND TECHNOLOGIES

Skills

- Describing uses, appearance, and definitions.
- Giving a short presentation: Structuring a presentation, exploring effective presentation strategies.

Language

- Language of description (e.g., It's really + adj./ It can + verb/ It looks like, it is shaped like /It is in the shape of …); defining relative clauses, reduced relative clauses.
- Adjectives and qualities, order of adjectives.
- Comparing and contrasting; superlative adjectives.
- Nouns and adjectives connected with geometry and properties.
- Reason and purpose
- Conditionals.
- Language for presenting: Key words and phrases for introducing, and concluding your presentation, signposting language for linking ideas; language for dealing with questions; persuasive language.

UNIT 3: GIVING INSTRUCTIONS AND DESCRIBING A MANUFACTURING PROCESS

Skills

- Describing a process; explaining a process using a diagram; discussing the stages of production.
- Writing clear instructions and warnings.

Language

- The Passive Voice: present simple passive structures.
- Verbs for manufacturing operations.
- Imperatives for instructions and warnings.
- Language for sequencing instructions and processes (sequence words).
- Adverbials of time (once, while, before and after)
- Prepositions.

4. INSPECTION AND QUALITY CONTROL: REPORT WRITING

Skills

- Writing a short report: general guidelines (structure, format, and style).
- Writing a short report about a problem.

Language

- Possibility and Probability
- Past simple and Present Perfect.
- Time expressions.

5. JOB SEARCH: PREPARING FOR A JOB INTERVIEW Skills

- Identifying your personal strengths, key skills and experience.
- Writing a short CV.
- Talking about your CV.
- Writing a cover letter.
- Preparing a job interview: asking and answering interview questions.
- Learning strategies to build applicant's confidence.

Language

- Phrases for demonstrating personal strengths and weaknesses.
- Phrases to give details of your personal characteristics, qualifications, transferable skills, professional experience, etc.
- Action verbs; positive adjectives, positive expressions.
- Softening negative information and highlighting positive information.
- Avoiding spelling mistakes.
- Revision of past form of verbs, and prepositions.
- Useful language for opening, main body and closing cover letters.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	8	15	23
Autonomous problem solving	8	10	18
ICT supported practices (Repeated, Dont Use)	5	8	13
Mentored work	4	16	20
Problem and/or exercise solving	6	10	16
Objective questions exam	6	10	16
Essay	4	15	19
Oral exam	8	16	24

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

Methodologies	
	Description
Introductory activities	Activities directed at presenting the subject, taking contact with the students and gathering information in relation to their previous knowledges of the subject.
Lecturing	Explanation of the linguistic contents and its application (Use of English) in the learning process and the acquisition of the contained theoretical contents of the subject.
Autonomous problem solving	Activities focused on dealing with exercises related to the subject. Students develop the skills and the fulfillment of exercises related with the linguistic skills (Use of English) in Technical English and the communicative skills; especially the oral expression (Speaking).
ICT supported practices (Repeated, Dont Use)	The practice activities in connection to the four communicative skills: oral understanding (Listening), oral expression (Speaking), reading comprehension (Reading), and written expression (Writing), as well as the linguistic skill (Use of English) in Technical English. These activities are done individually or in group.
Mentored work	The analysis and resolution of practical exercises in relation to grammar and vocabulary combined with the communicative skills. Students autonomously perform tasks within and outside the classroom as homework; especially the communicative task of written expression (Writing).

Personalized assistance	
Methodologies	Description
Introductory activities	General guidance to students on the subject concerning goals and how to achieve them. Exploring motivations and interests of the students. Indications on assignments and exercises to be done during the course, dates of assignment deliveries and the examination dates and how to achieve goals on the subject. Indicating that no tutorial will be done on the telephone or internet (electronic post, Skype, etc.). In case of any doubt, students will have to contact directly with the professor in the classroom or during tutorial hours.
Mentored work	Activities carried out in the classroom and during tutorials in order to supervise the learning process of the entrusted tasks and in relation to the communicative skill of written expression (Writing) and the linguistic skill (Use of English) in the English language.
Autonomous problem solving	This activity is directed to boost the realization of the diverse exercises related with the communicative skills and the linguistic skill in the application of the theoretical concepts of the language in practice. Detecting the difficulties in the learning process and lessening the different levels of the English language of each student with the rest of the participants in the course.

Lecturing	The personalized attention in lecturing aims at the correct comprehension and the encouragement given to students in the classroom and during tutorials during the learning process of the theoretical concepts of the subject; as well as making indications on the practice of exercises to be carried out and giving advice about the performance so as to successfully achieve a pass in this subject.
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Tests	Description
Oral exam	The aim of the personalized attention of the oral examination centers in the preparation, encouragement and the supervision of the oral expression (Speaking) in the classroom during the course and previous to the oral examination. The purpose of this activity is to encourage students to express not only with relevance and quality in relation to engineering and its specific vocabulary but also with linguistic correctness.

Assessment				
	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Evaluation of the theoretical concept of the Technical English language and its application. Performance of practical exercises in relation to the linguistic skill (Use of English).	20	B10	D4 D10 D18
Objective questions exam	Evaluations of communicative skill of oral understanding (Listening) with contents related to engineering (16%).	32	B10	D1 D10 D18
	Evaluations of the communicative skill of reading comprehension (Reading) with contents related to engineering (16%).			
Essay	Evaluations of the communicative skill of the written expression (Writing).	16	B10	D1 D4 D7 D10 D18
Oral exam	Evaluations of the communicative skill of oral expression (Speaking) in relation to the linguistic skill and vocabulary in the field of engineering.	32	B10	D1 D4 D7 D10 D17 D18

Other comments on the Evaluation

Particular considerations

There are two assessment systems: continuous or final. The selection of a system excludes the other.

1.1. Continuous assessment

To qualify for the system of continuous evaluation, students are required to attend 80% of the total lecture hours with academic progress and participation. Students not reaching that percentage will lose this option. The assignments and tests done during the course will be worth 100 % of the final assessment for those students choosing the continuous evaluation. The non-completion of the assignments requested during the course will be counted as a zero (0.0). The assignments must be delivered or submitted by the deadlines and dates set in advance.

1.2. Final assessment (non-attendants)

Students choosing the final examination will have to take a final overall test that will take place on the official date established by the School of Industrial Engineering. To this end, students should consult the school's website, where the examination date and time are specified.

2. Subject's final grade

2.1. Continuous assessment

The final mark for this subject is calculated taking into consideration all the skills practised during the course. Therefore, each one of them is given the following weight in the final grade:

Listening: 16%

Speaking: 32%

Reading: 16%

Writing: 16%

On the other hand, the practical exercises related to the grammatical and lexical contents and to the communicative skills, and the application of linguistic contents (Use of English) will have a weight of 20% of the mark obtained. Therefore, both parts (theory and practice) will add up to 100%, being 5 (five) the required mark to pass the subject.

To pass the course through continuous assessment, it is necessary to obtain an average grade of 5 points with a minimum of 4 (out of 10) in each of the parts. If this is not the case, the final average grade of the subject will be truncated with a maximum grade of 4.5 (out of 10), even if the arithmetic average of the tests is higher.

To completely pass the course, students who obtained a mark below 4 in any of the parts on the first edition of records will have to resit the failed part(s) in an exam in July of the current academic year. If the course is not passed in the second call, students will have to resit the exam of the whole course in future calls, except for the next assessment call in September.

Continuous assessment will consider not only the relevance and appropriateness of the content of the answers, but also their linguistic correctness.

Partial or total plagiarism in any of the assignments or activities will result in an automatic fail of the subject. To claim ignorance of what plagiarism is, will not exempt students of their responsibility in this regard.

2.2. Final Assessment (non-attendants)

The final assessment is calculated as follows:

Listening: 16%

Speaking: 32%

Reading: 16%

Writing 16%

On the other hand, the practical exercises related to the grammatical and lexical contents and to the communicative skills, and the application of linguistic contents (Use of English) will have a weight of 20% of the mark obtained. Therefore, both parts (theory and practice) will add up to 100%, being 5 (five) the required mark to pass the subject.

To pass the course, it is necessary to obtain an average grade of 5 points with a minimum of 4 (out of 10) in each of the parts. If this is not the case, the final average grade of the subject will be truncated with a maximum grade of 4.5 (out of 10), even if the arithmetic average of the tests is higher.

Regarding July's test, to completely pass the course, final assessment students who obtained a mark below 4 in any of the parts on the first edition of records will have to resit the exam of the whole course in future calls, including all the skills and linguistic contents of the subject.

Final assessment will consider not only the relevance and appropriateness of the content of the answers, but also their linguistic correctness.

Partial or total plagiarism in any of the assignments or activities will result in an automatic fail of the subject. To claim ignorance of what plagiarism is, will not exempt students of their responsibility in this regard.

3. Additional considerations

3.1. During the examinations no dictionaries, notes or electronic devices (mobile phones, tablets, PCs, etc.) will be allowed.

3.2. It is students' responsibility to check all the resources in MooVi and/or their emails, as well as to be aware of examination or submission dates.

3.3. All the above-mentioned comments also pertain to Erasmus students. In the event of not being able to access MooVi, students must contact the professor to solve the problem.

3.4. Students are requested to have an adequate ethical behaviour. In case of detecting an unethical behaviour (copying, plagiarism, use of not authorized electronic devices, and others), it will be considered that the student does not meet the requirements to pass the subject. In this case, the overall grade in the current academic year will be a fail (0.0).

Basic Bibliography

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Complementary Bibliography

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www.voanews.com/specialenglish,
iate.europa.eu, **Technical English Dictionary**,
www.howjsay.org, **A free online Talking English Pronunciation Dictionary**,

Recommendations

Other comments

We recommend students, who wish to take part in this course, to have a prior A1 level in English so as to reach the A2 level, according to the Common European Framework of Reference for Languages of the Council of Europe.

Requisites:

To register in this subject it is necessary to have passed or to be registered for all the subjects of the lower-division courses to the course where this subject is placed.

We also recommend continuous assessment due to the methodology used to practice and consolidate the learning process of the subject contents. Therefore, the active participation of students is essential to pass the Technical English subject requisites.

It is advisable to check the School's lectures timetable so as to avert incompatibility of attendance with any other subject. Therefore students will not be permitted to sit for continuous evaluation if there is overlap.

In order to avoid damaging computers, students will not be allowed to take drinks or food into the classroom. If the ingestion of liquid or food is necessary, students must show an official medical prescription.

IDENTIFYING DATA				
Technical english 2				
Subject	Technical english 2			
Code	V12G350V01904			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	English			
Department				
Coordinator	García de la Puerta, Marta			
Lecturers	García de la Puerta, Marta			
E-mail	mpuerta@uvigo.es			
Web				
General description	This course aims at providing students with a systematic adequacy to develop the appropriate skills for communicating in Technical English at level B1 according to the Common European Framework of Reference for Languages (CEFR). As far as possible, contents will be adapted to the level of each student.			

Training and Learning Results	
Code	
B10	CG10 Ability to work in a multidisciplinary and multilingual environment.
D1	CT1 Analysis and synthesis.
D4	CT4 Oral and written proficiency in a foreign language.
D7	CT7 Ability to organize and plan.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.
D18	CT18 Working in an international context.

Expected results from this subject		
Expected results from this subject	Training and Learning Results	
To improve students' sense of linguistic awareness of English as a second language, the grammatical and lexical mechanisms and types of expressions.	B10	D1 D4 D7 D9 D10 D17 D18
Improving students' listening and reading skills, as well as their speaking and writing skills in Technical English at intermediate level (B1).	B10	D1 D4 D7 D9 D10 D17 D18
To upgrade students' grammatical and lexical notions of the English language, and the comprehension of basic Technical English structures at B1 level.	B10	D1 D4 D7 D9 D10 D17 D18
To encourage students to use the English language within the engineering context, and the benefits and usefulness of the English language when applying their grammatical, lexical, and cultural knowledge.	B10	D1 D4 D7 D9 D10 D17 D18

Promoting students' critical autonomy for the comprehension and understanding of dialogues and texts written in Technical English.	B10	D1 D4 D7 D9 D10 D17 D18
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Contents

Topic

UNIT 1. Facts and figures: Presenting data	UNIT 1 Skills - Writing, reading, and presenting facts and figures in a professional setting. - Understanding symbols and abbreviations. - Describing dimensions and specifications; phrases related to length, width, thickness, etc. - Locating required information in a table of technical data. Language focus - Expressing facts and figures (mathematical symbols, dates, amounts, internet symbols and abbreviations). - Phrases for approximating numbers; saying results. - Vocabulary for describing trends. - Prepositions.
UNIT 2. Professional Presentations: Presenting with Impact	UNIT 2 Skills - Delivering impactful presentations. - Structuring a presentation. - Illustrating the importance of body language and voice power to communicate your message clearly and persuasively. - Describing Trends. - Describing and referring to visual aids. Language focus - Presentation language: Language for introducing your presentation; language for focusing and emphasizing key points; language for in recapping. - Using persuasive language to create impact. - Signposting language for linking the parts. - Cause-effect verbs. - Describing timelines: past simple, present perfect, etc.
UNIT 3. Technical Descriptions	Skills - Understanding and describing process diagrams, phases and procedures. - Describing technical functions and applications and explaining how technology works - Describing specific materials; categorising materials and specifying and describing properties - Describing component shapes and features; explaining manufacturing techniques - Describing health and safety precautions and emphasising the importance of precautions. Language focus - Verbs for describing stages of a process. - The passive form: Present simple passive structures. - Time Connectors. - Verbs for describing movement; verbs and adjectives to describe advantages; adverbs for adding emphasis. - Cause-effect (lead to, result in, etc.) - Negative prefixes (in-, un-, dis-, etc.). - Relative clauses: Defining vs non-defining relative clauses; shortened relative clauses. - Mixed conditionals, first vs. second conditional. - Words for describing mechanisms, machining, properties of materials.

UNIT 4. Applying for a Job

Skills

- Doing a self-evaluation of your strengths and weaknesses.
- Writing different types of CV.
- Becoming acquainted with cover and application letters.
- Preparing for job interviews.
- Demonstrating the best body language for job interviews.

Language focus

- Phrases for demonstrating strengths and weaknesses.
- Useful language for talking about yourself, and demonstrating your skills and experience.
- Action verbs; positive adjectives, positive expressions.
- Softening negatives and turning negatives into positives.
- Avoiding spelling mistakes.
- Phrases for opening and closing a letter of application.

UNIT 5. Writing Emails

Skills

- Writing short emails with appropriate formatting.
- Recognizing and producing formal and informal language in emails.
- Making your writing structured; writing effective openings and closings
- Handling style, tone and voice.

Language focus

- Common email expressions.
- Writing style.
- Creating a warm, professional tone.
- Avoiding spelling mistakes.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Mentored work	4	16	20
Autonomous problem solving	8	10	18
ICT supported practices (Repeated, Dont Use)	5	8	13
Lecturing	8	15	23
Problem and/or exercise solving	6	10	16
Essay	4	15	19
Objective questions exam	3	5	8
Oral exam	8	16	24
Objective questions exam	3	5	8

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

Methodologies

	Description
Introductory activities	Activities aimed at presenting the subject, getting in touch with students and gathering information about their previous knowledge on the topic.
Mentored work	Analysis and resolution of practical exercises related to the grammatical and lexical contents, and to the communication skills. The students must develop these activities in an autonomous way, specially those homework activities concerning Writing skills.
Autonomous problem solving	Activities in which problems are presented and/or exercises related to the subject. The student must develop the analysis and resolution of problems and/or activities concerning the four communicative skills at an individual level, as well as the technical English linguistic skill (Use of English); specially those ones concerning Speaking.
ICT supported practices (Repeated, Dont Use)	Practice of the four communicative skills: listening, speaking, reading and writing, as well as the technical English linguistic skill (Use of English) at an individual or group level.
Lecturing	Explanation of linguistic contents and their application (Use of English) for the learning and acquisition of the theoretical contents of the subject.

Personalized assistance

Methodologies	Description
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Introductory activities	The objective of the introductory activities is to provide general guidance on the subject; to promote learning strategies; to make general notes about the work and exercises, deadlines for the submission of work and the exam dates; and to give advice on how to pass the subject. It is important to know that no tutorials will be done on the telephone or internet (email, Skype, etc.). In case of any doubt or comment, students should contact directly with the professor in the classroom or during tutorial hours.
Autonomous problem solving	This activity seeks to help students with the practical exercises related to the communicative skills and the linguistic skills and their application for the learning and acquisition of the theoretical contents of the subject.
Mentored work	Practice of the different exercises in relation to the communicative skills and linguistic skills in order to apply English theoretical concepts.
Lecturing	The personalised attention for the master class is focused on the attention of students in the classroom and during tutorial hours. It focuses on the correct comprehension and promotion of the learning of the subject's theoretical concepts, as well as on providing guidance on work and practical exercises and on giving advice on how to pass the subject.
Tests	Description
Oral exam	The objective of the personalised attention of the oral exam is focused on the preparation, promotion and supervision of the oral expression (Speaking) in the classroom during the course and before the exam. This activity seeks to help the students not only to express themselves with relevance and appropriateness using the topics and vocabulary from the field of engineering, but also with linguistic correction.

Assessment				
	Description	Qualification	Training and Learning Results	
Problem and/or exercise solving	Evaluation of theoretical concepts and their application. Resolution of practical exercises related to the linguistic skill (Use of English) of technical English.	20	B10	D7 D10 D18
Essay	Evaluation of the writing skill.	16	B10	D1 D4 D7 D9 D10 D18
Objective questions exam	Evaluation of the listening skill with engineering-related contents.	16	B10	D4 D9 D10 D18
Oral exam	Evaluation of the speaking skill with engineering-related vocabulary and topics.	32	B10	D1 D4 D7 D10 D17 D18
Objective questions exam	Evaluation of the reading skill with engineering-related topics and vocabulary.	16	B10	D1 D4 D7 D10 D17 D18

Other comments on the Evaluation

Particular considerations

There are two assessment systems: continuous or final. The selection of a system excludes the other.

1.1. Continuous assessment

To qualify for the system of continuous evaluation, students are required to attend 80% of the total lecture hours with academic progress and participation. Students not reaching that percentage will lose this option. The assignments and tests done during the course will be worth 100 % of the final assessment for those students choosing the continuous evaluation. The non-completion of the assignments requested during the course will be counted as a zero (0.0). The assignments must be delivered or submitted by the deadlines and dates set in advance.

1.2. Final assessment (non-attendants)

Students choosing the final examination will have to take a final overall test that will take place on the official date established by the School of Industrial Engineering. To this end, students should consult the school's website, where the examination date and time are specified.

2. Subject's final grade

2.1. Continuous assessment

The final mark for this subject is calculated taking into consideration all the skills practised during the course. Therefore, each one of them is given the following weight in the final grade:

Listening: 16%

Speaking: 32%

Reading: 16%

Writing: 16%

On the other hand, the practical exercises related to the grammatical and lexical contents and to the communicative skills, and the application of linguistic contents (Use of English) will have a weight of 20% of the mark obtained. Therefore, both parts (theory and practice) will add up to 100%, being 5 (five) the required mark to pass the subject.

To pass the course through continuous assessment, it is necessary to obtain an average grade of 5 points with a minimum of 4 (out of 10) in each of the parts. If this is not the case, the final average grade of the subject will be truncated with a maximum grade of 4.5 (out of 10), even if the arithmetic average of the tests is higher.

To completely pass the course, students who obtained a mark below 4 in any of the parts on the first edition of records will have to resit the failed part(s) in an exam in July of the current academic year. If the course is not passed in the second call, students will have to resit the exam of the whole course in future calls, except for the next assessment call in September.

Continuous assessment will consider not only the relevance and appropriateness of the content of the answers, but also their linguistic correctness.

Partial or total plagiarism in any of the assignments or activities will result in an automatic fail of the subject. To claim ignorance of what plagiarism is, will not exempt students of their responsibility in this regard.

2.2. Final Assessment (non-attendants)

The final assessment is calculated as follows:

Listening: 16%

Speaking: 32%

Reading: 16%

Writing 16%

On the other hand, the practical exercises related to the grammatical and lexical contents and to the communicative skills, and the application of linguistic contents (Use of English) will have a weight of 20% of the mark obtained. Therefore, both parts (theory and practice) will add up to 100%, being 5 (five) the required mark to pass the subject.

To pass the course, it is necessary to obtain an average grade of 5 points with a minimum of 4 (out of 10) in each of the parts. If this is not the case, the final average grade of the subject will be truncated with a maximum grade of 4.5 (out of 10), even if the arithmetic average of the tests is higher.

Regarding July's test, to completely pass the course, final assessment students who obtained a mark below 4 in any of the parts on the first edition of records will have to resit the exam of the whole course in future calls, including all the skills and linguistic contents of the subject.

Final assessment will consider not only the relevance and appropriateness of the content of the answers, but also their linguistic correctness.

Partial or total plagiarism in any of the assignments or activities will result in an automatic fail of the subject. To claim ignorance of what plagiarism is, will not exempt students of their responsibility in this regard.

3. Additional considerations

- 3.1. During the examinations no dictionaries, notes or electronic devices (mobile phones, tablets, PCs, etc.) will be allowed.
- 3.2. It is students' responsibility to check all the resources in MooVi and/or their emails, as well as to be aware of examination or submission dates.
- 3.3. All the above-mentioned comments also pertain to Erasmus students. In the event of not being able to access MooVi, students must contact the professor to solve the problem.
- 3.4. Students are requested to have an adequate ethical behaviour. In case of detecting an unethical behaviour (coping, plagiarism, use of not authorized electronic devices, and others), it will be considered that the student does not meet the requirements to pass the subject. In this case, the overall grade in the current academic year will be a fail (0.0).

Sources of information

Basic Bibliography

Beigbeder Atienza, Federico, **Diccionario Técnico Inglés/Español; Español/Inglés**, Díaz de Santos,
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Picket, Nell Ann; Laster, Ann A. & Staples Katherine E., **Technical English: Writing, Reading and Speaking**, Pearson Limited Education,

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www.agendaweb.org,
www.bbc.co.uk/worldservice/learningenglish/,
www.edufind.com/english/grammar,
www.voanews.com/specialenglish,
www.mit.edu, **Massachusetts Institute of Technology**,
www.iate.eu, **Eu's Multilingual Technical and Scientific Dictionary**,

Recommendations

Other comments

We recommend students to have some knowledge of English. This course will start from an A2 level and it will reach B1 level, according to the European Framework of Reference for Languages of the Council of Europe.

Requisites:

To register in this subject, it is necessary to have passed or to be registered for all the subjects of the lower courses.

We also recommend continuous assessment due to the methodology used to practise and consolidate the contents of the subject. Therefore, the active participation of students is essential to pass the Technical English subject.

It is advisable to check and compare this subject's timetable with the School's lectures timetables so as to avoid incompatibilities. Students will not be allowed to choose continuous assessment if there is an overlap with other subjects.

In order to avoid damaging the room's computer equipment, students will not be allowed to take drinks or food into the classroom. If the ingestion of liquids or food is due to medical reasons, students must show an official medical prescription.

Sending emails or using of mobile phones during the lessons are prohibited.

The student who does not comply with the information in the previous paragraph will also lose the opportunity to follow the continuous assessment process.

IDENTIFYING DATA**Methodology for the preparation, presentation and management of technical projects**

Subject	Methodology for the preparation, presentation and management of technical projects			
Code	V12G350V01905			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Alonso Rodríguez, José Antonio			
Lecturers	Alonso Rodríguez, José Antonio González Cespón, José Luis Seoane González, Pablo			
E-mail	jaalonso@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The aim of this course is to prepare the students to handle the methods, techniques and tools that are needed for the elaboration and management of technical documents in the industrial field of Engineering.			

It will also be sought to develop skills in the handling of information and communication technologies related to the professional field of the student's degree.

Furthermore, the student skills to communicate properly the knowledge, procedures and results in the Industrial Engineering field will be strengthened.

An essentially practical approach will be used, based in the solution of specific application exercises -with guidance of the subject's lecturer- that will require to apply the theoretical contents of the course.

Training and Learning Results

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C18	CE18 Knowledge and skills to organize and manage projects. Know the organizational structure and functions of a project office.
D2	CT2 Problems resolution.
D3	CT3 Oral and written proficiency.
D5	CT5 Information Management.
D6	CT6 Application of computer science in the field of study.
D7	CT7 Ability to organize and plan.
D8	CT8 Decision making.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D11	CT11 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 more just and equal society
D13	CT13 Ability to communicate orally and in writing in the Galician language.
D14	CT14 Creativity.
D15	CT15 Objectification, identification and organization.
D17	CT17 Working as a team.
D18	CT18 Working in an international context.
D20	CT20 Ability to communicate with people not expert in the field.

Expected results from this subject

Expected results from this subject	Training and Learning Results
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Utilization of methodologies, technics and tools for the organization and management of all technical documents other than engineering projects.	B3	C18	D2 D7 D8 D9 D10 D14 D15 D17
Skills in the utilization of information systems and in the communications in the industrial scope.			D5 D6 D9 D11 D17
Skills to communicate properly the knowledge, procedures, results, abilities in the field of Engineering in Industry.			D3 D13 D17 D18 D20

Contents

Topic	
Edition and composition of scientific texts - technical	Editors of text Introduction to the language *LaTeX Language *Markdown *Metadatos
Management of the knowledge	Plagiarism Quote and references Bibliography and bibliographic agents Use of bibliography with editors of Managing text of knowledge: *Obsidian *Plugins and staff in *Obsidian
Editorial	Norms and styles of editorial Editorial and preparation of scientific documents - technical. Language *inclusivo
Oral defence of works	Realisation of presentations Language *gestual Protocol Presentation and defence of works *academicos

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	40	50
Practices through ICT	20	23.5	43.5
Presentation	5	5	10
Workshops	15	20	35
Laboratory practice	2.5	0	2.5
Problem and/or exercise solving	3	0	3
Presentation	2	0	2
Essay	1	3	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	Class *expositiva of the professor with support of visual material and of Tics
Practices through ICT	The methodology of practices with support of TIC focuses in the autonomous learning of the student through the TIC, and in the cooperative work between student and professor.
Presentation	The professor explains with the example, making a presentation of as it has to make an oral exhibition.
Workshops	A workshop is a class of instruction or of information that centres in the education of skilled technicians or in the study of a subject in specific.

Personalized assistance

Assessment

Description		Qualification	Training and Learning Results			
Laboratory practice	Realisation of proofs and practical exercises related with the contents of the matter, in the frame of the personalised attention to the students.	25	B3	C18	D2 D3 D5 D7 D8 D9 D10 D13 D14 D15 D17 D18 D20	
Problem and/or exercise solving	Resolution of exercises related with the subject of management of the knowledge and of bibliographic management, appointments and references.	25	B3	C18	D2 D3 D7 D8 D9 D11 D14 D15	
Presentation	Preparation and oral exhibition of a subject proposed by the *profesorado	25				
Essay	Preparation of one or several works of type *cientifico-technical proposed by the *profesorado and with application of all the exposed in the subject.	25				

Other comments on the Evaluation

to) Modality of Continuous Evaluation: In each one of the items indicated will be precise to take out a minimum note of 4 on 10. Of not being like this, the student will have to go back to examine of the item suspense.&*b) Modality of global Evaluation: The student will be able to surpass the subject in a consistent global evaluation in: Preparation of a scientific document-technical with *LaTeX. (40%) Preparation of a clear-cut structure in a vault of *Obsidian (30%) Preparation of a presentation and oral exhibition of&the same *nbsp; &*nbsp;(30%) In each one of the proofs indicated, will be precise to take out a minimum note of 4 on 10. Of not being like this, the student will have to go back to examine of the item suspense.&*nbsp;ethical Commitment: expects that the present student a suitable ethical behaviour. In the case to detect a no ethical behaviour (copy, plagiarism, utilisation of unauthorised electronic devices, and others) considers that the student does not gather the necessary requirements to surpass the matter. In this case the global qualification in the current academic course will be of suspense (0.0).

Sources of information

Basic Bibliography

Álvarez Maraón, Gonzalo, **EL ARTE DE PRESENTAR: CÓMO PLANIFICAR, ESTRUCTURAR, DISEÑAR Y EXPONER PRESENTACIONES**, 1ª, Gestión 2000, 2012

Lannon, John M. and Gurak, Laura J., **TECHNICAL COMMUNICATION**, 13th, Pearson, 2013

Pringle, Alan S. and O'Keefe, Sarah S., **TECHNICAL WRITING 101: A REAL-WORLD GUIDE TO PLANNING AND WRITING TECHNICAL CONTENT**, 1st, Scriptorium Publishing Services, 2009

Complementary Bibliography

BIBLIOGRAFÍA BÁSICA: -----, -----,

Blair, Lorrie, **WRITING A GRADUATE THESIS OR DISSERTATION**, 1st, Sense Publishers, 2016

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Pease, Allan, **ESCRIBIR BIEN ES FÁCIL: GUÍA PARA LA BUENA REDACCIÓN DE LA CORRESPONDENCIA**, 1ª, Amat, 2007

BIBLIOGRAFÍA COMPLEMENTARIA: -----, -----,

Balzola, Martín, **PREPARACIÓN DE PROYECTOS E INFORMES TÉCNICOS**, 2ª, Balzola, 1996

Boeglin Naumovic, Martha, **LEER Y REDACTAR EN LA UNIVERSIDAD: DEL CAOS DE LAS IDEAS AL TEXTO ESTRUCTURADO**, 1ª, MAD, 2007

Calavera, J., **MANUAL PARA LA REDACCIÓN DE INFORMES TÉCNICOS EN CONSTRUCCIÓN: INFORMES, DICTÁMENES, ARBITRAJES**, 2ª, Intemac, 2009

Córcles Cubero, Ana Isabel, **CÓMO REALIZAR BUENOS INFORMES: SORPRENDA CON INFORMES CLAROS, DIRECTOS Y CONCISOS**, 1ª, Fundacion Confemetal, 2007

García Carbonell, Roberto, **PRESENTACIONES EFECTIVAS EN PÚBLICO: IDEAS, PROYECTOS, INFORMES, PLANES, OBJETIVOS, PONENCIAS, COMUNICACIONES**, 1ª, Edaf, 2006

Himstreet, William C., **GUÍA PRÁCTICA PARA LA REDACCIÓN DE CARTAS E INFORMES EN LA EMPRESA**, 1ª, Deusto, 2000

Sánchez Pérez, José, **FUNDAMENTOS DE TRABAJO EN EQUIPO PARA EQUIPOS DE TRABAJO**, 1ª, McGraw-Hill, 2006

Williams, Robin, **THE NON-DESIGNER'S PRESENTATION BOOK**, 1st, Peachpit Press, 2009

Recommendations

Subjects that it is recommended to have taken before

Graphic expression: Fundamentals of engineering graphics/V12G320V01101

Technical Office/V12G320V01704

Other comments

Previously to the realisation of the final assesments, students should check in the FAITIC platform to know whether it is necessary for them to carry any particular documentation, materials, etc. into the exam room to perform the tests.

It is necessary that the student registered in this course, either has passed all courses of the former years, or is registered in the courses he's not passed yet.

IDENTIFYING DATA				
Programación avanzada para a enxeñaría				
Subject	Programación avanzada para a enxeñaría			
Code	V12G350V01906			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department				
Coordinator	López Fernández, Joaquín			
Lecturers	Camaño Portela, José Luís López Fernández, Joaquín			
E-mail	joaquin@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	Aplicación práctica de técnicas actuais para a programación de aplicacións industriais para *computadores e dispositivos móbiles. Programación orientada a obxectos en Xava para sistemas *Windows e *Android.			

Resultados de Formación e Aprendizaxe

Code	
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
C3	CE3 Coñecementos básicos sobre o uso e programación dos ordenadores, sistemas operativos, bases de datos e programas informáticos con aplicación en enxeñaría.
D2	CT2 Resolución de problemas.
D5	CT5 Xestión da información.
D6	CT6 Aplicación da informática no ámbito de estudo.
D7	CT7 Capacidade para organizar e planificar.
D17	CT17 Traballo en equipo.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Coñecementos informáticos avanzados aplicables ao exercicio profesional dos futuros enxeñeiros, con especial énfase nas súas aplicacións á resolución de problemas no ámbito da Enxeñaría	B3 B4	C3	D2 D5 D6 D7 D17
Coñecer os fundamentos informáticos de diferentes paradigmas de programación (estruturada, modular, orientada a obxectos), as súas posibilidades, características e aplicabilidade á resolución de problemas no ámbito da Enxeñaría	B3 B4	C3	D2 D5 D6 D7 D17
Capacidade para utilizar linguaxes e contornas de programación e para programar algoritmos, rutinas e aplicacións de complexidade media para a resolución de problemas e o tratamento de datos no ámbito da Enxeñaría	B3 B4	C3	D2 D5 D6 D7 D17
Coñecer os fundamentos do proceso de desenvolvemento de software e as súas diferentes etapas	B3 B4	C3	D2 D5 D6 D7 D17
Capacidade para desenvolver interfaces gráficas de usuario	B3 B4	C3	D2 D5 D6 D7 D17

Contidos		
Topic		
Programación orientada obxectos en Java	Linguaxe Java. Clases, obxectos e referencias. Tipos de datos, instrucións, operadores. Matrices e coleccións. Herdanza, interfaces, polimorfismo. Tratamento de excepcións. Programación de gráficos mediante JavaFX.	
Creación de aplicacións para dispositivos móbiles	Sistemas Android. Ferramentas de desenvolvemento de aplicacións. Interfaces de usuario para dispositivos móbiles. Acceso a bases de datos. Manexo de sensores e cámara. Procesado de imaxe. Comunicación inalámbrica con dispositivos industriais. Acceso a bases de datos.	

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticas de laboratorio	18	9	27
Resolución de problemas	20	40	60
Lección maxistral	12.5	25	37.5
Informe de prácticas, prácticum e prácticas externas	8.5	17	25.5

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

Metodoloxía docente	
	Description
Prácticas de laboratorio	Desenvolvemento de aplicacións industriais para control, monitorización e automatización de plantas industriais, en sistemas Windows e Android
Resolución de problemas	Posta en práctica dos coñecementos adquiridos na materia mediante a súa aplicación á resolución de problemas habituais na enxeñaría
Lección maxistral	Introdución e descrición dos diferentes conceptos e técnicas relacionados coa materia

Atención personalizada	
Methodologies	Description
Lección maxistral	Atención personalizada para resolución de dúbidas do alumnado
Prácticas de laboratorio	Atención personalizada para resolución de dúbidas do alumnado
Resolución de problemas	Atención personalizada para resolución de dúbidas do alumnado
Tests	Description
Informe de prácticas, prácticum e prácticas externas	Atención personalizada para resolución de dúbidas do alumnado

Avaliación						
	Description	Qualification	Training and Learning Results			
Prácticas de laboratorio	Avaliarase as solucións achegadas polo alumno na resolución das diferentes prácticas de laboratorio propostas	40	B3 B4	C3	D2 D5 D6 D7 D17	
Resolución de problemas	Cualificarase a aplicación dos coñecementos adquiridos na resolución de tarefas de enxeñaría específicas	30	B3 B4	C3	D2 D5 D6 D7 D17	
Lección maxistral	Avaliarase a participación activa do alumno nas diferentes actividades formativas	10	B3 B4	C3	D2 D5 D6 D7 D17	
Informe de prácticas, prácticum e prácticas externas	Calidade dos informes das diferentes prácticas propostas e das solucións achegadas	20	B3 B4	C3	D2 D5 D6 D7 D17	

Other comments on the Evaluation

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considérase que o

alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0.0).

A avaliación nesta materia ten un compoñente moi alto de avaliación continua durante a realización das diferentes actividades académicas desenvolvidas durante o curso. No caso de convocatorias diferentes da convocatoria de maio, a avaliación realizarase no laboratorio, mediante o desenvolvemento práctico dunha aplicación similar ás desenvolvidas durante o curso.

Bibliografía. Fontes de información

Basic Bibliography

B.C. Zapata, **Android Studio application development**, 2013,

K. Sharan, **Beginning Java 8 fundamentals**, 2014,

I.F. Darwin, **Java cookbook**, 2014,

L.M. Lee, **Android application development cookbook**, 2013,

Complementary Bibliography

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Y.D. Liang, **Introduction to Java programming**, 2011,

R. Matthews, **Beginning Android tablet programming**, 2011,

P. Mehta, **Learn OpenGL ES**, 2013,

G. Milette, A. Stroud, **Professional Android sensor programming**, 2012,

J. Morris, **Android user interface development**, 2011,

R. Schwartz, etc, **The Android developer's cookbook**, 2013,

R.G. Urma, M. Fusco, A. Mycroft, **Java 8 in action**, 2015,

Recomendacións

Subjects that it is recommended to have taken before

Informática: Informática para a enxeñaría/V12G320V01203

IDENTIFYING DATA				
Seguridade e hixiene industrial				
Subject	Seguridade e hixiene industrial			
Code	V12G350V01907			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department				
Coordinator	González Sas, Olalla			
Lecturers	González Sas, Olalla			
E-mail	olallags83@uvigo.es			
Web				
General description	Nesta materia abórdanse os aspectos máis destacados das técnicas xerais e específicas da Seguridade do Traballo, as diferentes ramas da Hixiene do Traballo, a Ergonomía como disciplina centrada no sistema persoa-máquina, a influencia dos factores psicosociais sobre a saúde do traballador, así como a lexislación elaborada sobre todos estes aspectos.			

Resultados de Formación e Aprendizaxe

Code	
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
B6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
B7	CG7 Capacidade para analizar e valorar o impacto social e ambiental das solucións técnicas.
B11	CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial. CG11 Conocimiento, comprensión y capacidad para aplicar la legislación necesaria en el ejercicio de la
D2	CT2 Resolución de problemas.
D5	CT5 Xestión da información.
D7	CT7 Capacidade para organizar e planificar.
D8	CT8 Toma de decisións.
D9	CT9 Aplicar coñecementos.
D10	CT10 Aprendizaxe e traballo autónomos.
D14	CT14 Creatividade.
D17	CT17 Traballo en equipo.
D20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results	
CG1 Capacidade para a redacción, firma e desenvolvemento de proxectos no ámbito da enxeñaría industrial, que teñan por obxecto, segundo a especialidade, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.	B6 B11	D5
CG2 Capacidade para a dirección das actividades obxecto dos proxectos de enxeñaría descritos na competencia CG1.		D5 D9 D10
CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial.	B4 B7	D2 D5 D9 D10 D14 D17 D20

CG11 Coñecemento, comprensión e capacidade para aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico Industrial.	B4 B6 B7 B11	D2 D7 D8 D9 D10 D14 D17 D20
CT1 Análise e síntese.	B4 B7	D2 D5 D7 D8 D9 D14 D17 D20

Contidos

Topic	
TEMA 1.- Introducción á Seguridade e Hixiene do Traballo	1.1.- Terminoloxía básica 1.2.- Saúde e traballo 1.3.- Factores de risco 1.4.- Incidencia dos factores de risco sobre a saúde 1.5.- Técnicas de actuación fronte aos danos derivados do traballo
TEMA 2.- Evolución histórica e lexislación	2.1.- Evolución histórica 2.2.- Evolución en España 2.3.- A Seguridade e Hixiene do Traballo na lexislación española 2.4.- Responsabilidades e sancións
TEMA 3.- Seguridade do Traballo	3.1.- O accidente de traballo 3.2.- Seguridade do traballo 3.3.- Causas dos accidentes 3.4.- Análise estatística dos accidentes 3.5.- Xustificación da prevención
TEMA 4.- Técnicas de seguridade. Avaliación de riscos	4.1.- Técnicas de seguridade 4.2.- Obxectivos da avaliación de riscos 4.3.- Avaliación xeral 4.4.- Avaliación das condicións de traballo 4.5.- Técnicas analíticas posteriores ao accidente 4.6.- Técnicas analíticas anteriores ao accidente
TEMA 5.- Normalización	5.1.- Vantaxes, requisitos e características das normas 5.2.- Normas de seguridade 5.3.- Procedemento de elaboración 5.4.- Orde e limpeza
TEMA 6.- Sinalización de seguridade	6.1.- Características e normativa 6.2.- Clases de sinalización 6.3.- Sinalización en forma de panel
TEMA 7.- Equipos de protección	7.1.- Individual 7.2.- Integral 7.3.- Colectiva
TEMA 8.- Técnicas específicas de seguridade	8.1.- Máquinas 8.2.- Incendios e explosións 8.3.- Contactos eléctricos 8.4.- Manutención manual e mecánica 8.5.- Industria mecánica 8.6.- Produtos químicos 8.7.- Mantemento
TEMA 9.- Hixiene do Traballo	9.1.- Ambiente industrial 9.2.- Hixiene do traballo e terminoloxía 9.3.- Hixiene teórica e valores límites ambientais 9.4.- Hixiene analítica 9.5.- Hixiene de campo e enquisa hixiénica 9.6.- Hixiene operativa
TEMA 10.- Axentes físicos ambientais	10.1.- Ruído e vibracións 10.2.- Iluminación 10.3.- Radiacións *ionizantes e non *ionizantes 10.4.- Tensión térmica

TEMA 11.- Protección fronte a riscos hixiénicos	11.1.- Vías respiratorias 11.2.- Oídos 11.3.- Ollos
TEMA 12.- Riscos hixiénicos da industria química	12.1.- Procesos inorgánicos 12.2.- Procesos orgánicos 12.3.- Accidentes graves
TEMA 13.- Seguridade nos lugares de traballo	13.1.- A seguridade no proxecto 13.2.- Mapas de riscos
TEMA 14.- Ergonomía	14.1.- Concepto 14.2.- Aplicación da ergonomía á seguridade 14.3.- Carga física e fatiga muscular 14.4.- Carga e fatiga mental
TEMA 15.- Psicosocioloxía aplicada á prevención	15.1.- Factores psicosociais 15.2.- Consecuencias dos factores psicosociais sobre a saúde 15.3.- Avaliación dos factores psicosociais 15.4.- Intervención psicosocial

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	26	49	75
Resolución de problemas	24	22	46
Exame de preguntas obxectivas	2	15	17
Resolución de problemas e/ou exercicios	2	10	12

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

Metodoloxía docente

	Description
Lección maxistral	Exposición oral e directa, por parte do profesor, dos coñecementos fundamentais correspondentes aos temas da materia.
Resolución de problemas	O profesor expón aos alumnos unha serie de problemas para que os traballen e resolvan en clase en pequenos grupos.

Atención personalizada

Methodologies	Description
Resolución de problemas	Darase a coñecer os alumnos, a principio de curso, os horarios de tutorías nos que se resolverán as dúbidas que existan con respecto á teoría, problemas e traballos

Avaliación

	Description	Qualification	Training and Learning Results
Resolución de problemas	Proporase ao alumno unha serie de problemas que terá que resolver	30	B4 B6 B7 D2 D5 D8 D9 D10 D14 D17
Exame de preguntas obxectivas	A finalidade desta proba de resposta múltiple, que figura no calendario de exames da Escola, é avaliar o nivel de coñecementos alcanzado polos alumnos	40	B11 D5 D7 D8 D9 D10
Resolución de problemas e/ou exercicios	A finalidade de esta proba de desenvolvemento, que terá lugar na semana previa a semana de exames da Escola, é a resolución dun caso práctico que deberán resolver os alumnos de modo que se aplique de maneira práctica os coñecementos adquiridos	30	

Other comments on the Evaluation

Con respecto ao exame de XULLO (2ª convocatoria), se manterá a cualificación obtida polo alumno nos controis e presentacións / exposicións realizados durante o período docente. Iso significa que o alumno unicamente realizará probaa tipo test do devandito exame. Cando a Escola libere a un alumno do proceso de avaliación continua, a súa cualificación será o 100% da nota obtida en probaa tipo test anteriormente citada.Compromiso éticoEspérase que o alumno

presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, por exemplo), considerárase que *el alumno non reúne os requisitos necesarios para superar a materia.

Bibliografía. Fontes de información

Basic Bibliography

Mateo Floría, P. y otros, **Manual para el Técnico en Prevención de Riesgos Laborales**, 9ª,

Cortés Díaz, J. Mª, **Técnicas de Prevención de Riesgos Laborales: Seguridad e Higiene del Trabajo**, 9ª,

Complementary Bibliography

Menéndez Díez, F. y otros, **Formación Superior en Prevención de Riesgos Laborales**, 4ª,

Gómez Etxebarria, G., **Prontuario de Prevención de Riesgos Laborales**,

Recomendacións

Other comments

Para matricularse nesta materia é necesario superar ou ben matricularse de todas as materias dos cursos inferiores ao curso en que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

IDENTIFYING DATA				
Laser technology				
Subject	Laser technology			
Code	V12G350V01908			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish English			
Department				
Coordinator	Pou Saracho, Juan María			
Lecturers	Barro Guizán, Óscar Boutinguiza Larosi, Mohamed Pou Saracho, Juan María			
E-mail	jpou@uvigo.es			
Web				
General description	(*)Introduction to laser technology and its applications for undergraduate students of the industrial field.			

Training and Learning Results	
Code	
B10	CG10 Ability to work in a multidisciplinary and multilingual environment.
D10	CT10 Self learning and work.

Expected results from this subject		
Expected results from this subject		Training and Learning Results
- Know the physical principles in which it bases the operation of a laser and his parts.	B10	D10
- Know the main properties of a laser and relate them with the potential applications.		
- Know the different types of lasers differentiating his specific characteristics.		
- Know the main applications of the technology laser in the industry.		

Contents	
Topic	
Chapter 1.- INTRODUCTION	1. Electromagnetic waves in the vacuum and in the matter. 2. Laser radiation. 3. Properties of the laser radiation.
Chapter 2.- BASICS	1. Photons and energy level diagrams. 2. Spontaneous emission of electromagnetic radiation. 3. Population inversion. 4. Stimulated emission. 5. Amplification.
Chapter 3. COMPONENTS OF A LASER	1. Active medium 2. Excitation mechanisms. 3. Feedback mechanisms. 4. Optical cavity. 5. Exit device.
Chapter 4. TYPES OF LASER	1. Gas lasers 2. Solid-state lasers 3. Diode lasers. 4. Other lasers.
Chapter 5. OPTICAL COMPONENTS AND SYSTEMS	1. Spherical lenses. 2. optical centre of a lens. 3. Thin lenses. Ray tracing. 4. Thin lenses coupling. 5. Mirrors. 6. Filters. 7. Optical fibers.
Chapter 6. INDUSTRIAL APPLICATIONS	1. Introduction to laser materials processing 2. Introduction to laser cutting and drilling. 3. Introduction to laser welding. 4. Introduction to laser marking. 5. Introduction to laser surface treatments.

Planning			
	Class hours	Hours outside the classroom	Total hours
Laboratory practical	18	30.6	48.6
Lecturing	32.5	65	97.5
Essay questions exam	1.7	0	1.7
Report of practices, practicum and external practices	1.9	0	1.9
Problem and/or exercise solving	0.3	0	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
Laboratory practical	Activities of application of the knowledge to specific situations and of acquisition of basic and practical skills related to the matter object of study. They will be developed in the laboratories of industrial applications of the lasers of the EEI.
Lecturing	Exhibition on the part of the teacher of the contents on the matter object of study. Exhibition of real cases of application of the laser technology in the industry.

Personalized assistance	
Methodologies	Description
Laboratory practical	

Assessment				
	Description	Qualification	Training and Learning Results	
Essay questions exam	Several tests consisting of development questions will be proposed, so that no test exceeds 40% of the overall grade for the subject..	70	B10	D10
Report of practices, practicum and external practices	The evaluation of the laboratory practices will be carried out by means of the qualification of the corresponding practice reports.	20	B10	D10
Problem and/or exercise solving	During the course there will be carried out a test of follow-up of the subject that will consist of two questions of equal value.	10	B10	D10

Other comments on the Evaluation

If some student was resigning officially the continuous assessment, the final note would be calculated by the following formula: $(0.8 \times \text{Exam qualification}) + (0.2 \times \text{Practices qualification})$. It is mandatory to carry out the laboratory practices in order to pass the subject. It is mandatory to attend 75% of the theory lessons to pass the subject. Ethical commitment: it is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0). The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

Jeff Hecht, **UNDERSTANDING LASERS: AN ENTRY-LEVEL GUIDE**, IEEE, 2008

W.Steen, J. Mazumder, **LASER MATERIALS PROCESSING**, Springer, 2010

Complementary Bibliography

Recommendations

Other comments

Requirements: To register for this module the student must have passed or be registered for all the modules of the previous year.

In case of discrepancies, the spanish version (castellano) will prevail.

IDENTIFYING DATA				
Integración da planta na xestión do negocio				
Subject	Integración da planta na xestión do negocio			
Code	V12G350V01911			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Optional	4	1c
Teaching language	Castelán			
Department				
Coordinator	Orge Álvarez, Beatriz Prudencia			
Lecturers	Orge Álvarez, Beatriz Prudencia			
E-mail	orge@uvigo.es			
Web				
General description				

Resultados de Formación e Aprendizaxe

Code	
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
C22	CE22 Capacidade para deseñar, xestionar e operar procedementos de simulación, control e instrumentación de procesos químicos.
D2	CT2 Resolución de problemas.
D6	CT6 Aplicación da informática no ámbito de estudo.
D7	CT7 Capacidade para organizar e planificar.
D8	CT8 Toma de decisións.
D9	CT9 Aplicar coñecementos.
D10	CT10 Aprendizaxe e traballo autónomos.
D17	CT17 Traballo en equipo.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Planificar, programar e gestionar operacións e procedementos de sistemas de control de produción de procesos batch e continuos.	B3 B4	C22	D2 D6 D7 D8 D9 D10 D17
Integrar a información de os procesos de a planta química en a xestión de o negocio.	B3 B4	C22	D6 D7 D8 D9 D10
Adquirir habilidades para o traballo en grupo con obxectivos.			D7 D8 D17

Contidos

Topic	
Técnicas de planificación, programación e xestión de a produción de procesos batch e continuos.	Técnicas de planificación, programación e xestión de a produción de procesos batch e continuos.

Integración de as operacións e procesos de a industria química e de proceso en a xestión de o negocio. Visibilidade e produción colaborativa.	Integración de as operacións e procesos de a planta química en a xestión de o negocio. Visibilidade e produción colaborativa (Collaborative Manufacturing).
	Xestión e integración de procesos batch, ISA S-88
Modelado de planta para o intercambio de información ERP-Mes. Estándares de integración. Operacións de planta e recursos: persoal, equipamento, material, enerxía, variables de proceso, lotes, etc.	Modelado de planta para o intercambio de información ERP - MES. Estándares de integración (ISA S-95). Xestión e integración de a enerxía en a planta. Determinación de consumos e emisións específicas.
Proxecto de integración: modelado e implementación de un caso real de unha industria química e de proceso.	Resolución de casos reais de planificación de produción na industria química e de proceso utilizando ferramentas de software. -Proxecto de integración: modelado e implementación dun caso real dunha industria química ou de proceso.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	20	35	55
Resolución de problemas	20	35	55
Estudo de casos	35	77	112
Exame de preguntas de desenvolvemento	3	0	3

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

Metodoloxía docente

	Description
Lección maxistral	Exposición en clase dos conceptos e procedementos craves para a aprendizaxe do contido do temario.
Resolución de problemas	Resolución de exemplos e exercicios ilustrativos da materia impartida nas sesións magistrais.
Estudo de casos	Resolución de casos prácticos e exercicios de aplicación dos coñecementos relacionados coa materia, coa axuda do profesor e de forma autónoma.

Atención personalizada

Methodologies	Description
Estudo de casos	Atención para a resolución de dúbidas e seguimento do traballo diario do alumno.
Resolución de problemas	Atención para a resolución de dúbidas e seguimento do traballo diario do alumno.

Avaliación

	Description	Qualification	Training and Learning Results		
Resolución de problemas	Traballos e exercicios propostos polo profesor que comprendan os conceptos e procedementos craves contidos no temario.	20	B3 B4	C22	D2 D6 D7 D8 D9 D10
Estudo de casos	Resolución por parte do alumno de casos prácticos de aplicación dos coñecementos adquiridos e presentación do correspondente informe da actividade realizada.	40	B3 B4	C22	D2 D6 D7 D8 D9 D10 D17
Exame de preguntas de desenvolvemento	Exame teórico-práctico que comprenda os conceptos e procedementos craves.	40	B3 B4	C22	D2 D6 D8 D9

Other comments on the Evaluation

Alumnos con avaliación continua:-Na segunda convocatoria consérvase a nota da avaliación continua. Alumnos con renuncia oficial á avaliación continua:-O exame final valerá o 100% da nota para aqueles alumnos con renuncia á avaliación continua concedida oficialmente polo centro.Compromiso ético:

Espérase

que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no presente curso académico será de suspenso (0,0).

Bibliografía. Fontes de información

Basic Bibliography

B. Scholten, **The Road to Integration: A Guide to Applying the ISA-95 Standard in Manufacturing**, 2007

Meyer, Fuchs, Thiel, **Manufacturing Execution Systems (MES): Optimal Design, Planning, and Deployment**, 2009

Li, W.D.; Ong, S.K.; Nee, A.Y.C, **Collaborative Product Design and Manufacturing Methodologies and Applications**, 2007

ANSI/ISA S-95,

ANSI/ISA S-88,

Complementary Bibliography

Recomendacións

Subjects that are recommended to be taken simultaneously

Xestión e posta en servizo de plantas químicas e de proceso/V12G350V01912

Optimización de produtos/V12G350V01701

Simulación e optimización de procesos químicos/V12G350V01702

Subjects that it is recommended to have taken before

Control e instrumentación de procesos químicos/V12G350V01603

Other comments

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

IDENTIFYING DATA				
Xestión e posta en servizo de plantas químicas e de proceso				
Subject	Xestión e posta en servizo de plantas químicas e de proceso			
Code	V12G350V01912			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Optional	4	1c
Teaching language	Castelán			
Department				
Coordinator	Orge Álvarez, Beatriz Prudencia			
Lecturers	Orge Álvarez, Beatriz Prudencia			
E-mail	orge@uvigo.es			
Web				
General description				

Resultados de Formación e Aprendizaxe	
Code	
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
C20	CE20 Capacidade para a análise, deseño, simulación e optimización de procesos e produtos.
D2	CT2 Resolución de problemas.
D7	CT7 Capacidade para organizar e planificar.
D8	CT8 Toma de decisións.
D9	CT9 Aplicar coñecementos.
D10	CT10 Aprendizaxe e traballo autónomos.
D17	CT17 Traballo en equipo.

Resultados previstos na materia			
Expected results from this subject	Training and Learning Results		
Manexar fontes de información e documentación en Enxeñaría química.			D7 D10 D17
Estimar as capacidades e os custos de equipamentos e instalacións de plantas químicas e de proceso.	B3 B4	C20	D2 D9 D10 D17
Estimar os custos das operacións de planta tanto en procesos continuos como *batch.	B3 B4	C20	D2 D9 D10 D17
Coñecer e aplicar os principios básicos da *reingeniería de procesos a unha planta xa existente.	B3 B4	C20	D2 D7 D8 D9 D10
Aplicar criterios económicos de deseño e estimar os riscos en plantas de proceso.	B3 B4	C20	D7 D8 D9 D10

Contidos
Topic

Estratexia da investigación industrial e desenvolvemento de procesos na industria química e de proceso.	Fontes de información e documentación en Ingeniería Química. Estratexia da investigación industrial e desenvolvemento de procesos na industria química e de proceso.
Localización e dimensionamento da planta. Estimación de capacidade e de custos de equipos e procesos. Custos de produción, operación e xerais. Índices de custos de planta. Posta en servizo e operación de plantas.	Localización e dimensionamento da planta. Estimación de capacidade e de custos de equipos e procesos. Custos de produción, operación e xerais. Índices de custos de planta. Posta en servizo e operación de plantas.
Optimización e criterios económicos de deseño baseados na sustentabilidade. Variables de deseño Rentabilidade e Risco. Criterios estáticos e dinámicos.	Xestión e modelado de industrias de proceso de produción flexible multiproducto
Reingeniería de procesos (BPR).	Optimización e criterios económicos de deseño baseados na sustentabilidade. Variables de deseño Rentabilidade e Risco. Criterios estáticos e dinámicos.
Resolución de casos reais aplicados a industria química e de proceso.	Reingeniería de procesos (BPR).
	Resolución de casos reais aplicados a industria química e de proceso.

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	20	35	55
Resolución de problemas	20	35	55
Estudo de casos	35	77	112
Exame de preguntas de desenvolvemento	3	0	3

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

Metodoloxía docente

	Description
Lección maxistral	Exposición en clase dos conceptos y procedementos craves para o aprendizaxe do contido do temario. Se fomentará a participación activa do alumno.
Resolución de problemas	Resolución de exemplos e exercicios ilustrativos da materia impartida nas sesións maxistras.
Estudo de casos	Resolución de casos prácticos e exercicios de aplicación dos coñecementos relacionados coa materia, coa axuda do profesor e de forma autónoma.

Atención personalizada

Methodologies	Description
Estudo de casos	Atención para a resolución de dúbidas e seguimento do traballo diario de o alumno.
Resolución de problemas	Atención para a resolución de dúbidas e seguimento do traballo diario de o alumno.

Avaliación

	Description	Qualification	Training and Learning Results		
Resolución de problemas	Traballos e exercicios propostos polo profesor que comprendan os conceptos e procedementos craves contidos no temario.	20	B3 B4	C20	D2 D7 D8 D9 D10
Estudo de casos	Resolución por parte do alumno de casos prácticos de aplicación dos coñecementos adquiridos e proba práctica a realizar cara a mediados do cuatrimestre.	40	B3 B4	C20	D2 D7 D8 D9 D10 D17
Exame de preguntas de desenvolvemento	Exame teórico-práctico que comprenda os conceptos e procedementos craves.	40	B3 B4	C20	D2 D8 D9

Other comments on the Evaluation

Alumnos con avaliación continua:

-Aqueles alumnos que obteñan polo menos o 50% da nota da proba práctica que se realizará cara a mediados do cuatrimestre (semana de o 19 a o 23 de novembro de 2018) poden optar por liberar esa materia no exame final.

-Para poder presentar as memorias dos estudos de casos propostos é necesario asistir polo menos a o 80% das clases prácticas. En caso de non asistir polo menos a o 80 % das clases prácticas a nota desta parte será de 0,0.

-En a segunda convocatoria consérvase a nota de a avaliación continua.

Alumnos con renuncia oficial a a avaliación continua:

-Para aqueles alumnos con renuncia a avaliación continua concedida oficialmente polo centro o exame final incluírá unha parte específica dos casos prácticos e valerá o 100% da nota.

Compromiso ético:

Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plagio, utilización de aparellos electrónicos non autorizados, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. En este caso a cualificación global no presente curso académico será acorde a normativa vigente

Bibliografía. Fontes de información

Basic Bibliography

A.J. Gutierrez, **Diseño de Procesos en Ingeniería Química**, 2003

Happel, Jordan, **Economía de los Procesos Químicos**, 1981

Complementary Bibliography

E. Himmelblau, Lasdon, **Optimization of Chemical Process**, 2001

A.Vian, **El Pronóstico Económico en Química Industrial**, 1975

A.B.Badiru, **Project Management in Manufacturing and High Technology Operations**, 1988

Christine Paszko, Elizabeth Turner, **Laboratory Information Management Systems**, 2002

L. Cabra Dueñas; A. de Lucas, **Metodologías del Diseño y Gestión de Proyectos para Ingenieros Químicos**, 2010

Recomendacións

Subjects that are recommended to be taken simultaneously

Optimización de produtos/V12G350V01701

Simulación e optimización de procesos químicos/V12G350V01702

Other comments

En caso de discrepancias, prevalecerá a versión en castelán de esta guía.

IDENTIFYING DATA				
Heating and cooling in the process industry				
Subject	Heating and cooling in the process industry			
Code	V12G350V01913			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Cerdeira Pérez, Fernando			
Lecturers	Cerdeira Pérez, Fernando			
E-mail	nano@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The main objective is that the students acquire the basic knowledge related to the heat exchanges that take place in the different equipment and installations, such as the heat exchangers, boilers, heat pumps, etc.			
	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results	
Code	
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry.
B5	CG5 Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, reports, work plans and other similar works.
B6	CG6 Capacity for handling specifications, regulations and mandatory standards.
B7	CG7 Ability to analyze and assess the social and environmental impact of the technical solutions.
B11	CG11 Knowledge, understanding and ability to apply the necessary legislation in the exercise of the profession of Industrial Technical Engineer.
D2	CT2 Problems resolution.
D7	CT7 Ability to organize and plan.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.
D20	CT20 Ability to communicate with people not expert in the field.

Expected results from this subject		
Expected results from this subject	Training and Learning Results	
New	B4	D2
	B5	D7
	B6	D9
	B7	D10
	B11	D17
		D20
New	B4	D2
	B5	D7
	B6	D9
	B7	D10
	B11	D17
		D20
New	B4	D2
	B5	D7
	B6	D10
	B7	D17
	B11	D20

New	B4	D2
	B5	D7
	B6	D9
	B7	D10
	B11	D17
		D20

Contents

Topic	
Transmission of Heat	Heat exchangers . - Analysis of heat exchangers. - Method NTU - Types of exchangers. Boiling and condensation
Thermal engineering.	Processes of combustion. Burners. Boilers Ovens and dryers. Isolations.
Refrigeration technology	Refrigeration machine and Heat pump. Coefficients of efficiency. Vapor compression refrigeration cycles. Devices for the production of cold. Refrigerants Cryogenics.
Energetic efficiency	Application of the renewable energies (solar thermal, geothermal, biomass,...) as an energy source in the process industry.
-- Practical of laboratory and with support of the TIC	- Determination of the enthalpy of combustion. - Calculation of a deposit of LPG. - Study of the propagation of flame. - Higrometric study of the air. - Study of the heat exchangers. - Energetic balance of a boiler. - Visit to a boilers room.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	22	22	44
Laboratory practical	12	10	22
Problem solving	14	26	40
Mentored work	0	10	10
Practices through ICT	4	4	8
Field practice	4	0	4
Objective questions exam	1	10	11
Objective questions exam	1	10	11

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

Methodologies

	Description
Lecturing	Explanation in blackboard supported with presentation in transparencies, videos and any material that the teacher consider useful to do comprehensible the syllabus of the subject.
Laboratory practical	Practices of laboratory applied.
Problem solving	Resolution of exercises and necessary practical cases to comprise the concepts seen in the classes of theory.
Mentored work	Execution of works individual and/or in group. Inside this activity includes the presentation of works in front of the group and his back evaluation.
Practices through ICT	Resolution of exercises by means of the support of computer programs.
Field practice	(*)Se realizan visitas a instalaciones térmicas reales (salas de máquinas de industrias de proceso) para conocer aspectos de eficiencia energética, medioambiental y seguridad de la práctica de la ingeniería. En algunos casos, tendrán que realizar una búsqueda bibliográfica previa de la normativa de obligado cumplimiento. Esta acción se completa con un breve cuestionario sobre nociones de salud y seguridad industrial.

Personalized assistance

Methodologies	Description
Lecturing	The professor will attend the doubts of the students so much in the classroom as in the schedule of tutorial.

Laboratory practical	The professor will attend the doubts of the students so much in the laboratory as in the schedule of tutorial.
Problem solving	The professor will attend the doubts of the students so much in the classroom as in the schedule of tutorial.
Practices through ICT	The professor will attend the doubts of the students so much in the computer classroom as in the schedule of tutorial.
Mentored work	The professor will attend the doubts of the students so much in the classroom as in the schedule of tutorial.

Assessment

	Description	Qualification	Training and Learning Results	
Lecturing	Classical master explanation on whiteboard supported by presentation on transparencies, videos and any material that the teacher considers useful to make the syllabus of the subject.	15	B4 B5 B6 B7	D2 D9 D10
Problem solving	Realization of applied laboratory practices	25	B4 B5 B6 B7	D2 D9 D10
Mentored work	Preparation of a memory and presentation of the work proposed, individually or in group, on the thematic proposal to the start of course.	20	B4 B5 B6 B7 B11	D7 D9 D10 D17 D20
Objective questions exam	Objective proof (1) consisting of short questions or multiple choice to know the progressive evolution of the students during the development of the matter.	20	B4 B5 B6 B7 B11	D7 D9
Objective questions exam	Objective proof (2) consisting of short questions or multiple choice to know the progressive evolution of the students during the development of the matter.	20	B4 B5 B6 B7 B11	D7 D9

Other comments on the Evaluation

The final examination will be composed by a theory part (15%) and a problem part (25%) and it will be mandatory to obtain a minimum mark of 3,5 out of 10 between both tests. The continuous evaluation (EC) will be evaluated by the work (W) and by 2 objective tests (PO); those who have officially renounced the EC will have had to take a specific questionnaire (CE) at the first opportunity of the course announcement.

The continuous evaluation (EC, 40%) will be evaluated through the work and of objective proofs; those that have renounced officially to the EC will have to make a specific questionnaire (SQ) at the earliest opportunity of the course call. In the second opportunity (July call), the students that have made the EC will be able to choose between keeping the EC mark or make the SQ of the second opportunity.

The End of Degree call will be fully evaluated by means of an exam (100%), that is, the EC of the previous course will not be taken into account.

A numerical rating system of 0 to 10 points will be used according to current legislation (RD 1125/2003, September 5, BOE September 18).

It is expected an adequate ethical behaviour of the student. In case of detecting unethical behaviour (copying, plagiarism, unauthorized use of electronic devices, etc.) shall be deemed that the student does not meet the requirements for passing the subject. In this case, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

Incropera, F.P. et al, **Principles of heat and mass transfer**, 7th ed., international student version, 2013

Múñoz Domínguez, M.; Rovira de Antonio, A.J., **Ingeniería Térmica**, 2006

Complementary Bibliography

Moran, Michael J.; Shapiro, Howard N., **Fundamentos de termodinámica técnica**, 2ª ed., 2004

Rey Martínez F.J.; Velasco Gómez E., **Bombas de calor y energías renovables en edificios**, 2005

Torrella Alcaraz, Enrique, **Frío industrial : métodos de producción**, 2010

Kohan, Anthony L., **Manual de calderas**, 2000

Kreith, Frank, **The CRC handbook of thermal engineering**, 2000

Recommendations

Subjects that it is recommended to have taken before

(*)Física: Física I/V12G350V01102

(*)Física: Física II/V12G350V01202

Chemistry: Chemistry/V12G350V01205

Thermodynamics and heat transfer/V12G350V01301

Other comments

To enrol in this matter is necessary to have surpassed or enrol of all the subjects of the inferior courses.

IDENTIFYING DATA				
Deseño de plantas químicas e de proceso				
Subject	Deseño de plantas químicas e de proceso			
Code	V12G350V01914			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán Galego			
Department				
Coordinator	Alonso Rodríguez, José Antonio			
Lecturers	Alonso Rodríguez, José Antonio González Cespón, José Luis			
E-mail	jaalonso@uvigo.es			
Web				
General description	A materia de Deseño de Plantas Químicas e de Proceso ten como visión e como misión proporcionar ao futuro Graduado en Enxeñaría en Química Industrial os coñecementos, capacidades e habilidades que lle permitan deseñar, avaliar e implantar plantas de procesado no ámbito da enxeñaría química. É unha materia de natureza interdisciplinar porque require de coñecementos previos sobre procesos e tecnoloxías de transformación de produtos, construcións e instalacións industriais; así como sobre metodoloxías de elaboración, organización e xestión de proxectos, entre outros. O estudo da materia é unha ferramenta fundamental para afianzar os coñecementos adquiridos polo alumnado durante o estudo da carreira, desde os aspectos fundamentais de química física, matemáticas, expresión gráfica, nos cales descansan as aplicacións de enxeñaría química, ata a *implementación dos mesmos na elaboración de proxectos de procesos e plantas de proceso. Para logralo emprégase un enfoque amplo dos contidos da materia, buscando a integración dos coñecementos adquiridos ao longo da carreira, mediante a *implementación de metodoloxías de aprendizaxe activas para que os contidos expostos en clases teóricas aplíquense no desenvolvemento das actividades prácticas, orientadas á realidade industrial da profesión, asimilando o emprego áxil e preciso da distinta normativa de aplicación e das boas prácticas profesionais establecidas, apoiándose nas novas tecnoloxías para documentar, elaborar, xestionar o deseño de procesos e plantas de proceso no ámbito profesional da enxeñaría química.			

Resultados de Formación e Aprendizaxe	
Code	
B1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, que teñan por obxecto, segundo a especialidade, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
B5	CG5 Coñecementos para a realización de medicións, cálculos, valoracións, taxacións, peritaxes, estudos, informes, planes de labores e outros traballos análogos.
B6	CG6 Capacidade para o manexo de especificacións, regulamentos e normas de obrigado cumprimento.
C18	CE18 Coñecementos e capacidades para organizar e xestionar proxectos. Coñecer a estrutura organizativa e as funcións dunha oficina de proxectos.
D2	CT2 Resolución de problemas.
D7	CT7 Capacidade para organizar e planificar.
D8	CT8 Toma de decisións.
D10	CT10 Aprendizaxe e traballo autónomos.
D14	CT14 Creatividade.
D17	CT17 Traballo en equipo.
D20	CT20 Capacidade para comunicarse con persoas non expertas na materia.

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

Comprender os aspectos básicos de formulación xeral que supón a implantación dun proceso.	B1 B3	
Coñecer e interpretar a diferente normativa de obrigado cumprimento existente referente á actividade.	B6	D8 D20
Desenvolver documentos que expresen a idea de deseño concibida	B1 B4 B5	D2 D7 D8 D14 D17
Habilidade para o traballo en grupo con obxectivos.	B4	D8 D14 D17
Adquirir habilidades para xestionar a información relativa ás plantas de proceso	B4 B6	D2 D7 D8 D10 D14 D17 D20
Capacidade para o deseño de instalacións e sistemas auxiliares na industria química e de proceso.	B1 B4 B5 B6	C18 D2 D7 D8 D10 D14 D17 D20

Contidos

Topic	
Introdución e presentación da materia.	Presentación. Guía docente da materia. Criterios e normas para o desenvolvemento da materia.
Instalacións de iluminación	Luz: concepto, onda electromagnética, resonancia. Percepción da luz. Fisioloxía do ollo. Absorción e reflexión. Xeración da cor: RGB e CMYK. Unidades luminosas: lumen e lux. Iluminación. Curvas fotométricas. Niveis de luz. UNE 12464. Calculo do numero de fontes e luminarias. Aplicacións de cálculo: DIALUX ou INDALUX. Eficiencia energética.
Instalacións eléctricas	Repaso de conceptos básicos: intensidade, impedancia e voltaje. Tensión monofásica e trifásica. Diferenzas e aplicación. Conexións de forneo. Elementos dunha instalación eléctrica. Protección magnetotérmica e diferencial. Neutro e toma de terra. Automatización de instalacións, Contactores. Accionamiento por lóxica eléctrica ou microcontrolador. Deseño dunha instalación eléctrica. Dimensionamiento. Línea de forza e línea de alumado. Reglamento Electrotécnico de Baixa Tensión.
Ventilación	Ventilación Conceptos de ventilación. Calidade de aire. Efecto invernadero. Humidade do aire. Sicrometría. Conductos de aire. Versión consolidada do Real Decreto 1027/2007.
Fontanería e saneamiento	A auga. Caudales de auga e presións. Componentes dunha instalación. Tuberías de distribución. Montaxes. Auga quente. Tuberías de evacuación. Probas reglamentarias.
Ruído industrial	Ruído industrial Concepto de ruído. Ondas. Parámetros. Presión e potencia acústica, dB e dBA. Fisioloxía do oído. Reverberación. Tempo de reverberación T60 e T30. Absorción. Coeficiente de absorción e materiais. Lei de Sabine. Absorción en grandes volumes. Illamento. Concepto de enerxía. Lei de masas. Frecuencias de coincidencia e resonancia. Curvas de illamento. Control do ruído nunha industria. Propagación do son fonte-transmisión-recepción. Enfermidades laborais e relación cos medicamentos. Equipos de protección individual.
Reglamento APQ	Real Decreto 656/2017
Aire comprimido	Aire. Parámetros do aire. Equipos de compresión. Real Decreto 2060/2008

Planificación

	Class hours	Hours outside the classroom	Total hours
Actividades introductorias	2	1	3

Lección maxistral	18	27	45
Resolución de problemas	12	12	24
Aprendizaxe baseado en proxectos	18	60	78
Traballo	2	0	2
Resolución de problemas e/ou exercicios	2	0	2
Traballo	2	0	2
Traballo	2	0	2

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

Metodoloxía docente	
	Description
Actividades introductorias	Presentátese a materia, información dos contidos da mesma, metodoloxías que se van a aplicar, traballos a realizar na asignatura e forma de avaliación. Así mesmo realizásense dinámicas na clase para fomentar a interrelación no alunado.
Lección maxistral	Clase maxistral participativa onde se exporán os obxectivos e os principais contidos do temario e poranse a disposición dos alumnos todos aqueles materiais necesarios para o desenvolvemento das actividades prácticas programadas.
Resolución de problemas	O alumno debe desenvolver as solucións axeitadas ou correctas a os exercicios plantexados que se basean na teoría impartida. Realizásense aplicando fórmulas, algoritmos ou procedementos de transformación da información dispoñible. Será necesaria a interpretación dos resultados.
Aprendizaxe baseado en proxectos	Realizátese un traballo aplicando a metodoloxía de "Aprendizaxe Baseada en Proxectos- ABP". Realización dun proxecto de ingeniería, traballando cun equipo aberto. Farase fincapé na aplicación de ferramentas e coñecementos de ingeniería industrial para crear solucións de ingeniería para as necesidades reais dunha industria.

Atención personalizada	
Methodologies	Description
Aprendizaxe baseado en proxectos	O estudante realizara un proxecto de enxeñería, traballando cun equipo aberto. Farase fincapé na aplicación de ferramentas e coñecementos de enxeñería industrial para crear solucións de ingeniería para as necesidades reais dunha industria. Faranse titorías de grupo co profesor para aclarar dúbidas e para o seguimento do traballo.

Avaliación					
	Description	Qualification	Training and Learning Results		
Traballo	Realización de un traballo de diseño de la instalación eléctrica de una planta industrial y su iluminación	22	B1 B3 B4 B5	C18	D2 D7 D8 D10 D14 D17 D20
Resolución de problemas e/ou exercicios	Realización de diferentes ejercicios relativos al temario	34	B1 B3 B4 B5 B6	C18	D2 D7 D8 D10 D14 D17 D20
Traballo	Dimensionado y diseño de la ventilación de una instalación industrial	22	B1 B3 B4 B5 B6	C18	D2 D7 D8 D10 D14 D17 D20
Traballo	Determinación del nivel de ruido de una instalación	22	B1 B3 B4 B5 B6	C18	D2 D7 D8 D10 D14 D17 D20

Other comments on the Evaluation

SISTEMA DE AVALIACIÓN:

O sistema de avaliación por defecto é o sistema de avaliación continua. O alumno que desexa aproveitar un sistema de avaliación non continuado deberá solicitalo oficialmente, no tempo e na forma establecidos para iso na E.E.I. Se o estudante non solicita u obtén o veredicto favorable da renuncia á avaliación continua, enténdese que está no sistema de avaliación continua.

O alumno que pretende solicitar a exención de avaliación continua deberá notificarlle o profesor o máis axiña posible. Recoméndase facelo ao comezo do curso ou antes de comezar o ensino.

A avaliación levarase a cabo en función das rúbricas publicadas na plataforma TEMA da materia.

CRITERIOS DE SUPERACIÓN DA MATERIA mediante avaliación continua:

Para aprobar o aluno pola avaliación continua debe satisfacer simultaneamente dúas condicións:

- a) obter unha puntuación mínima de 4 das 10 en cada unha das seccións avaliable ou partes sinaladas.
- b) obter unha puntuación media, ponderada segundo as porcentaxes indicadas anteriormente, cun mínimo de 5 a 10.

Se unha sección é suspendida, ou o estudante desexa mellorar o grao dunha sección, ter un máximo de dous (2) oportunidades para facelo. Neste caso, aplicárase un coeficiente corrector á cualificación da sección. O prazo para tales correccións será establecido polo profesor.

CRITERIOS DE SUPERACIÓN DA MATERIA mediante avaliación continua:

Os alumnos que opten por renunciar oficialmente á avaliación continua deberán realizar un traballo supervisado polo profesor, consistente nun proxecto industrial ou similar, e unha proba de avaliación. Para obter a cualificación atoparase a media proporcional (teoría do 60% e prácticas do 40%). E é obrigatorio obter unha nota mínima de 4 puntos sobre 10 posibles en cada unha das partes. Para superar a materia, a media mencionada debe ser como mínimo de 5 puntos sobre 10 posibles.

Bibliografía. Fontes de información

Basic Bibliography

España. Ministerio de la Presidencia, **RITE + resumen de normas UNE**, 5ª ed, Ceysa, 1985

Fernando Vila Arroyo (coord.), **El libro blanco de la iluminación**, Comité Español de Iluminación, 2013

Jiménez Alcaide, L.; Rodríguez Pascual, A., **El proyecto de una planta química**, UCOPress, Editorial Universidad de Córdoba, 2016

Perry, R.H.; Green, D.W.; Maloney, JO, **Manual del ingeniero químico**, 7ª ed, McGraw-Hill Interamericana de España S.L., 2001

Rase, F; Barrow, M.H., **Diseño de tuberías para plantas de proceso**, Blume, 2001

Sinnott, R.; Towler, G., **Diseño en ingeniería química**, Reverté, 2012

Lagunas Marqués, Ángel, **Instalaciones eléctricas comerciales e industriales : resolución de casos prácticos**, 7ª ed., act., Paraninfo, 2017

Complementary Bibliography

Recomendacións

Subjects that continue the syllabus

Traballo de Fin de Grao/V12G350V01991

Subjects that it is recommended to have taken before

Ciencia e tecnoloxía dos materiais/V12G350V01305

Fundamentos de sistemas e tecnoloxías de fabricación/V12G350V01304

Enxeñaría química I/V12G350V01405

Mecánica de fluídos/V12G350V01401

Resistencia de materiais/V12G350V01404

Control e instrumentación de procesos químicos/V12G350V01603

Enxeñaría química II/V12G350V01503

Oficina técnica/V12G350V01604

Química industrial/V12G350V01504

Tecnoloxía medioambiental/V12G350V01502

Other comments

Previamente á realización das probas facilitarase normativa, manuais ou calquera outro material que sexa necesario.

Requisitos: Para matricularse nesta materia é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situada esta materia.

En caso de discrepancias, prevalecerá a versión en castelán desta guía.

IDENTIFYING DATA				
Bioelectroquímica				
Subject	Bioelectroquímica			
Code	V12G350V01921			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	1c
Teaching language	Galego			
Department				
Coordinator	Nóvoa Rodríguez, Ramón			
Lecturers	Nóvoa Rodríguez, Ramón			
E-mail	rnovoa@uvigo.gal			
Web	http://moovi.uvigo.gal/			
General description	(*)Nesta materia preténdese introducir ó alumnado na disciplina de Electroquímica, os seus fundamentos e súas aplicacións, con especial énfase nas aplicacións industriais e biotecnolóxicas.			

Resultados de Formación e Aprendizaxe

Code	
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
C16	CE16 Coñecementos básicos e aplicación de tecnoloxías ambientais e sustentabilidade.
C19	CE19 Coñecementos sobre balances de materia e enerxía, biotecnoloxía, transferencia de materia, operacións de separación, enxeñaría da reacción química, deseño de reactores, e valorización e transformación de materias primas e recursos enerxéticos.
D2	CT2 Resolución de problemas.
D9	CT9 Aplicar coñecementos.
D10	CT10 Aprendizaxe e traballo autónomos.
D17	CT17 Traballo en equipo.

Resultados previstos na materia

Expected results from this subject	Training and Learning Results		
Coñecer os aspectos básicos das reaccións electroquímicas aplicadas a sistemas biotecnolóxicos	B3 B4	C19	D2 D10 D17
Aplicar os conceptos básicos da bioelectroquímica á eliminación de contaminantes, bioenerxía, biocorrosión, etc.	B4	C16	D9 D17

Contidos

Topic	
Electrolitos e interfases	Potencial de electrodo Estructura das interfases Cinética electroquímica Transporte de materia
Métodos de estudo	Instrumentación electroquímica Electrodos Métodos de corrente continua Métodos de corrente alterna
(bio)Sensores	Potenciométricos (incluíndo selectividade encimática). Amperométricos
Electroquímica industrial	Electrólise Síntese Baterías Pilas de combustible (incluíndo as de base biolóxica)
Corrosion	Fundamentos Métodos de protección
Biointerfases	Interfases entre biomoléculas Bioenerxía Biocatálise

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32.5	65	97.5
Prácticas de laboratorio	9	13.5	22.5
Resolución de problemas	9	13.5	22.5
Resolución de problemas e/ou exercicios	2	0	2
Resolución de problemas e/ou exercicios	2	0	2
Informe de prácticas, prácticum e prácticas externas	0.5	3	3.5

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

Metodoloxía docente	
	Description
Lección maxistral	Exposición dos contidos da materia con apoio audiovisual
Prácticas de laboratorio	Traballos prácticos sincronizados coa exposición de contidos: técnicas experimentais e casos de aplicación.
Resolución de problemas	Resolución de exercicios que permitan fixa-los conceptos de teoría e afrontar con garantía de aproveitamento o traballo de laboratorio.

Atención personalizada	
Methodologies	Description
Resolución de problemas	A resolución de exercicios e as prácticas contarán con asistencia individualizada ó alumnado.
Prácticas de laboratorio	A resolución de exercicios e as prácticas contarán con asistencia individualizada ó alumnado.

Avaliación					
	Description	Qualification	Training and Learning Results		
Prácticas de laboratorio	Traballo no laboratorio e memoria de actividade	30	B4		D9 D17
Resolución de problemas	Exame de exercicios relacionados coa teoría	30	B4	C16 C19	D2 D9 D10
Resolución de problemas e/ou exercicios	Avaliaranse os conceptos presentados nas leccións maxistras mediante exame de cuestións curtas	40	B3	C16 C19	D9 D10

Other comments on the Evaluation

Compromiso ético:

Espérase que o alumno presente un comportamento ético axeitado. No caso de detectar un comportamento non ético (copia, plaxio, utilización de aparatos electrónicos non autorizados, etc.) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Nese caso a cualificación global no presente curso académico será de suspenso (0.0 puntos).

Non se permitirá a utilización de ningún dispositivo electrónico durante as probas de avaliación, salvo autorización expresa. O feito de introducir un dispositivo electrónico non autorizado na aula de exame será considerado motivo de non superación da materia no presente curso académico e a cualificación global será de suspenso (0.0 puntos).

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións

Subjects that it is recommended to have taken before
Química: Química/V12G350V01205
Ciencia e tecnoloxía dos materiais/V12G350V01305
Enxeñaría química I/V12G350V01405
Tecnoloxía electrónica/V12G350V01402
Enxeñaría química II/V12G350V01503

Other comments

Requisitos:

Para matricularse nesta materia é aconsellable ter superado ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está emprazada esta materia.

IDENTIFYING DATA				
Biotechnological processes and products				
Subject	Biotechnological processes and products			
Code	V12G350V01922			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Longo González, María Asunción			
Lecturers	Longo González, María Asunción			
E-mail	mlongo@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The use of microorganisms for the transformation of raw materials has been carried out by humans since antiquity, although it is more recent (2nd half of 20th century) the use of biocatalysts (microorganisms, enzymes or other biological systems) in industrial processes. The biotechnology industry can be considered an emerging sector of high economic profitability, which makes it necessary to have the scientific and technological knowledge that allow developing and adapting bioprocesses in the different sectors of application. The subject aims to provide students with a global view on the use of biocatalysts (microorganisms, cells or biomolecules) for the development of biotechnological industrial processes as an alternative to traditional processes. The main unit operations involved in this type of process will be studied, as well as the specific aspects that differentiate them from conventional industrial chemical processes. Given that it is a field in continuous expansion, reference will be made to the most recent advances and trends.			
English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.				

Training and Learning Results	
Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry.
C16	CE16 Basic knowledge and application of environmental technologies and sustainability.
C19	E19 Knowledge of mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, reactor design, and recovery and processing of raw materials and energy resources.
D1	CT1 Analysis and synthesis.
D2	CT2 Problems resolution.
D3	CT3 Oral and written proficiency.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D16	CT16 Critical thinking.
D17	CT17 Working as a team.

Expected results from this subject			
Expected results from this subject	Training and Learning Results		
Identification of the basic concepts of biotechnological processes, their products and their sources.	B3 B4	C19	D1 D2 D3 D9 D10
Knowledge and understanding of the biotechnological processes carried out by microorganisms of industrial interest, the stages of transformation and separation of products and the most common equipment used.	B3 B4	C16 C19	D1 D2 D3 D9 D10 D16 D17

Being able to propose biotechnological processes in different areas, through knowledge of methodology, requirements and regulations, considering aspects related to the environment, energy and resources.

B3 C16 D1
B4 C19 D2
D3
D9
D10
D16
D17

Contents

Topic

Fundamentals of biotechnological processes: microorganisms, enzymes and other metabolites of industrial interest.	- Introduction to biotechnological processes. Microbiological and biochemical fundamentals, and raw materials used.
Technology of biotechnological processes and products. Design of a biotechnological process. Practical cases.	- Preparation of raw materials. - Reaction stage. Kinetics and operation of bioreactors. - Recovery and purification operations. - Study of commercial biotechnological processes and new trends.
Process intensification, energy integration, environmental and biosafety considerations.	- Energy integration methodologies - Introduction to the assessment of environmental impact of processes. - Biosafety. Best available techniques in the biotechnology industry.

Planning

	Class hours	Hours outside the classroom	Total hours
Case studies	9.5	24.5	34
Laboratory practical	18	18	36
Presentation	2	12	14
Lecturing	15	15	30
Mentored work	3	17	20
Seminars	3	11	14
Essay questions exam	1	0	1
Problem and/or exercise solving	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
Case studies	Processes of interest will be selected, which are representative of the current trends in the biotechnology sector, and a critical analysis will be carried out, in groups or individually. Short presentations will be made in the classroom, encouraging debate, as much as possible.
Laboratory practical	Laboratory experiments and field practices in companies related to the processes treated throughout the course will be carried out. The students will have the support material necessary for a proper understanding of the experiments to be carried out. A brief final report will be prepared in which the main results and conclusions should be collected.
Presentation	The students will make brief presentations of the cases studied in the classroom, as well as the supervised work. A question time will be included, in which the questions posed must be answered.
Lecturing	The lecturer will present the general aspects of the program in a structured way, with special emphasis on the fundamentals and most important or difficult to understand aspects. The lecturer will provide, through the Tem@ platform, the necessary material for a correct follow-up of the subject. The student will be able to work previously the material handed out by the lecturer and consult the recommended bibliography to complete the information.
Mentored work	The students will develop a small project on a subject assigned by the lecturer. The work will be carried out in groups, that will deliver a written essay and make a presentation.
Seminars	Proposal and resolution of practical cases related to the subject matter. Complementary activity to the case study.

Personalized assistance

Methodologies	Description
Lecturing	Academic activity carried out by the lecturer during tutoring hours where students, individually or in small groups, can ask questions about the subject, and receive guidance and additional support. This activity can also be carried out in a remote way (through email or virtual campus).

Laboratory practical	Academic activity carried out by the lecturer during tutoring hours where students, individually or in small groups, can ask questions about the subject, and receive guidance and additional support. This activity can also be carried out in a remote way (through email or virtual campus).
Seminars	Academic activity carried out by the lecturer during tutoring hours where students, individually or in small groups, can ask questions about the subject, and receive guidance and additional support. This activity can also be carried out in a remote way (through email or virtual campus).
Mentored work	Academic activity carried out by the lecturer during tutoring hours where students, individually or in small groups, can ask questions about the subject, and receive guidance and additional support. This activity can also be carried out in a remote way (through email or virtual campus).
Case studies	Academic activity carried out by the lecturer during tutoring hours where students, individually or in small groups, can ask questions about the subject, and receive guidance and additional support. This activity can also be carried out in a remote way (through email or virtual campus).
Presentation	Academic activity carried out by the lecturer during tutoring hours where students, individually or in small groups, can ask questions about the subject, and receive guidance and additional support. This activity can also be carried out in a remote way (through email or virtual campus).

Assessment						
	Description	Qualification	Training and Learning Results			
Case studies	The work done during the seminars, case studies and practical classes will be evaluated based on: - assistance - attitude and participation of the students during the sessions - quality of submitted reports	20	B3 B4	C16 C19	D1 D2 D3 D9 D10 D16 D17	
Presentation	The students will make a presentation of the supervised work, which will be assessed based on its clarity, rigor and demonstration of the knowledge acquired on the subject.	10			D1 D3 D16 D17	
Mentored work	The report presented on the assigned work subject will be evaluated. This report must include some minimum aspects, based on a guide that will be provided to the students.	10	B3 B4	C16 C19	D1 D2 D3 D9 D10 D16 D17	
Essay questions exam	Written tests will be carried out, which will include essay questions, for the evaluation of the acquired competences in relation to the contents of the course.	30	B3 B4	C16 C19	D1 D2 D3 D9	
Problem and/or exercise solving	Written tests will be carried out, which will include short questions or exercises and problems, for the evaluation of the acquired competences in relation to the contents of the course.	30	B3 B4	C16 C19	D1 D2 D3 D9	

Other comments on the Evaluation

1. Considerations on continuous evaluation.

- The participation of the student in any of the acts of evaluation of the course will imply the condition of presented and, therefore, the assignment of a qualification.
- Attendance at a minimum of 80% of practical classes (laboratory, industry visits, seminars) is mandatory, which cannot be recovered.
- To pass the course, students must obtain at least a score of 5 points out of 10 in the partial exam and in the final exam, and a minimum of 4 points out of 10 in each of the other evaluation sections (practical classes, project). In any case, the overall qualification required to pass the course, resulting from the weighted sum of all the evaluation sections, will be 5 points out of 10.
- Students may waive the continuous assessment system through the procedure and within the period established by the School. If such resignation is requested and authorized, 100% of the grade will be assigned by taking a final exam, in which questions can be asked about all the topics taught in the course, including those corresponding to

practical classes.

2. Considerations about the exams (partial and final).

- **Partial exam.** During the course there will be a partial and eliminatory test, which will include problems and/or exercises, as well as essay questions, and which will have a weight in the overall grade of 30 %. To pass this test, a score of at least 5 points out of 10 must be obtained.
- **Final exam 1st opportunity.** It will include the contents not evaluated in the partial test, and will have a relative weight of 30 % in the overall grade of the course. In case of not having passed the partial test, the students will be given the opportunity to repeat the evaluation of the corresponding contents, on the same date assigned for the final exam.
- **Final exam 2nd opportunity.** The exam may put forward questions about all the subjects taught in the course, including those corresponding to practical classes. Students who have obtained the minimum qualification established in this guide for the various evaluation sections (practical classes, project, partial exam), may only be assessed for the rest of the content.

3. Considerations on the qualification records

- **1st opportunity qualification record.** The global mark will be the weighted sum of those obtained in all the assessments carried out (practical classes, project, partial exam and final exam), provided that the minimum required grades have been passed (4 points out of 10 in practical classes and project, 5 points out of 10 in partial and final exams). In case of failing or not showing up for the partial and/or final exam, the record will reflect the Fail rating, with a numerical value resulting from the weighted sum of the practical classes and project grades, applying the global grade contribution percentages specified in this guide; the contents approved in these two sections will be considered as passed with a view to the 2nd opportunity qualification record.
- **2nd opportunity qualification record.** The global mark will be the weighted sum of those obtained in all the assessments carried out, provided that the minimum required marks have been passed. In case of failing or not taking the final exam, the record will reflect the Fail grade, with a numerical value resulting from the weighted sum of the practical classes and project grades, applying the global grade contribution percentages specified in this guide.

4. Ethical considerations

The student is expected to exhibit an adequate ethical behavior. In case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices, and others), it will be considered that the student does not meet the necessary requirements to pass the subject. In this case, the overall grade in the current academic year will be Fail (0.0).

The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized. The introduction of a non-authorized electronic device in the exam room will be considered a reason for not passing the subject in this academic year and the overall rating will be Fail (0.0)

Updated exam calendar: <https://eei.uvigo.es/gl/alumnado/planificacion-academica/calendario-de-exames/>

Lecturer acting as course coordinator: María Asunción Longo González

Sources of information

Basic Bibliography

Henry C. Vogel; Celeste L. Todaro, **Fermentation and biochemical engineering handbook: principles, process design and equipment**, 3^a, Elsevier, 2014

Michael R. Ladisch, **Bioseparations engineering : principles, practice, and economics**, 1^a, Wiley, 2001

Wim Soetaert, Erick J. Vandamme, **Industrial biotechnology : sustainable growth and economic success**, 1^a, Wiley-VCH, 2010

Robin Smith, **Chemical process design and integration**, 2^a, John Wiley & Sons, 2016

José A. Teixeira; Antonio A. Vicente, **Engineering aspects of food biotechnology**, 1^a, CRC Press, 2014

José López Carrascosa y Aurelia Modrego, **La biotecnología y su aplicación industrial en España**, 1^a, Universidad Carlos III, 1994

OECD, **The application of Biotechnology to industrial Sustainability**, 1^a, OECD Publishing, 2001

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Modelling of biotechnological processes/V12G350V01924

Subjects that are recommended to be taken simultaneously

Product optimisation/V12G350V01701

Subjects that it is recommended to have taken before

Chemical engineering 1/V12G350V01405

Chemical engineering 2/V12G350V01503

Reactors and biotechnology/V12G350V01601

IDENTIFYING DATA				
Industrial organic chemistry				
Subject	Industrial organic chemistry			
Code	V12G350V01923			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Longo González, María Asunción			
Lecturers	Longo González, María Asunción Moure Varela, Andrés			
E-mail	mlongo@uvigo.es			
Web				
General description	In this course, the fundamental aspects related to the structure of organic compounds and their reactions are presented. Particular attention will be paid to polymerization methods and techniques, and to the intermediate chemicals most frequently used on an industrial scale, as well as other sectors of interest in the organic chemical industry.			
	English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results

Code				
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.			
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry.			
C4	CE4 Ability to understand and apply the basic knowledge of general chemistry, organic chemistry and inorganic chemistry, and their applications in engineering.			
D2	CT2 Problems resolution.			
D9	CT9 Apply knowledge.			
D10	CT10 Self learning and work.			
D16	CT16 Critical thinking.			
D17	CT17 Working as a team.			

Expected results from this subject

Expected results from this subject	Training and Learning Results		
(*)	B3	C4	D10 D16 D17
New	B3 B4	C4	D2 D9 D10 D16 D17
New	B3 B4	C4	D2 D9 D10 D16 D17
New	B3 B4	C4	D10 D16 D17

Contents

Topic			
1. The organic chemical industry.	1.1. Introduction and general characteristics. 1.2. Raw materials 1.3. Petrochemistry 1.4. Intermediate products and final products.		

2. Fundamental concepts of organic chemistry.	2.1. Bonds, hybridisation and geometry. 2.2. Hydrocarbons. Aromaticity. Resonant structures. 2.3. Functional groups. 2.4. Intermolecular interactions 2.5. Conformations and isomery.
3. Reactivity of organic compounds.	3.1. Kinetics and mechanisms of reaction. 3.2. Homogeneous and heterogeneous catalysis. 3.3. Reactivity of organic compounds. 3.3.1. Reactivity of substrates 3.3.2. Electronic structure of reagents. 3.3.3. Reaction intermediates 3.4. Types of organic reactions.
4. Ethylene. Propylene. Intermediate and end-products. Polymerisation.	4.1. Addition reactions. 4.2. Industrial products from ethylene. 4.3. Industrial products from propylene. 4.4. Polymeric materials. Classifications. 4.4.1. Polymerisation reactions. Additions and condensations. 4.4.2. Polyethylene and polypropylene.
5. Fraction C4. Dienes and polyenes. Intermediate and end-products. Fibres and elastomers.	5.1. Butenes. 5.2. Dienes, types and characteristics. 5.3. Synthesis of Diels Alder. 5.4. Elastomers. 5.4.1. Isoprene rubbers. 5.4.2. Isobutylene rubbers. 5.4.3. 1,3-butadiene rubbers. 5.5. Fibres 5.5.1. Acrylic, polyamides and polyesters.
6. Fraction BTX. Intermediate and end-products. Resins.	6.1. Reactivity of the arenos. Benceno. 6.2. Effect of substituentes. Activators and deactivators. 6.3. Industrial derivatives of toluene. 6.3.1. Production of phenol and its derivatives. Phenolic and epoxi resins 6.3.2. Polyesters. Styrene polymers.
7. Other organic compounds of industrial interest.	7.1. Nitrogen compounds. 7.1.1. Dyazonium salts . Dyes and pigments. 7.2. Halogenated compounds. Solvents and insecticides. 7.3. Oxygene compound. Organic acids, alcohols and ketones of industrial interest. 7.4. Tensioactive agents. Types and characteristics.

Planning

	Class hours	Hours outside the classroom	Total hours
Problem solving	9	27.5	36.5
Laboratory practical	18	18	36
Mentored work	1.5	14	15.5
Lecturing	16	40	56
Problem and/or exercise solving	2	0	2
Presentation	2	0	2
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
Problem solving	Throughout the course, exercises will be solved, either in the classroom or autonomously by the students, and handed out for evaluation if needed.
Laboratory practical	Laboratory practices will be carried out, and they will include questions or exercises, which must be submitted for evaluation. This activity is mandatory to pass the course.
Mentored work	Topics related to the contents of the course will be proposed to the students, so that they prepare an individual or group work on any of them.
Lecturing	It will consist of the exposition of the contents of the course, based on the proposed bibliography and the documentation provided on the FAITIC platform

Personalized assistance

Methodologies	Description
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Lecturing	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.
Problem solving	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.
Laboratory practical	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.
Mentored work	Personalized attention to students will be provided for all activities in the course, in the hours scheduled for tutorials.

Assessment					
	Description	Qualification	Training and Learning Results		
Laboratory practical	Attitude, participation and quality of the work carried out in the laboratory will be considered. In addition the student will respond to questions raised in each of the practices, and deliver the required lab reports.	20	B3 B4	C4	D9 D16 D17
Problem and/or exercise solving	Partial tests will be carried out, which will include short answer questions and problems, for the evaluation of the skills acquired in relation to the contents of the course.	30	B3	C4	D9 D16
Presentation	The quality of the contents of the delivered work will be evaluated, together with the presentation and the answers to the questions.	20	B3 B4	C4	D10 D16 D17
Objective questions exam	There will be a final exam, which will include short questions and problems, to evaluate the acquisition of the competences of the course.	30	B3 B4	C4	D2 D9 D16

Other comments on the Evaluation

1. Considerations on continuous evaluation.

- The participation of the student in any of the acts of evaluation of the course will imply the condition of presented and, therefore, the assignment of a qualification.
- Attendance at a minimum of 80% of laboratory practices is mandatory, which cannot be rescheduled.
- To pass the course, students must obtain at least a score of 5 points out of 10 in all the evaluation sections (laboratory practices, project, partial exam, final exam). So, the overall qualification required to pass the course, resulting from the weighted sum of all the evaluation sections, will be 5 points out of 10.
- Students may waive the continuous assessment system through the procedure and within the period established by the School. If such resignation is requested and authorized, 100% of the grade will be assigned by taking a final exam, in which questions can be asked about all the topics taught in the course, including those corresponding to practical classes.

2. Considerations about the exams (partial and final).

- **Partial exam.** During the course there will be a partial and eliminatory test, which will include short questions and problems or exercises, and which will have a weight in the overall grade of 30 %. To pass this test, a score of at least 5 points out of 10 must be obtained.
- **Final exam 1st opportunity.** It will include the contents not evaluated in the partial test, and will have a relative weight of 30 % in the overall grade of the course. In case of not having passed the partial test, the students will be given the opportunity to repeat the evaluation of the corresponding contents, on the same date assigned for the final exam.
- **Final exam 2nd opportunity.** The exam may put forward questions about all the subjects taught in the course, including those corresponding to practical classes. Students who have obtained the minimum qualification established in this guide for the various evaluation sections (laboratory practices, project, partial exam), may only be assessed for the rest of the content.

3. Considerations on the qualification records

- **1st opportunity qualification record.** The global mark will be the weighted sum of those obtained in all the assessments carried out (laboratory practices, memory and presentation of project, written exams), provided that the minimum required grades have been passed. In case of failing or not showing up for the partial and/or final exam, the record will reflect the Fail rating, with a numerical value resulting from the weighted sum of the laboratory practices and the project, applying the global grade contribution percentages specified in this guide; the contents approved in these two sections will be considered as passed with a view to the 2nd opportunity qualification record.
- **2nd opportunity qualification record.** The global mark will be the weighted sum of those obtained in all the assessments carried out, provided that the minimum required marks have been passed. In case of failing or not taking the final exam, the record will reflect the Fail grade, with a numerical value resulting from the weighted sum of the laboratory practices and the project, applying the global grade contribution percentages specified in this guide.

4. Ethical considerations

The student is expected to exhibit an adequate ethical behavior. In case of detecting unethical behavior (copying, plagiarism, use of unauthorized electronic devices, and others), it will be considered that the student does not meet the necessary requirements to pass the subject. In this case, the overall grade in the current academic year will be Fail (0.0).

The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized. The introduction of a non-authorized electronic device in the exam room will be considered a reason for not passing the subject in this academic year and the overall rating will be Fail (0.0)

Updated exam calendar: <https://eei.uvigo.es/gl/alumnado/planificacion-academica/calendario-de-exames/>

Lecturer acting as course coordinator: María Asunción Longo González

Sources of information

Basic Bibliography

Primo Yúfera, E., **Química orgánica básica y aplicada. Tomo I y II.**, Reverté,
 Harold, A. Wittcoff, **Productos químicos orgánicos industriales. Vol 1. Materias primas y fabricación.**, Limusa,
 Philip S. Baley, **Química orgánica. Conceptos y aplicaciones**, Pearson,
 M^a José Climent Olmedo, et al., **Química orgánica. Principales aplicaciones industriales.**, Univ. Politécnica de Valencia,
 Harold A. Wittcoff, **Productos químicos orgánicos industriales. Vol 2. Tecnología, formulaciones y usos.**, Limusa,

Complementary Bibliography

Green, Mark M., **Organic chemistry principles and industrial practice.**, Wiley -VCH,
 McMurry, **Química orgánica.**, Cengage,
 Harold A. Wittcoff, **Industrial Organic Chemicals**, Wiley,
 Issa Katime Amashta, et al., **Introducción a la ciencia de los materiales poliméricos. Síntesis y caracterización.**, Univ. País Vasco.,

Recommendations

Subjects that are recommended to be taken simultaneously

Bioelectrochemistry/V12G350V01921
 Biotechnological processes and products/V12G350V01922

Subjects that it is recommended to have taken before

Chemistry: Chemistry/V12G350V01205
 Experimentation in industrial chemistry 1/V12G350V01505
 Experimentation in industrial chemistry 2/V12G350V01602
 Chemical engineering 2/V12G350V01503
 Industrial chemistry/V12G350V01504

Other comments

To enroll in this course it is necessary to have passed or be enrolled in all the subjects of the courses lower than the course in which this subject is scheduled.

In case of discrepancies, the Spanish version of this guide will prevail.

IDENTIFYING DATA				
Modelling of biotechnological processes				
Subject	Modelling of biotechnological processes			
Code	V12G350V01924			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	#EnglishFriendly Spanish Galician English			
Department				
Coordinator	Deive Herva, Francisco Javier			
Lecturers	Álvarez Álvarez, María Salomé Deive Herva, Francisco Javier			
E-mail	deive@uvigo.es			
Web	http://https://moovi.uvigo.gal/			
General description	Since ancient times, man has used biotechnological processes to obtain products of interest. Currently, the biotechnology sector is one of the areas that is experiencing the greatest growth, which entails the need to select, within a space of possibilities, those alternatives that, based on a predetermined criterion, allow meeting the desired objectives. The search for a formal approach to the design problem promotes the need to find mathematical models that fit the empirical data and that allow greater ease in the optimization and simulation of these processes. All this will result in greater efficiency and ease of control of the diversity of biotechnology-based processes. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Training and Learning Results				
Code				
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.			
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry.			
B6	CG6 Capacity for handling specifications, regulations and mandatory standards.			
B10	CG10 Ability to work in a multidisciplinary and multilingual environment.			
C19	E19 Knowledge of mass and energy balances, biotechnology, mass transfer, separation operations, chemical reaction engineering, reactor design, and recovery and processing of raw materials and energy resources.			
C21	CE21 Ability to design and management procedures applied experimentation, especially for the determination of thermodynamic and transport properties, and modeling of phenomena and systems in the field of chemical engineering, systems with fluid flow, heat transfer, mass transfer operations, kinetics of chemical reactions and reactors.			
C22	CE22 Ability to design, manage and operate simulation procedures, control and instrumentation of chemical processes.			
D2	CT2 Problems resolution.			
D6	CT6 Application of computer science in the field of study.			
D8	CT8 Decision making.			
D9	CT9 Apply knowledge.			
D10	CT10 Self learning and work.			
D14	CT14 Creativity.			
D15	CT15 Objectification, identification and organization.			
D17	CT17 Working as a team.			

Expected results from this subject				
Expected results from this subject	Training and Learning Results			
Knowledge of complex dynamic phenomena by simulation or by reconstruction in simple laboratory models	B3	C19	D2	
	B6	C21	D6	
	B10		D8	
			D9	
			D10	
			D14	
			D15	

Understand the integration of equipment for the correct design of a biotechnological process	B3	C19 C22	D8 D9 D15
Know how to apply control techniques to biotechnological processes	B4 B6 B10	C21 C22	D2 D6 D8 D9 D10 D14 D15 D17

Contents

Topic	
Subject 1. Introduction to the modelling of biotechnological processes.	Models and types of models in biotechnology. Hierarchical analysis in modelling.
Subject 2. Sequential modelling of bioprocesses.	Integral analysis of biotechnological processes. Use of simulation tools. SuperProDesigner.
Subject 3. Mathematical modelling.	Obtaining empirical data. Characterisation and control of biotechnological processes. Microbial kinetics
Subject 4. Numerical methods in bioprocesses.	Linear and non linear equations. Ordinary differential equations.
Subject 5. Introduction to the design of experiments in bioprocesses	Factorial designs. Utilisation of specific software for the design of experiments
Subject 6. Design of basic units in a biotechnological process.	Design of equipment like tanks and pipes. Scaling-up

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Lecturing	15	30	45
Mentored work	10	40	50
Laboratory practical	18	18	36
Presentation	3	6	9
Essay questions exam	3	6	9

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

Methodologies

	Description
Introductory activities	In this activity the different parts and topics developed during the course will be presented to the students, as well as the aims, competences and evaluation criteria. Likewise, the project case will be given to different groups and the way to tackle it will be explained
Lecturing	Lecturing will be structured by following the contents distribution in a sequential manner, and highlighting the foundations and more difficult parts to be understood by the students. The lecturer will facilitate, through moovi platform, the material required for a correct follow-up of the matter. The student will have to work on the material prior to the lecture and consult the recommended bibliography to complete the information.
Mentored work	Along the course, the students will develop a work consisting in modelling and simulating a biotechnological plant, based on scientific literature and laboratory data. A report must be carried out where all the details, simulation, modelling, data discussion, control strategy, plans, etc. are included.
Laboratory practical	The students will perform laboratory experiments, and all the required material will be available for them in the laboratory to ease their ability to successfully carry out biotechnological tasks like media preparation, enzyme determination, plate culturing or bioreactor set up. They will also perform visits to important biotechnological companies from our surroundings like Lonza Biologics. The student will prepare a final report in which the main results and conclusions must be collected, in accordance with a guide that will be facilitated them through the platform tem@.
Presentation	The students will make a public defence on the simulation projects, and will be evaluated by a jury composed by lecturers from the department of chemical engineering and/or professionals from the private sector in the field of the chemical engineering

Personalized assistance

Methodologies	Description
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Lecturing	During the tutorships, individually or in groups, the student may ask the lecturer about any doubt posed on the matter. Likewise, the students also will be able to do queries to the professor through the moovi platform or by email. The lecturer will inform on the available schedule in the presentation of the matter and in moovi platform
Mentored work	During the tutorships, individually or in groups, the student may ask the lecturer about any doubt posed on the matter. Likewise, the students also will be able to do queries to the professor through the moovi platform or by email. The lecturer will inform on the available schedule in the presentation of the matter and in moovi platform
Laboratory practical	During the tutorships, individually or in groups, the student may ask the lecturer about any doubt posed on the matter. Likewise, the students also will be able to do queries to the professor through the moovi platform or by email. The lecturer will inform on the available schedule in the presentation of the matter and in moovi platform
Presentation	During the tutorships, individually or in groups, the student may ask the lecturer about any doubt posed on the matter. Likewise, the students also will be able to do queries to the professor through the moovi platform or by email. The lecturer will inform on the available schedule in the presentation of the matter and in moovi platform

Assessment

Assessment	Description	Qualification	Training and Learning Results			
Mentored work	During some sessions, the students will develop a work on a biotechnological process that will be exposed in front of a jury, that will evaluate it in accordance with some quality criteria	25	B4 B6 B10	C19 C21 C22	D2 D6 D8 D9 D10 D14 D15 D17	
Laboratory practical	The students will develop laboratory practices on biotechnological processes, going from data obtaining to process modelling and simulation. After the practical session, a report must be delivered where the main results are critically discussed	15	B3 B6	C19	D2 D6 D8 D9 D14 D17	
Presentation	The project will be exposed to a jury composed by lecturers and/or professionals from private companies of chemical engineering.	20	B4 B6 B10		D2 D6 D8 D14 D15 D17	
Essay questions exam	A global evaluation of the competencies described in the matter will be carried out at the end of the teaching period. To pass the exam, the students will have to get a minimum of 50% of the maximum mark.	40	B3 B4 B10	C19 C21 C22	D2 D6 D8 D9 D10 D14 D15 D17	

Other comments on the Evaluation

The participation of the student in any of the evaluation activities involve that she/he will be subjected to assessment and involves a "presented" mark. A total of 5 points out of 10 should be reached to pass the subject. Analogously, the essay questions exam must be qualified with 5 out of 10 to pass the subject. It is expected that the student shows an ethical behaviour in what it concerns to copy, plagiarism, utilisation of unauthorised electronic devices or commitment with the team work. Otherwise, it will be considered that the student does not meet the indispensable requirements to pass the matter. In this case, the global qualification in the present academic course will be "fail" (0). Finally, the utilisation of any electronic device during the evaluation will not be allowed except for a explicit permission. In case of detecting his presence in the classroom during the examination the student will be assessed with a global mark "fail".

Sources of information

Basic Bibliography

Bjorn K. Lydersen, **Bioprocess Engineering: Systems, Equipment and Facilities**, John Wiley, 1994
Jonh Smith, **Biotechnology**, 5ª, Cambridge University Press, 2009

G.D. Najafpour, **Biochemical Engineering and Biotechnology**, Elsevier, 2007

Pauline M. Doran, **Bioprocess Engineering Principles**, Elsevier Science and Technology, 1995

Complementary Bibliography

H.G. Vogel and C.L. Todaro, **Fermentation and Biochemical Engineering Handbook, Principles, Process Design and Equipment**, 2^o, Noyes publications, 1997

M. Rodríguez Fernández, **Modelado e identificación de bioprocesos**, 2006

Recommendations

Subjects that are recommended to be taken simultaneously

Biotechnological processes and products/V12G350V01922

Subjects that it is recommended to have taken before

Chemical engineering 1/V12G350V01405

Chemical engineering 2/V12G350V01503

Industrial chemistry/V12G350V01504

Reactors and biotechnology/V12G350V01601

Other comments

To enrol in this matter it is necessary to have passed or be enrolled in all the matters of previous courses of the degree

In case of discrepancies, the Spanish version of this guide will prevail.

IDENTIFYING DATA				
Environmental management techniques				
Subject	Environmental management techniques			
Code	V12G350V01925			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language				
Department				
Coordinator	Domínguez Santiago, María de los Ángeles			
Lecturers	Domínguez Santiago, María de los Ángeles			
E-mail	admiguez@uvigo.es			
Web				
General description	In this *asignatura tackle the main appearances of the management of waste, *tecnicas of treatment of the same and minimisation of waste			

Training and Learning Results

Code	
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering specializing in Industrial Chemistry.
B7	CG7 Ability to analyze and assess the social and environmental impact of the technical solutions.
C16	CE16 Basic knowledge and application of environmental technologies and sustainability.
D2	CT2 Problems resolution.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
Know the methods of minimisation and revalorization of waste.	C16		D10
Know the methods of treatment of toxic and dangerous waste.	C16		D9
Master the tools of environmental management in the Chemical Industry.	B4		D2 D9 D10
Know the environmental legislation that affects the industrial processes.	B7	C16	D2 D9 D10
Know apply the acquired knowledge to practical cases.	B4 B7	C16	D2 D9 D10 D17

Contents

Topic	
Subject 1.- Waste	General concepts. Classification of the waste. Toxic and dangerous waste. Applicable legislation
Subject 2.- Treatment of waste	Definition. Legislation. Treatments of the waste. Centres of treatment
Subject 3.- Sustainability. Minimisation of industrial waste. Best available techniques.	Sustainability. Stages of a program of minimisation. Technicians of minimisation of the pollution. Application of the best available techniques to a process.
Subject 4.- Life Cycle Assessement	Definition. Stages of the LCA. Applications

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	60	86
Mentored work	10	3.5	13.5
Presentation	2	4	6
Problem solving	10	10.5	20.5

Essay questions exam	2	10	12
Problem and/or exercise solving	2	10	12

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

Methodologies

	Description
Lecturing	Theoretical class in which the professor will expose the most notable appearances of each subject, taking like base the available documentation in the platform Tema.
Mentored work	The students will make a work related with the best available technicians applicable to a process. The main points that the students have to develop and the bibliography recommended will be indicated.
Presentation	The students will make an oral presentation of the work made and will answer to the questions made by the professor and by the other students.
Problem solving	Some exercises will be solved in class and others will be solved by the students and delivered on time

Personalized assistance

Methodologies	Description
Problem solving	The students can solve any doubts during the assigned hours.
Mentored work	The work will be monitored along the course.

Assessment

	Description	Qualification Training and Learning Results			
Mentored work	The students will realise and will deliver the work assigned.	10	B7	D9 D10 D17	
Presentation	The students will realise an oral presentation of an assigned work	10	C16	D9	
Problem solving	The students will have to realise and deliver the exercises proposed.	15	B4 B7	C16 D2 D9	
Essay questions exam	The students will realise an exam of all the subject	25	B7	C16 D9	
Problem and/or exercise solving	It will make a proof of practical application on management of waste	40	B4	C16 D2 D9	

Other comments on the Evaluation

It is precise to reach a minimum grade of 3,5/10 in each one of the sections evaluable.

Second opportunity: the qualifications of the sections mentored work, presentation and problem solving will be maintained

The students that renounce to the continuous evaluation have to make an examination of all the matter in the date fixed by the EEI for these exams

Commitment ethic: it expects that the student present a behaviour ethic suitable. In the case to detect a behaviour no ethic (copy, plagiarism, use of devices unauthorised, and others) it will be considered that the student fails to meet the necessary requirements to pass the matter. In this case the qualification in the present course will be failing grade (0.0).

Sources of information

Basic Bibliography

J.J. Rodríguez y A. Irabien, **Los residuos peligrosos, caracterización, tratamiento y gestión**, Síntesis, 1999

W. Klopffer, B. Grahl, **Lyfe Cycle Assessment: a guide to best practice**, Wiley-VCH, 2014

Complementary Bibliography

D.T. Allen, D.R. Shonnard, **Green Engineering. Environmentally conscious design of chemical processes**, Prentice-Hall, 2002

Recommendations

Other comments

IDENTIFYING DATA**Internships: Internships in companies**

Subject	Internships: Internships in companies			
Code	V12G350V01981			
Study programme	Grado en Ingeniería en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Izquierdo Belmonte, Pablo Eguizábal Gándara, Luis Eduardo			
Lecturers	Eguizábal Gándara, Luis Eduardo			
E-mail	pabloizquierdob@uvigo.es eguizaba@uvigo.es			

----- UNPUBLISHED TEACHING GUIDE -----

IDENTIFYING DATA				
Traballo de Fin de Grao				
Subject	Traballo de Fin de Grao			
Code	V12G350V01991			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	12	Mandatory	4	2c
Teaching language	Castelán Galego Inglés			
Department	Tecnoloxía electrónica			
Coordinator	Izquierdo Belmonte, Pablo			
Lecturers	Izquierdo Belmonte, Pablo			
E-mail	pabloizquierdob@uvigo.es			
Web				
General description	O Traballo de Fin de Grao (TFG) é un traballo orixinal e persoal que cada estudante realizará de forma autónoma baixo tutorización docente, e debe permitirlle mostrar de forma integrada a adquisición dos contidos formativos e as competencias asociadas ao título. A súa definición e contidos están explicados de forma máis extensa no Regulamento do Traballo Fin de Grao aprobado pola Xunta de Escola da Escola de Enxeñaría Industrial o 21 de xullo de 2015.			

Resultados de Formación e Aprendizaxe	
Code	
B1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, que teñan por obxecto, segundo a especialidade, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
B2	CG2 Capacidade para a dirección das actividades obxecto dos proxectos de enxeñaría descritos na competencia CG1.
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.
B10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.
B12	CG12 Exercicio orixinal a realizar individualmente e presentar e defender ante un tribunal universitario, consistente nun proxecto no ámbito das tecnoloxías específicas da Enxeñaría Industrial no campo de Química Industrial de natureza profesional no que se sintetizen e integren as competencias adquiridas nos ensinos.
D4	CT4 Comunicación oral e escrita de coñecementos en lingua estranxeira.
D12	CT12 Habilidades de investigación.
D13	CT13 Capacidade para comunicarse por oral e por escrito en lingua galega.

Resultados previstos na materia		
Expected results from this subject	Training and Learning Results	
Procura, ordenación e estruturación de información sobre calquera tema.	B1 B2 B3 B4 B10 B12	D12
Elaboración dunha memoria na que se recollan, entre outros, os seguintes aspectos: antecedentes, problemática ou estado da arte, obxectivos, fases do proxecto, desenvolvemento do proxecto, conclusións e liñas futuras.	B1 B2 B3 B4 B10 B12	D4 D12 D13
Deseño de equipos, prototipos, programas de simulación, etc, segundo especificacións.	B1 B2 B3 B4 B10 B12	D12

Contidos	
Topic	
Proxectos clásicos de enxeñaría	Poden versar, por exemplo, sobre o deseño e mesmo a fabricación dun prototipo, a enxeñaría dunha instalación de produción, ou a implantación dun sistema en calquera campo industrial. Polo xeral, neles desenvólvese sempre a parte documental da memoria (cos seus apartados de cálculos, especificacións, estudos de viabilidade, seguridade, etc. que se precisen en cada caso), planos, prego de condicións e orzamento e, nalgúns casos, tamén se contempla os estudos propios da fase de execución material do proxecto.
Estudos técnicos, organizativos e económicos	Consistentes na realización de estudos relativos a equipos, sistemas, servizos, etc., relacionados cos campos propios da titulación, que traten un ou máis aspectos relativos ao deseño, planificación, produción, xestión, explotación e calquera outro propio do campo da enxeñaría, relacionando cando cumpra alternativas técnicas con avaliacións económicas e discusión e valoración dos resultados.
Traballos teórico-experimentais	De natureza teórica, computacional ou experimental, que constitúan unha contribución á técnica nos diversos campos da enxeñaría incluíndo, cando cumpra, avaliación económica e discusión e valoración dos resultados.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Actividades introductorias	5	25	30
Traballo tutelado	15	0	15
Presentación	1	14	15

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

Metodoloxía docente	
	Description
Actividades introductorias	O alumno realizará, de forma autónoma, unha procura bibliográfica, lectura, procesamento e elaboración de documentación.
Traballo tutelado	O estudante, de maneira individual, elabora unha memoria segundo as indicacións do Regulamento do Traballo Fin de Grao da EEI.
Presentación	O alumnado debe preparar e defender o traballo realizado diante dun tribunal de avaliación segundo as indicacións do Regulamento do Traballo Fin de Grao da EEI.

Atención personalizada	
Methodologies	Description
Traballo tutelado	Cada alumno terá un titor e/ou un co-titor encargados de guiarlle, e que lle marcarán as directrices oportunas para realizar o TFG.

Avaliación				
	Description	Qualification	Training and Learning Results	
Traballo tutelado	A cualificación da memoria do Traballo Fin de Grao levará a cabo segundo o especificado no Regulamento do Traballo Fin de Grao da Escola de Enxeñaría Industrial.	70	B1 B2 B3 B4 B10 B12	D4 D12
Presentación	A defensa do Traballo Fin de Grao levará a cabo segundo o especificado no Regulamento do Traballo Fin de Grao da Escola de Enxeñaría Industrial.	30	B1 B2 B3 B4 B10 B12	D4 D12

Other comments on the Evaluation

Bibliografía. Fontes de información

Basic Bibliography**Complementary Bibliography**

Recomendacións

Other comments

Compromiso ético: Espérase que o alumno presente un comportamento ético adecuado. No caso de detectar un comportamento non ético (copia, plaxio ou outros) considerarase que a cualificación global no presente curso académico será de suspenso (0.0).

Requisitos: Para matricularse no Traballo Fin de Grao é necesario superar ou ben estar matriculado de todas as materias dos cursos inferiores ao curso no que está situado o TFG.

Información importante: No momento da defensa do TFG, o alumno deberá ter todas as materias restantes do título superadas, tal como establece o artigo 7.7 do Regulamento para a realización do Traballo Fin de Grao da Universidade de Vigo.

A orixinalidade da memoria será obxecto de estudo mediante unha aplicación informática de detección de plaxios.

IDENTIFYING DATA				
Prácticas en empresa/asignatura optativa				
Subject	Prácticas en empresa/asignatura optativa			
Code	V12G350V01999			
Study programme	Grao en Enxeñaría en Química Industrial			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán Galego			
Department	Tecnoloxía electrónica			
Coordinator	Izquierdo Belmonte, Pablo Eguizábal Gándara, Luis Eduardo			
Lecturers	Eguizábal Gándara, Luis Eduardo			
E-mail	pabloizquierdob@uvigo.es eguzaba@uvigo.es			
Web	http://eei.uvigo.es			
General description	Mediante a realización de prácticas en empresa o alumno poderá aplicar os coñecementos e as competencias adquiridas durante os seus estudos, o que permitirá complementar e reforzar a súa formación e facilitar a súa incorporación ao mercado laboral.			

Resultados de Formación e Aprendizaxe	
Code	
B1	CG1 Capacidade para a redacción, sinatura e desenvolvemento de proxectos no ámbito da enxeñaría industrial, que teñan por obxecto, segundo a especialidade, a construción, reforma, reparación, conservación, demolición, fabricación, instalación, montaxe ou explotación de: estruturas, equipos mecánicos, instalacións enerxéticas, instalacións eléctricas e electrónicas, instalacións e plantas industriais, e procesos de fabricación e automatización.
B2	CG2 Capacidade para a dirección das actividades obxecto dos proxectos de enxeñaría descritos na competencia CG1.
B3	CG3 Coñecemento en materias básicas e tecnolóxicas que os capacite para a aprendizaxe de novos métodos e teorías, e os dote de versatilidade para adaptarse a novas situacións.
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e capacidade para comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial na mención de Química Industrial.

Resultados previstos na materia	
Expected results from this subject	Training and Learning Results
Capacidade para adaptarse ás situacións reais da profesión.	B1 B2 B3 B4
Integración en grupos de traballo multidisciplinares.	B2 B3 B4
Responsabilidade e traballo autónomo.	B1 B2 B3 B4

Contidos	
Topic	
Integración nun grupo de traballo nunha empresa.	O alumno integrarase no contexto organizativo dunha empresa, téndose que coordinar cos diferentes membros do grupo de traballo ao que sexa asignado.
Realización de actividades ligadas ao desempeño da profesión.	Ao alumno encomendaráselle unha serie de tarefas relacionadas cos coñecementos e coas competencias dos seus estudos.

Planificación			
	Class hours	Hours outside the classroom	Total hours
Prácticum, Practicas externas e clínicas	0	150	150

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

Metodoloxía docente	
	Description
Prácticum, Practicas externas e clínicas	O alumno integrarase nun grupo de traballo nunha empresa onde terá a oportunidade de poñer en práctica os coñecementos e as competencias adquiridas durante os seus estudos, e así complementar e reforzar a súa formación.

Atención personalizada	
Methodologies	Description
Prácticum, Practicas externas e clínicas	O alumno dispoñerá dun titor na empresa onde fará a súas prácticas e dun titor académico.

Avaliación			
	Description	Qualification	Training and Learning Results
Prácticum, Practicas externas e clínicas	Os estudantes en prácticas deberán manter un contacto continuado non só co seu titor na empresa, senon tamén co seu titor académico. Ao concluír as prácticas, os alumnos deberán entregar ao seu titor académico unha memoria final e o informe en documento oficial D6- Informe do estudante. Na avaliación terase en conta a valoración do desempeño do alumno realizada polo titor na empresa, o seguimento realizado polo titor académico e os informes entregados polo alumno.	100	B1 B2 B3 B4

Other comments on the Evaluation
Adicionalmente ao xa exposto nesta guía docente é preciso facer as seguintes aclaracións: 1º. Esta materia rexerase polo establecido no Regulamento de Prácticas en Empresa da EEI (http://eei.uvigo.es/opencms/export/sites/eei/eei_gl/documentos/escola/Normativa/practicas_empresa.pdf). 2º. A Escola fará pública a oferta de prácticas en empresa curriculares entre as que o alumnado, que cumpra os requisitos descritos no artigo 6 do citado regulamento, deberá facer a súa escolla dentro do prazo fixado ao efecto. O procedemento de realización de prácticas en empresa curriculares está establecido no artigo 7 do regulamento. 3º. A duración das prácticas pode chegar a ser ata de un máximo de 240 horas, para que o alumno saque o maior proveito da súa estadía na empresa. Será a empresa na súa oferta de prácticas a que estipulará a duración das mesmas.

Bibliografía. Fontes de información
Basic Bibliography
Complementary Bibliography

Recomendacións
