



(*)Escola de Enxeñaría Industrial

Information

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Grado en Ingeniería en Tecnologías Industriales

Subjects

Year 4th

Code	Name	Quadmester	Total Cr.
V12G360V01701	Electronic instrumentation	1st	6
V12G360V01702	Technical Office	1st	6
V12G360V01703	Environmental technology	1st	6
V12G360V01704	Thermal technology	1st	6
V12G360V01705	Electrical systems	1st	6
V12G360V01801	Control and industrial automation	2nd	6
V12G360V01802	Basics of business administration	2nd	6
V12G360V01902	Electrical components in vehicles	2nd	6
V12G360V01903	Technical english 1	2nd	6
V12G360V01904	Technical english 2	2nd	6
V12G360V01905	Methodology for the preparation, presentation and management of technical projects	2nd	6
V12G360V01906	Advanced programming for engineering	2nd	6
V12G360V01907	Safety and industrial hygiene	2nd	6
V12G360V01908	Laser technology	2nd	6
V12G360V01981	Internships: Internships in companies	2nd	6
V12G360V01991	Final Year Dissertation	2nd	12
V12G360V01999	Internships/elective	2nd	6

IDENTIFYING DATA				
Electronic instrumentation				
Subject	Electronic instrumentation			
Code	V12G360V01701			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Eguizábal Gándara, Luis Eduardo			
Lecturers	Eguizábal Gándara, Luis Eduardo Rodríguez Castro, Francisco			
E-mail	eguzaba@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	A Instrumentación Electrónica é a parte da electrónica que se ocupa da medición de calquera tipo de magnitude física, da conversión da mesma a magnitudes eléctricas e do seu tratamento para proporcionar a información adecuada a un sistema de control, a un operador humano ou ambos. A instrumentación ten dous grandes temas de traballo: - O estudo dos sensores e dos seus circuítos de acondicionamento. - O estudo dos equipos de Instrumentación, que se empregan na industria para a medida de calquera tipo de variable física.			

Training and Learning Results

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
C23	CE23 Applied knowledge of electronic instrumentation
D2	CT2 Problems resolution.
D9	CT9 Apply knowledge.
D17	CT17 Working as a team.

Expected results from this subject

Expected results from this subject	Training and Learning Results	
(*)	B3	C23
(*)		C23 D9
New		D2 D9
New	C23	D2
New		D17

Contents

Topic	
Topic 1: Introduction to the electronic instrumentation	The electronic instrumentation in the context of the control of processes. Systems of measure and his characterisation.
Topic 2: Systems of Acquisition of Data (DAS or DAQ). Auxiliary circuits	Bridges of measure. Fixers of tension. Sources of current. Converters V/I and I/V.
Topic 3: DAS. Amplification and signals filtering	Amplifiers of instrumentation, programmable amplifiers, amplifier of isolation. Types of filters. Techniques of implementation of active filters.
Topic 4: DAS. Circuits of conversion and multiplexed	Circuits of show and retention (S&H). Conversion A/D and D/A, types and technical characteristics. Analog switches. Multiplexer analog.
Topic 5: Implementation of systems of acquisition of data	Basic structures. Criteria of election in function of the parameters of the system.
Topic 6: Physical principles of sensors	Introduction. Piezoelectricity. Magnetostriction. Piezoresistivity. Pyroelectricity. Magnetoresistance. Thermoelectricity. Thermoresistivity. Photoresistivity. Inductive sensors. Capacitive sensors. Ultrasonic sensors.
Topic 7: general Characteristics of the sensors	Technical characteristics. Types of commercial exits. Connection of sensors to electronic systems of control.
Topic 8: Proximity sensors	Inductive, capacitive, ultrasonic, optoelectronic, magnetic and safety sensors.

Topic 9: Sensors of temperature and of discharge	Sensors of Temperature: Thermocouples, sensors of infrared and integrated sensors. Sensors of discharge: Sensors of differential pressure, vortex, acceleration of *Coriolis, of turbine, electromagnetic. Criteria of selection.
Topic 10: Pressure and level sensors	Pressure sensors (Primary measuring elements: Bourdon tube, diaphragm, bellows), potentiometric, piezoelectric, capacitive, inductive, strain gauge and magnetostrictive. Level sensors: Ultrasonic, resistive, float, static pressure, differential pressure, conductivity, capacitive, inductive, optical, rotary vane and radioactive. Selection criteria.
Topic 11: Displacement sensors	Inductive sensors: LVDT, RVDT, Synchrogenerator and Resolver. Optoelectronic sensors: Absolute and incremental encoders. Applications. Selection criteria.
Topic 12: Sensors of electrical and magnetic variables	Transformer of intensity. *Shunt. Sensors of effect *Hall. Measure of magnetic fields with *Magnetoresistencias. Criteria of selection.
Topic 13: Introduction to the control of processes based in the use of microcontrollers	Introduction to the control of processes Introduction to the microcontrollers Introduction to the actuators: hydraulic, tyres and electronic (Electronics of Power)
Topic 14: Teams of electronic instrumentation	Classification, technical characteristics and connection of teams of instrumentation. Criteria of selection. Buses of instrumentation.
Topic 15: Introduction to Power Electronics (PE)	Introduction. Structure of the systems of PE. Types of converters. Semiconductors of powers. Passive components in PE. Calculation of powers.
Practice 1. Introduction to the Virtual instrumentation. LabVIEW.	The execution data flow on LabVIEW. Frontal panel and diagrams of blocks. Description of the main types of data and structures of programming.
Practice 2: Introduction to the control of processes based in the System On Chip (SOC) ESP32.	Introduction to the control of processes based in uControladores. Study of the ESP32. Introduction to the surroundings of development of the platform M5Stack. Implementation of an application of control based in the M5Stack Stick C
Practice 3: System of acquisition of data for the measure of temperature.	It will be implementing a system of acquisition of complete data for the conditioning of a sensor of temperature PT1000.
Mentored work.	- Implementation of a circuit of the measure and the control of a physical variable and his back acquisition by means of distinct hardware of capture. - Incorporate the information captures in a system of management of the information, to make tasks of control of production and control of processes.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	28	30	58
Laboratory practical	12	6	18
Problem solving	8	13	21
Mentored work	6	30	36
Essay questions exam	3	10	13
Objective questions exam	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	They will develop in the schedules fixed by the direction of the centre. They consist in an exhibition, by part of the professor, of the contents of the matter. Also it will proceed to show examples and technical solutions that illustrate properly the problematic to treat. The student will be able to expose all the doubts and questions that consider timely, during the session. The teacher will look for the most active possible of the student.
Laboratory practical	It will show to the student some practical settings or simulations on the matter treated that they put of self-evident the technical characteristics of the settings made, as well as the form to make measures in the same by means of sensors and the instrumentation of the laboratory.
Problem solving	The complementary activity of the magistrate's sessions in which they formulate problems and/or exercises related to the subject. The student will have to develop suitable solutions to the problems and/or exercises proposed in the classroom and of other extracted of the bibliography. They will identify possible doubts that will resolve in the classroom or in personalized tutorials.
Mentored work	This time devotes to the realisation of works of laboratory in team, related with the conditioning of sensors, visualisation of the variable measured and storage of information.

Personalized assistance

Methodologies	Description
Laboratory practical	The teacher will personally attend to the doubts and queries of the students, about the study of theoretical concepts, laboratory practices or projects. Students will have the opportunity to attend personalized tutorials or in groups in the teacher's office at the time established for that purpose at the beginning of the course and which will be published on the subject page.
Mentored work	In the practical classes and in tutorials each of the doubts that arise in the completion of the work will be solved in a personalized way.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	The students will make the designs and planned settings in the billed of the practice and will deliver a memory with the results of the same.	10	D9 D17
Mentored work	Once made the supervised work, the students will owe to elaborate a descriptive memory. It will fix a day for the delivery of the memory and the presentation of the work made, to the professor. This note will form part of the continuous evaluation.	30	D9 D17
Essay questions exam	In the dates indicated by the calendar of examinations of the centre, will make the final proofs that will consist in problems of development.	30	D2
Objective questions exam	In the dates indicated by centre and by means of continuous evaluation, will make proofs of short questions of test.	30	B3 C23

Other comments on the Evaluation

Long answer tests and multiple choice tests will be carried out on the dates set by the center or by the teacher and will represent 60% of the final grade. The remaining 40% will correspond to the grade obtained throughout the course, through continuous evaluation, of the laboratory practices and the supervised work. In each of these evaluations a minimum grade of 30% will be required

Students who are recognized by the management of the center for their resignation from continuous assessment, must attend the final test. This will represent 60% of the grade, the remaining 40% will be obtained through a practical exam and the completion of a work. In this case, the practical exam and the work will be compulsory, and in these tests a minimum grade of 50% must be obtained.

In the second call, the same procedure will be followed.

The practice note will only be saved for one academic year.

Ethical commitment:

The student is expected to exhibit appropriate ethical behavior. In the 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 a failure (0.0).

The use of any electronic device will not be allowed during the evaluation tests unless expressly authorized. The fact of introducing an unauthorized electronic device in the exam room will be considered a reason for not passing this subject in this academic year and the overall grade will be failed (0.0).

THE ACQUISITION OF SKILLS AND ITS INFLUENCE ON THE EVALUATION

In this subject there is no competency assessment approach. Next, it is specified how the different teaching activities exercise the student in the different competencies and how their acquisition conditions the final grade obtained by the student.

CG3. Knowledge of basic and technological subjects, which enables them to learn new methods and theories and gives them the versatility to adapt to new situations.

The acquisition of this competence is guaranteed (in the scope of the subject) by its own contents. The self-assessment activities, the practicals and the different assessment tests deal with these content of a technological nature.

CT2. Problem resolution.

Students exercise in this competence through the proposed activities: problem sets and theoretical resolution of the assemblies proposed in the practice statements. The acquisition of competence in the field of the subject is justified by the fact that the assessment tests (thematic blocks and individual tests) consist almost entirely of problem solving.

This competence is achieved and evaluated in the proposed laboratory work. These are carried out in groups of two and at the end of them, each group must submit a written report of the activities carried out. The students who prepare the best works must make an oral presentation.

CT9. Apply knowledge.

The students exercise this competence, especially in the laboratory sessions, where they have to transfer to the simulations and to the assembly and real measurements what was studied in the theoretical sessions. The laboratory sessions are evaluated one by one, averaging the final grade as long as there is minimal attendance and use.

CT17 Teamwork.

The students exercise this competence in the laboratory sessions, since these sessions are carried out in teams of two. Collaboration between both students is necessary to successfully carry out the setups, measurements and data collection required in each experiment. The practice teacher verifies that the prior preparation and development of each of the sessions is the result of the collaboration of the two members of each group. In case of detecting anomalies in this sense, the qualifications of each member of the group are penalized and individualized.

Sources of information

Basic Bibliography

M. A. Pérez García, J. C. Álvarez Antón, J. C. Campo Rodríguez, F. J. Ferrero Martín y G. J. Grillo, **Instrumentación Electrónica**, Thomson, 2003

Franco, Sergio, **Diseño con amplificadores operacionales y circuitos integrados analógicos**, 3ª edición, Mc Graw-Hill, 2013

Del Río Fdez, J., **LabVIEW: Programación de sistema de instrumentación**, 1ª, Garceta, 2011

Pérez García, M., **Instrumentación Electrónica: 230 problemas resueltos.**, 1ª, Garceta, 2012

Complementary Bibliography

Enrique Mandado Pérez, Jorge Marcos Acevedo, Celso Fernández Silva y José I. Armesto Quiroga, **Autómatas programables y sistemas de automatización**, Marcombo, 2009

Faludi, Robert, **Building wireless sensor networks**, O' Reilly, 2011

Recommendations

Subjects that continue the syllabus

Control and industrial automation/V12G360V01801

Subjects that it is recommended to have taken before

Automation and control fundamentals/V12G360V01304

Basics of circuit analysis and electrical machines/V12G360V01302

Electronic technology/V12G360V01401

IDENTIFYING DATA				
Technical Office				
Subject	Technical Office			
Code	V12G360V01702			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish			
Department				
Coordinator	Alonso Rodríguez, José Antonio Cerqueiro Pequeño, Jorge			
Lecturers	Alonso Rodríguez, José Antonio Cerqueiro Pequeño, Jorge Covela Ameijeiras, Pablo Díaz Vilariño, Lucía			
E-mail	jcerquei@uvigo.es jaalonso@uvigo.es			
Web	http://webs.uvigo.es/oficinatecnica			
General description	This matter has like vision and like mission approach to the student to his back professional life through the knowledge, handle and application of methodologies, technical and tools oriented to the preparation, organisation and management of projects and other technical documents. It employed a practical approach of the subjects, looking for the integration of the knowledges purchased to the long of the career of face to his application to the development of the methodology, organisation and management of technical works, as true essence of the profession of engineer in the frame of his *atribucións and fields of activity. *Promoverase The development of the competitions of the matter by means of a theoretical approximation-practical, in which the exposed contents of theoretical way develop by means of the realisation of practical activities and works of application oriented to the industrial reality of the profession, assimilating the agile and precise employment of the distinct rule of application and of the best practices established. Given the variety that produces in the spectrum of professional exits, the academic program possesses a part of general contents to all the Industrial Engineers, in which it treats to transmit those appearances that reinforce the **pluridisciplinaridad and possesses another more specific part of the speciality, that does reference to methodological or normative appearances of this field. Likewise the strategy employed allows to expose to the student the professional alternatives that open him , from the free professional exercise (**peritaciones, *ditames, reports, projects, etc.), even his immersion in a small / average technical office more oriented the installations or even to the design of product.			

Training and Learning Results

Code	
B1	CG1 Ability to design, develop, implement, manage and improve products and processes in various industrial fields, through analytical, computational and experimental appropriate techniques.
B2	CG2 Ability to lead activities related to CG1 competence.
C18	CE18 Knowledge and skills to organize and manage projects. Know the organizational structure and functions of a project office.
D1	CT1 Analysis and synthesis.
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.
D16	CT16 Critical thinking.
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	
(*)		C18	D3 D5 D6 D9 D10 D17
(*)	B1 B2	C18	D1 D2 D5 D6 D7 D8 D10 D11 D15 D17 D20
(*)	B1 B2		D1 D3 D5 D6 D7 D9 D14 D15 D17
(*)	B2	C18	D1 D2 D3 D5 D6 D7 D8 D9 D11 D13 D14 D16 D17 D20
(*)			D3 D5 D6 D7 D13 D14 D17 D20

Contents	
Topic	
Presentation	Presentation Guides Educational Methodology of work. Groups of work *Fontes of information and communication: SUBJECT and other Knowledges and *aplicacions computer for the matter.
Technical office.	Introduction *Funcions. Organisation of the work. Technicians of Work in instruments. Integration with the systems of the company. *Kanban. Taking of decision by means of weighting of criteria. Communication.

Cycle of life of a project	Phase I. Start. Diagram of functional blocks and the *sua description. Global definition of the project. Legal feasibility. (*PGOM And environmental legislation) Phase II. Scope and aims. Phase III. Realisation of the project. Phase IV. Closing: permissions and certifications of the project
Industrial project.	Project: Concept, classification, structure, cycle of life. Documents of the project: Index, memory, planes. *pliegos Of conditions, budget, studies with own entity. Normalisation. It JOINS 157002.
Administrative management of works of engineering.	Processing: visa, notary, Public Organisms, etc. Management of licences, permissions and permissions in front of public and personal institutions. Bidding and contracting of projects.
Industrial project. Planes	Structure and index of the planes. Typology of representation: dimension and relation. Block of titles. Sizes and scales. Folded. Criteria for wool preparation of planes. Example; planes of distribution. Example: planes of installations. Diagrams of principle. Legend of symbology.
Fire protection	Basic concepts: classification, sectorization, classification of materials, NRI, evacuation, means of protection. RD 2267/2004 and CTE DB-SI.
Budget and planning.	Measurement economic assessment Theory of management and planning of projects. Agile methodologies, *Gantt, *CPM and *PERT
Basic elements of construction	Basic elements of construction. Cover. *Cimentación. Structural elements. Coatings. Carpentries. Finishings. Examples.
Methodology of design of installations	Types of installations. Determination of loads. Elements of feeding of the loads. Elements of performance control and security. Planes of installations and diagrams of principle.
I fold of Conditions.	Types. Administrative Technical *Facultativas Bidding and contracting of projects.
Legislation.	Legislative legislation Interpretation of the technical legislation generic technical Legislation applied the speciality: *RD 485/1997, *RD 486/1997, *PGOM, *RD 314/2006
Technical documents.	Report: Concept, classification, structure. Certifications . Homologation *Peritaciones, Valuations.
Studies with own entity.	Relative studies to the fulfillment of the legislation of labour risks: Basic Study of Security and Health. Relative studies to the fulfillment of the legislation of management of waste.
Professional activity.	Processing: visa, notary, Public Organisms, etc. Management of licences, permissions and permissions in front of public and personal institutions. Bidding and contracting of projects.
Patent rights.	Technological innovation and patent rights. Patents and models of utility.
(*)Comunicación	(*)Técnicas de presentación de trabajos orales y escritas

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	2	0	2
Lecturing	12	24	36
Mentored work	2	6	8
Project based learning	12	24	36
Problem solving	6	6	12
Practices through ICT	4	4	8
Design Thinking	2	8	10
Learning-Service	4	20	24
Scientific events	2	8	10
Presentation	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
Introductory activities	The subject will be presented, information on the contents of the same, methodologies to be applied, work to be done in the subject and form of evaluation. Likewise, dynamics will be carried out in the class to promote the interrelationship in the students.
Lecturing	Presentation by the teacher of the contents on the subject of study, theoretical bases and/or guidelines of a work, exercise or project to be developed by the student.
Mentored work	Prepare a technical report on any issue related to Industrial Engineering, with the quality and rigour expected of an Industrial Engineer.
Project based learning	Work will be done using the methodology of "Project-Based Learning- *ABP". Realization of an engineering project, working with an open team. Emphasis will be placed on applying industrial engineering tools and knowledge to create engineering solutions for the real needs of an industry. Submit Problem solving The student must develop the right or correct solutions the exercises posed that are based on the theory taught. They will be performed by applying formulas, algorithms or transformation procedures gives available information. Interpretation of the results will be necessary.
Problem solving	The student must develop the right or correct solutions the exercises raised that are based on the theory taught. They will be performed by applying formulas, algorithms or transformation procedures gives available information. Interpretation of the results will be necessary.
Practices through ICT	Knowledge application activities in a given context, and the acquisition of basic and procedural skills in relation to the subject, through ICT.
Design Thinking	An interdisciplinary group will be created with students from other subjects and grades. This group, applying the methodology "Design Thinking" will generate a work of implementation and / or improvement on a specific activity.
Learning-Service	Learning-Service (ApS) is an innovative methodology that tries to change reality and improve students' learning. It is inserted into the set of activities carried out by a student, and connects with innovative proposals such as competency-based education, project-based or problem-based learning, cooperative and collaborative learning.
Scientific events	To present the ideas developed by students in collaborative groups, a presentation is organized in congress format. This will be public and broadcast in different media.

Personalized assistance

Methodologies	Description
Project based learning	The student will complete an engineering project, working with an open team. Emphasis will be placed on the application of industrial engineering tools and knowledge to create engineering solutions for the real needs of an industry. Group tutorials will be held with the teacher to answer questions and to follow up on the work.
Mentored work	The student, individually, prepares a technical report, or similar document, on a topic proposed by the teacher. Tutorials will be individual. The student's doubts will be clarified and he/she will be helped in the organization and planning of the work. Tutorials can be done in small groups, bringing together students with the same problem, for a better efficiency.
Design Thinking	The students, in a multidisciplinary group with students from other degrees, will work on a solution to the problem posed. This will be done by applying the Design Thinking methodology and simultaneously applying the Learning as a Service methodology. Meetings are planned to explain the methodologies to be applied and group tutorials to monitor the work.
Scientific events	We will work with the different groups of students to help them prepare the public exhibition of their work. You will conduct several rehearsals with them and guide them to achieve an effective presentation
Learning-Service	This methodology is integrated with the Design Thinking, so the monitoring will be as indicated in that section.

Assessment

	Description	Qualification	Training and Learning Results	
Lecturing	Theory: The proofs will be of type test or of brief answer. Minimum note of this part: 5 on a qualification of 10 (in this part)	15	B1 B2	D2 D9

Mentored work	Elaborate a relative technical report the any question related with the Industrial Engineering, with the quality and the rigour that expects of an Industrial Engineer. It published a *rúbrica of evaluation in the platform *MOOVI of the subject.	15	B1	D1 D3 D5 D6 D7 D8 D9 D10 D15 D16
Project based learning	Realisation of a project of engineering, working with an open team. It will do upsetting in the application of tools and knowledges of industrial engineering to create solutions of engineering for the real needs of an industry. It published a *rúbrica of evaluation in the platform *MOOVI of the subject. The evaluation includes an individual proof on the work and *ponderara the note of the project as it will expose in the *rubrica of evaluation.	40	B1 B2 C18	D2 D3 D5 D7 D8 D9 D10 D14 D17 D20
Learning-Service	Realisation of a work in group *interdisciplinar, with students of other subjects and degrees. This group, applying the methodology "*design *thinking" will do a work of implantation and/or improvement on a concrete activity. It will publish a *rúbrica of evaluation in the platform *MOOVI of the subject. In the *rúbrica collects the analysis of ethical and social appearance.	15		
Scientific events	Presentation of the ideas developed by the students in the groups *colaborativos. This activity will be public and with diffusion in different media. It published a *rúbrica of evaluation in the platform *MOOVI of the subject.	5		D1 D3 D5 D6 D17 D20
Presentation	Presentation of group of class of the work made with the methodology of Learning-Service. It valued the preparation of the presentation in *PowerPoint or equivalent and the oral exhibition of the same, to 50% each item.	10		

Other comments on the Evaluation

SYSTEM OF EVALUATION:-----

The system of evaluation by defect is the system of continuous evaluation. The student that wish to received to the system of evaluation no continuous will owe to requested officially, in the term and way established by the administration of the And.And.I. Yes the student does not request devandita renounces or does not obtain the favourable verdict of the renounces the continuous evaluation, understands which this in the system of continuous evaluation.

The evaluation will realize in base them rúbricas that publish in the platform MOOVI of the subject.

CRITERIA FOR CONTINUOUS

EVALUATION: =====

To surpass the subject by means of the evaluation continued owe to fulfil, simultaneously, two conditions:

it) obtain a minimum punctuation of 5 on 10 in each of the apartados aviables or parts indicated in the rúbricas that publish .

b) Obtain a half note, pondered second the percentages indicated previously, minimum of 5 on 10.

Yes one ítem this suspenso, or the student wishes to improve the note of one ítem, will have a maximum of two (2) opportunities to do it. In this case it will apply , envelope to qualification of the apartado, a coefficient corrector that indicated in the presentation of the course. The term for devanditas corrections will be established pole teaching staff.

The percentage that supposes each of the ítems in the qualification of the subject is the indicated in the following table.Ítems

15%technical Report	PercentageExamination of theoretical contents	15%Project of activity
40%Work colaborativo. Learning-service		
15%Communication of results (PowerPoint or analog)	5%Communication of results (presentation in examination)	5%Examination of project
5%Communication of results (presentation in congress)	5%Examination of project	Factor multiplicador of the projectMaquetación of the final document
demeritoEditorial of the final document	demeritoFulfilment of norms of delivery and terms	demerito

The subject evaluates in base it one rubrica of evaluation. In the platform MOOVI, published rubrícaa of evaluation of each of the apartados of the subject.

The terms and formats of delivery of the activities published in the platform MOOVI of the subject.The activities indicated

like demerito, qualify splitting of a note of 10 and yes no fulfil the specifications indicated in rubricas, suppose a factor of multiplication between 0 and 1, that multiplied the global note obtained.

The subject evaluates in base it one rubrica of evaluation. In the platform MOOVI, published rubricaa of evaluation of each of the apartados of the subject. The terms and formats of delivery of the activities published in the platform MOOVI of the subject.

CRITERIA OF OVERRUN OF The MATERIAMEDIANTE GLOBAL EVALUATION:

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The students that opt for requesting the global evaluation realized an examination with the following structure:

1. Part of theory. Length 45 minutes. Can be used notes and notes of kind, only in bear paper.

Rest of 20 minutes.

2. Practical exercise of realization of one project technical. 150 minutes. Can be used computer Rest of 20 minutes

3. Manufacture of a presentation in PowerPoint or similar, envelope the project developed in the apartado previous. 30 minutes. Use of the computer.

Rest of 10 minutes.

4. Oral exhibition of the previous presentation. Limited it a minimum of 5 minutes and a maximum of 10 minutes. Use of computer and proxector.

5. Relative oral questions to the presentation and the exercise of project during a maximum of 15 minutes.

The computer can be what bring the student, or facilitated the use of one of the computers of the classrooms computings of the School.

The presentation and oral defence will be recorded in video, in accordance with the rule gave University. The percentage that supposes each of the ítems in the qualification of the subject is the indicated in the following table.

Ítems	Percentage
Examination of theoretical contents	30%
Project of activity	40%
Communication of results (PowerPoint or analog)	10%
Communication of results (presentation in examination)	10%
Communication of results. Oral answers to questions	10%

ETHICAL COMMITMENT:

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it Expects that the present student an ethical behaviour accommodated. When studying the subject, the student, purchases a commitment of work in team, collaboration and as regards the mates and to the teaching staff. In the case to detect a no ethical behaviour (copy, plaxio, utilization of unlicensed electronic devices and others) will consider that the student does not gather the necessary requirements to surpass the subject. In this case the global qualification in the present academic course will be of suspenso (0.0).

Sources of information

Basic Bibliography

Profesor de la asignatura, **Apuntes de Oficina Técnica**, Plataforma de teledocencia,, 2017

Complementary Bibliography

Cos Castillo, Manuel de, **Teoría general del proyecto**, Síntesis, 1995

Cos Castillo, Manuel de, **Teoría general del proyecto II**, Síntesis, 1995

Paso a paso con Gantt Project, conectareducacion.educ.ar, 2016

GARCIA-HERAS PINO, ÁLVARO y JULIÁN RODRÍGUEZ FERNÁNDEZ, **Documentación técnica en instalaciones eléctricas**, 2ª, Ediciones Paraninfo S.A., 2017

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GONZÁLEZ, FRANCISCO JAVIER, **Manual para una eficiente dirección de proyectos y obras**, FC Editorial, 2014

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Recommendations

Subjects that continue the syllabus

Final Year Dissertation/V12G360V01991

Subjects that it is recommended to have taken before

Graphic expression: Fundamentals of engineering graphics/V12G360V01101

IDENTIFYING DATA				
Environmental technology				
Subject	Environmental technology			
Code	V12G360V01703			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	#EnglishFriendly Spanish Galician			
Department				
Coordinator	Álvarez da Costa, Estrella			
Lecturers	Álvarez da Costa, Estrella Cameselle Fernández, Claudio			
E-mail	ealvarez@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	Subject that belongs to the Block of Common Subjects of the Industrial Technologies. It is part of the curricula of all Degrees of Industrial Engineering.			

This subject provides an approach to Environmental Engineering, which is necessary to develop any engineering project. In it we work areas of Chemistry and Process Engineering, in order to study the pollutants behaviour and their effect on the environment and organisms, to design physical-chemical processes to mitigate pollution, as well as to evaluate the environmental impact of the industrial wastes.

The subject's objective is to know, understand, and know how to apply the techniques used, on an industrial scale, in fields such as solid wastes treatment and management, wastewater treatment, soil remediation, treatment of polluting gas industrial emissions, and pollution prevention.

Subject of the "English Friendly" program.

International students may request the teacher Claudio Cameselle Fernandez:

- Materials and bibliographic references for the follow-up of the subject in English.
- Attend tutorials in English.
- Tests and evaluations in English.

Training and Learning Results	
Code	
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.
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.
D12	CT12 Research skills.
D17	CT17 Working as a team.
D19	CT19

Expected results from this subject		
Expected results from this subject	Training and Learning Results	
Basic knowledge and application of environmental technologies and sustainability	C16	D2 D3 D10 D19
Problem solving	C16	D2 D3 D10 D19

Oral and writing communication	C16	D2 D3 D10
Knowledge application to practical and real cases	C16	D2 D3 D10 D19
Analysis and synthesis	C16	D1 D2 D3 D9 D10 D12 D17 D19
Ability to analyze and determine the social and environmental impact of the technical solutions to environmental problems	B7	D1 D3 D9 D10 D17 D19

Contents

Topic	
Lesson 1: Introduction to the environmental technology.	1. Material cycle economy. 2. Introduction to the best available techniques (BAT).
Lesson 2: Management of waste and effluents.	1. Urban waste management. 2. Industrial waste management. Industrial waste treatment facilities. 3. Regulations.
Lesson 3: Treatment of urban and industrial wastes.	1. Valorization. 2. Physico-chemical treatment. 3. Biological treatment. 4. Thermal treatment. 5. Landfilling. 6. Soil remediation technologies
Lesson 4: Treatment of industrial and municipal wastewaters.	1. Characteristics of municipal and industrial wastewaters. 2. Wastewater treatment plant. 3. Sludge treatment. 4. Water treatment and reuse 5. Regulations
Lesson 5: Atmospheric pollution.	1. Types and origin of atmospheric pollutants. 2. Dispersion of pollutants in the atmosphere. 3. Effects of the atmospheric pollution. 4. Treatment of polluting gas emissions. 5. Regulations
Lesson 6: Sustainability and environmental impact assessment	1. Sustainable development 2. Life cycle analysis and economy. 3. Ecological footprint and carbon footprint. 4. Introduction to the environmental impact assessment
Practice 1: Codification of wastes	
Practice 2: Preparation of immobilized activated charcoal for use as an adsorbent.	
Practice 3: Contaminants removal by adsorption with immobilized activated charcoal.	
Practice 4: Coagulation-flocculation: Establishment of optimal working conditions.	
Practice 5: Simulation of certain stages of a EDAR	
Practice 6: Life Cycle Analysis of a product.	

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	26	52	78
Problem solving	11	22	33
Laboratory practical	12	12	24

Objective questions exam	1	0	1
Problem and/or exercise solving	2	0	2
Report of practices, practicum and external practices	0	6	6
Case studies	0	6	6

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

Methodologies	
	Description
Lecturing	Teaching in the classroom of the key concepts and procedures for learning the syllabus contents.
Problem solving	Solving exercises with the teacher's help and independently.
Laboratory practical	Application of the knowledge acquired to the resolution of problems of environmental technology, using equipment and facilities available in the laboratory/computer room.

Personalized assistance	
Methodologies	Description
Laboratory practical	In tutorials, students can consult with their teacher any questions about laboratory practices or the report of practices to be done. The tutoring schedule of the teaching staff will be public and accessible to the students.
Lecturing	In tutorials, students can consult with their teacher any questions arising in the lectures and related to the contents seen in them. The schedule of tutorials of teachers will be public and accessible to students.
Problem solving	In tutorials, students can consult their teacher any questions about the resolution of problems raised in the classroom. The tutoring schedule of the teaching staff will be public and accessible to the students.

Assessment				
	Description	Qualification	Training and Learning Results	
Objective questions exam	Written test in which students must answer theoretical questions related to the syllabus of the subject. CG7, CE16 and CT19 competences will be assessed in this test, based on student responses to the questions. CT1, CT3 and CT10 competences are also evaluated, since the test is written and requires students' analysis and synthesis skills.	30	B7 C16	D1 D3 D10 D19
Problem and/or exercise solving	Written proof in which students must solve several problems related to the syllabus of the subject. CT2, CT9 and CT19 competences will be assessed in this proof, based on the resolution of various exercises of environmental technology, which require the use of applied knowledge related to the contents of the subject. CT1, CT3 and CT10 competences are also evaluated, since the proof is written and requires students' analysis and synthesis skills.	30		D1 D2 D3 D9 D10 D19

Report of practices, practicum and external practices	Detailed report for each practices that includes an explanation of the experimental work, as well as the results obtained, their analysis and the conclusions drawn from them. The laboratory practices are in teams of 2 students, but the report will be given individually. A report submitted by a student who did not previously do the practical in the laboratory will not be evaluated under any circumstances. In the computer classroom practices, each student will work individually and, consequently, the reports will also be individual. Similarly, only the report handed by a student who has previously attended the corresponding practical session will be assessed. The competences: CG7, CE16, CT1, CT3, CT9 and CT10, are assessed based on the quality of the written report elaborated by each student on his/her own. The following points will be evaluated in the report: text style and correctness, structure and presentation, analysis and discussion of the results, and conclusions. Competences CT12 and CT17 will be assessed based on the laboratory work. Lab practices will be carried out in pairs, and it is expected the student develop research skills in the field of environmental technology.	10	B7 C16	D1 D3 D9 D10 D12 D17
Case studies	All exercises, seminars, practical cases and theoretical / practical tests that are made and delivered to the teacher throughout the course, related to the concepts and contents of the syllabus. Throughout a four-month time several tests are performed. Competences CG7 and CE16 will be assessed considering the students' answers to the theoretical questions. Competences CT2, CT10 and CT12 will be assessed considering the students answers to the exercises. Competence CT3 will be assessed base on the two parts of the exam: theory and exercises; considering the precision and clarity of the answers.	30	B7 C16	D2 D3 D10 D12

Other comments on the Evaluation

Evaluation

A student who choose continuous assessment, to pass the course, must achieve a **MINIMUM SCORE** of **4.0 points** (out of 10) **in all the evaluation tests detailed in this guide**, ie, "Objective questions exam", "Problem and/or exercise solving", "Case studies" and "Report of practices". If a student reaches the minimum grade, to pass the subject must obtain a **FINAL GRADE** of **≥ 5.0**, that is, when the sum of grades of the "practice report", "Case study", "Exam of objective questions" and the "Problem solving and/or exercises" is **≥ 5.0**.

Students who "**officially renounces continuous assessment**", will make a "FINAL EXAM" (Objective questions exam + Problem and/or exercise solving) that will be worth 90% of the final grade, and a "EXAM OF PRACTICES" that will be worth 10% of the final grade. In any case, to pass the course, the student must achieve 50% of the maximum score in each of the constituent parts of the subject, ie, theory, problems and practices.

In addition, if a student misses more than 1 "laboratory practice", without a justified cause, in order to pass the course, he/she will have to do an exam of the practices that he/she did not do.

Second call:

In the second call the same criteria apply.

In relation to the July exam, the grade of "Case study" and "Practical report" will be kept, as soon as the student achieved the required minimum grade in the 1st call.

For the "Examination of objective questions" and the "Resolution of problems and/or exercises" if, at the 1st call, a student suspended one of the test and approves the other with a grade **≥ 6**, on the July exam, you only need to repeat the suspended part.

Ethical commitment:

The student is expected to present an adequate ethical behavior. If you detect unethical behavior (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 final grade, in the current academic year, will FAIL (0.0 points).

The use of electronic devices during the assessment tests will be allowed. The fact of introducing into the examination room an unauthorized electronic device, will be reason not pass the course in the current academic year, and the final grade will FAIL (0.0 points)

Sources of information**Basic Bibliography**

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Wark and Warner, **Contaminación del aire: origen y control**, Limusa, 1996

Jonker, G. y Harmsen, J., **Ingeniería para la sostenibilidad**, Reverté, 2014

Azapagic, A. and Perdan S., **Sustainable development in practice: Case studies for engineers and scientists**, Wiley, 2011

Reddy, K.R., Cameselle, C. and Adams, J.A., **Sustainable Engineering: Drivers, Metrics, Tools, and Applications**, Wiley, 2019

Recommendations**Subjects that it is recommended to have taken before**

Physics: Physics 1/V12G360V01102

Physics: Physics 2/V12G360V01202

Chemical technology/V12G360V01606

Chemistry: Chemistry/V12G380V01205

Other comments

Recommendations:

To enroll in this subject is necessary to have passed or be enrolled in all subjects of previous courses to the course that is located this subject.

IDENTIFYING DATA				
Tecnoloxía térmica				
Subject	Tecnoloxía térmica			
Code	V12G360V01704			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4	1c
Teaching language	Castelán Galego			
Department				
Coordinator	Chapela López, Sergio			
Lecturers	Chapela López, Sergio			
E-mail	schapela@uvigo.es			
Web				
General description	Nesta materia preténdese que o estudante adquira os coñecementos esenciais que lle permitan comprender o funcionamento das máquinas térmicas e os procesos que teñen lugar no seu interior, así como que coñeza os tipos de máquinas e instalacións máis importantes e os seus compoñentes. Os contidos enfócanse tanto a aspectos de eficiencia enerxética como a aspectos ambientais e sociais. Estes aplícanse a sistemas que empregan ciclos térmicos: ciclos de potencia (gas e vapor) e en ciclos de refrixeración e bomba de calor, así como o emprego de distintos combustibles renovables.			

Resultados de Formación e Aprendizaxe	
Code	
B4	CG4 Capacidade para resolver problemas con iniciativa, toma de decisións, creatividade, razoamento crítico e de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría 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.
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 relativa a instalacións industriais.
C7	CE7 Coñecementos de termodinámica aplicada e transmisión de calor. Principios básicos e a súa aplicación á resolución de problemas de enxeñaría.
D2	CT2 Resolución de problemas.
D7	CT7 Capacidade de organizar e planificar.
D9	CT9 Aplicar coñecementos.
D10	CT10 Aprendizaxe e traballo autónomos.
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		
Capacidade para coñecer, entender, utilizar e deseñar sistemas enerxéticos aplicando os principios e fundamentos da termodinámica e da *trasmisión de calor.	B4 B5 B6 B7 B11	C7	D2 D7 D9 D10 D17 D20
Comprender os aspectos básicos da combustión	B4 B5 B6 B7 B11	C7	D2 D7 D9 D10 D17 D20
Comprender os aspectos básicos de motores térmicos	B4 B5 B6 B7 B11	C7	D2 D7 D9 D10 D17 D20

Comprender os aspectos básicos do funcionamento dunha central térmica

B4
B5
B6
B7
B11

C7

D2
D7
D9
D10
D17
D20

Contidos

Topic

1- INTRODUCCIÓN	1. Problemática da Enerxía. A sociedade e a utilización da enerxía 2. Produción e consumo de enerxía
2- INTERCAMBIADORES DE CALOR	1- Introducción 2- Clasificación 3- Dimensionamiento 4. Método DTLM 5. Método NTU
3- AIRE HÚMIDO	1. Introducción 2. Índices de humidade 3. Entalpía do aire húmido 4. Punto de resío 5. Temperatura de saturación adiabática 6. Temperatura do bulbo húmido 7. Psicrométrico: Diagramas do aire húmido 8. Mestura de 2 ou mais aires húmidos 9. Mestura dunha masa de aire con auga, vapor e/ou calor 10. Procesos de acondicionamento de aire
4- COMBUSTIÓN	1. Introducción 2. Tipos de combustión 3. Aire mínimo ou teórico 4. Exceso de aire de combustión 5. Fumes da combustión 6. A combustión incompleta 7. Diagramas de combustión 8. Rendemento da combustión
5- MÁQUINAS TÉRMICAS	1. Máquinas térmicas. Xeneralidades 2. Ciclo Rankine 3. Ciclo Rankine con rexeneración 4. Turbinas de gas 5. Queimadores 6. Caldeiras: definición e tipoloxía 7. Eficiencia enerxética 8. Deseño de sistemas de Calor e ACS en edificación
6- TECNOLOXÍA DAS CENTRAIS TÉRMICAS	1. Tecnoloxía das centrais térmicas de vapor 2. Tecnoloxía das centrais de ciclo combinado 3. Tecnoloxía das centrais nucleares 4. Coxeneración
7- INTRODUCCIÓN ÓS MOTORES TÉRMICOS	1. Clasificación dos motores térmicos 2. Funcionamento dos motores de combustión interna alternativos (MCIA) 3. Partes dos MCIA 4. Nomenclatura e parámetros fundamentais 5. Ciclos teóricos 6. Ciclos reais
8- INSTALACIÓNS DE CLIMATIZACIÓN	1. Introducción 2. Ciclo de refrixeración 3. Bomba de calor 4. Compoñentes da bomba de calor 5. Características de funcionamento 6. Deseño de sistemas de climatización. 7. Eficiencia enerxética

Planificación

	Class hours	Hours outside the classroom	Total hours
Lección maxistral	31	30	61
Prácticas de laboratorio	10	10	20
Resolución de problemas	8	16	24
Traballo tutelado	0	30	30

Saídas de estudo	2	0	2
Prácticas con apoio das TIC	9	0	9
Resolución de problemas e/ou exercicios	2	0	2
Exame de preguntas obxectivas	1	0	1
Exame de preguntas obxectivas	1	0	1

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

Metodoloxía docente	
	Description
Lección maxistral	Explicación maxistral clásica en encerado apoiada con presentación en transparencias, vídeos e calquera material que o docente considere útil para facer comprensible o temario da materia
Prácticas de laboratorio	Realización de prácticas de laboratorio aplicadas. As actividades consistirán no desmonte de motores térmicos, medición de emisións...
Resolución de problemas	Resolución de exercicios e casos prácticos necesarios para a preparación das clases de teoría
Traballo tutelado	Traballos que realiza o alumno ao longo do curso académico. Dentro desta actividade inclúese a presentación de devanditos traballos ante o grupo e a súa posterior avaliación.
Saídas de estudo	Visitas a instalacións que permitan coñecer os equipos a nivel industrial que se explican nas clases
Prácticas con apoio das TIC	Resolución de exercicios mediante apoio de programas informáticos

Atención personalizada	
Methodologies	Description
Lección maxistral	Plantexamento das dúbidas en horario de tutorías. O alumno exporá, durante o horario dedicado ás tutorías, as dúbidas concernentes aos contidos que se desenvolven na materia, e/ou exercicios ou problemas que se expoñan relativos á aplicación dos contidos.
Resolución de problemas	Formulación de dúbidas en horario de prácticas. O alumno exporá, durante o horario dedicado ás prácticas, as dúbidas relativas aos conceptos e desenvolvemento das citadas prácticas.
Prácticas de laboratorio	Formulación de dúbidas en horario de tutorías. O alumno exporá, durante o horario dedicado ás tutorías, as dúbidas concernentes aos contidos que se desenvolven na materia, e/ou exercicios ou problemas que se expoñan relativos á aplicación dos contidos.
Traballo tutelado	O alumno exporá dúbidas en horario de tutorías ou nas clases dedicadas á elaboración do traballo referentes á elaboración e o desenvolvemento do mesmo.
Tests	Description
Resolución de problemas e/ou exercicios	
Exame de preguntas obxectivas	

Avaliación					
	Description	Qualification	Training and Learning Results		
Traballo tutelado	Entrega das memorias dos traballos realizados e presentación oral dos mesmos. Resolución de problemas expostos durante o curso.	20	B4 B5 B6 B7 B11	C7	D2 D7 D9 D10 D17 D20
Resolución de problemas e/ou exercicios	Exames parciais realizados durante o curso en horario de clase ou na data oficial de exame	40	B4 B5 B6 B7 B11	C7	D2 D7 D9 D10 D17 D20
Exame de preguntas obxectivas	Exames parciais realizados durante o curso en horario de clase ou na data oficial de exame	40	B4 B5 B6 B7 B11	C7	D2 D7 D9 D10 D17 D20

Other comments on the Evaluation

Avaliación continua □ Primeira oportunidade

Durante o cuadrimestre realizaranse dúas probas escritas parciais (P1 e P2) que cubrirán os contidos vistos ata a data da proba. A proba de P1 realizarase no horario lectivo e a de P2 na data e na aula do exame oficial. Os contidos avaliados en P1 non serán avaliados en P2.

Cada unha das probas P1 e P2 terá un valor do 40% da nota da materia (80% en total). Para aprobar a materia o alumnado deberá obter unha cualificación igual ou superior a 4 sobre 10 (1,6 puntos sobre 4) en cada unha das probas de P1 e P2.

A maiores, o alumnado deberá realizar un traballo (T) que suporá o 20% da nota da materia. O devandito traballo poderá ser sometido ao sistema antiplaxio e a porcentaxe máxima admisible será do 33%.

A nota final calcularase como: $P1+P2+T$. No caso de que a nota en calquera proba sexa inferior a 4 sobre 10 (1,6 puntos sobre 4) e a puntuación total da materia sexa superior a 4, a nota final será de 4.

Avaliación continua □ Segunda oportunidade

O exame de segunda oportunidade (E2) consistirá nunha proba escrita que se dividirá en dúas partes, unha na que se avaliarán os contidos teóricos da materia e outra na que o alumno abordará a resolución de problemas vistos na materia. Este exame representará o 80% da nota final da materia. Para aprobar a materia, o alumno deberá obter en E2 unha nota igual ou superior a 4 sobre 10 (3,2 puntos sobre 8).

Mantense a nota do traballo e non é recuperable.

A nota final calcularase como $E2+T$. No caso de que a nota en E2 sexa inferior a 4 sobre 10 (3,2 puntos sobre 8) e a puntuación total da materia sexa superior a 4, a nota final será de 4.

Avaliación global

O alumno que solicite oficialmente a renuncia á avaliación continua terá dereito a unha proba global (EG), escrita, cunha puntuación do 80%, na que se avaliarán os contidos teóricos e a resolución de problemas vistos ó longo do curso. Ademais, o 20% restante avaliarase mediante unha pregunta adicional na que o estudante realizará unha disertación escrita (DE) sobre un tema elixido dunha lista proposta. Para aprobar a materia o alumno deberá obter unha nota igual ou superior a 4 sobre 10 (3,2 sobre 8) en EG.

A nota final calcularase como a suma de EG e DE. No caso de que a nota do EG sexa inferior a 4 sobre 10 (3,2 puntos sobre 8) e a puntuación total da materia sexa superior a 4, a nota final será de 4.

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 autorizado, e outros) considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a calificación global no actual curso académico será de suspenso (0.0). 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 calificación global será de suspenso (0.0).

Bibliografía. Fontes de información

Basic Bibliography

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Çengel Yunus A., Boles Michael A., **Thermodynamics: an engineering approach**, 7th ed, McGraw-Hill, 2011

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Haywood, R.W, **Ciclos termodinámicos de potencia y refrigeración**, Limusa, 2000

Enrique Torrella Alcaraz., **Producción de frío**, Universidad Politécnica de Valencia, 2000

Juan Francisco Coronel Toro, **Colección de Problemas Resueltos de Tecnología Frigorífica**, Versión 3.0, Universidad de Sevilla, diciembre de 2006

Luis A. Molina Igartúa, Jesús M^a Alonso Girón, **Calderas de vapor en la industria: teoría, práctica, algoritmos y ejemplos de cálculo**, CADEM-EVE Ente Vasco de la Energía, Bilbao, 1996

Luis Alfonso Molina Igartua, Gonzalo Molina Igartua, **Manual de eficiencia energética térmica en la industria.**, CADEM (Grupo EVE), 1993. Bilbao

Heywood, J.B., **Internal combustion engines fundamentals**, McGraw-Hill,

F. Payri G., Desantes J. M., **Motores de Combustion Interna Alternativos**, Reverté, 2011

Recomendacións

Subjects that it is recommended to have taken before

Física: Física I/V12G340V01102

Física: Física II/V12G340V01202

Matemáticas: Cálculo I/V12G340V01104

Matemáticas: Cálculo II e ecuacións diferenciais/V12G340V01204

Termodinámica e transmisión de calor/V12G340V01302

Other comments

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 discrepancia, prevalecerá a versión en castelán desta guía.

IDENTIFYING DATA				
Electrical systems				
Subject	Electrical systems			
Code	V12G360V01705			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language				
Department				
Coordinator	Parajo Calvo, Bernardo José			
Lecturers	Parajo Calvo, Bernardo José			
E-mail	berpc@uvigo.gal			
Web	http://moovi.uvigo.gal/			
General description	(*)Analizar, diseñar e simula-lo funcionamento dos sistemas eléctricos. Coñecer e interpreta la normativa utilizada pra calcular instalaciones eléctricas industriaes.			

Training and Learning Results

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
C21	CE21 Knowledge of electric systems of power and their applications
D2	CT2 Problems resolution.
D6	CT6 Application of computer science in the field of study.
D10	CT10 Self learning and work.
D14	CT14 Creativity.
D16	CT16 Critical thinking.
D17	CT17 Working as a team.

Expected results from this subject

Expected results from this subject	Training and Learning Results		
New	B3	C21	D2 D6 D10 D14 D16 D17
(*)Documentación, elaboración, presentación y defensa del proyecto de una instalación		C21	D2 D6 D10 D17

Contents

Topic	
Systems of Electrical Energy	Introduction to the systems of electrical energy. The electrical sector Spanish. Operation of the electrical system Spanish: balance between production and consumption. Centres of Control of Electrical Network of Spain. Maps of network. Zones of distribution in Spain and small distributors. Quality of the Electrical Service. Indexes of quality of the Service.
Networks of Distribution in Low Tension	Elements of the aerial networks of *BT. Execution of the networks on façade and on supports. Subterranean networks of *BT. Put to earth and continuity of the neutral. Criteria of dimensioning of the wires of *BT. Tackled: general box of protection and line *repartidora. Forecast of loads and factors of simultaneity.

Elements of the Systems of Electrical Energy.	Introduction to the general description of the systems. *Aparamenta Electrical. Parameters of the electrical lines: resistance, inductance and *capacitancia. Model of the electrical line. Model of transformer of power. Model of the alternator. Preparation of the model of an electrical system in values by unit.
Centres of Transformation for Distribution	Diagrams and constitution of Centres of transformation. Systems of protection. Put to earth of the Centres. Switches, *seccionadores and fusible. *Pararrayos. Interconnection *pararrayos-*trafo. Picture of *BT: interconnections *trafo-picture of *BT. Protection against the environmental aggression.
Study of the Operation of the System: Flow of Loads	Introduction. Radial networks and *malladas. Solution to the flow of loads: method of Gauss-*Seidel. Control and operation of the system: structure, controls of frequency and of tension, tertiary control.
Protection of the Systems of Power.	Characteristics of the currents of *cortocircuito: method of calculation. (JOIN-IN 60909). Analysis of the *cortocircuitos *trifásicos balanced and unbalanced (JOIN-IN-21239). Criteria of protection of the electrical system Spanish. Elements of protection against overload and *cortocircuitos: automatic and fusible switches. *Sobretensiones: Origin and mechanism of propagation. Coordination of the isolation: protection against the *sobretensiones (JOIN-IN 60071-1-2).
Industrial installations in Drop and Half tension.	Elements of the installations: symbology, electrical diagrams, electrical wires, devices of control and protection, electrical pictures, fusible, *contactores and relays. Compensation of the reactive energy: harmonic and filters
Luminothcnics And Installations of Illumination.	Foundations of luminothecnics. Elements of the installations of lighted up. Efficiency of the luminous sources. Harmonic and lighted up

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	38	68
Problem solving	4	12	16
Laboratory practical	4	12	16
Mentored work	4	30	34
Objective questions exam	2	2	4
Essay questions exam	2	2	4
Laboratory practice	2	2	4
Essay	2	2	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	Exhibition of the cores of the subjects, followed of the convenient explanation to favour his understanding. Motivation of the interest by the knowledge of the matter.
Problem solving	Understanding of the models applied to justify the behaviour of the elements of the Electrical System. Application of the suitable procedures to evaluate his performance.
Laboratory practical	Practical application of the concepts learnt in theory. Know the elements and the procedures that employ in real electrical installations.
Mentored work	Deepening of the knowledge of the legal rule that affects to the design of the technical application. Documentation of solution adopted and justification of his opportunity for the security of the Surroundings: environment, users and installations.

Personalized assistance

Methodologies	Description
Lecturing	Attention to questions and doubts posed by the student in the development of the classes
Problem solving	Attention to questions and doubts posed by the student in the development of the classes
Mentored work	Attention to questions and doubts posed by the student in the development of the classes

Laboratory practical	Attention to questions and doubts posed by the student in the development of the classes
Tests	Description
Objective questions exam	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation
Essay questions exam	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation
Essay	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation
Laboratory practice	Attention to questions and doubts posed by the student regarding the development of the proof of evaluation

Assessment						
	Description	Qualification	Training and Learning Results			
Lecturing	Teaching of theoretical contents	0				
Problem solving	Examples and cases type	0				
Laboratory practical	Practical application of theoretical concepts	0				
Mentored work	(*)Ejemplos de trabajos e/ou proxectos a *realizar	0				
Objective questions exam	Answer to the questionnaires to evaluate the knowledges of the matter.	20	B3	C21		
Essay questions exam	Justification and documentation of the cases proposed.	40	B3	C21	D2 D10	
Laboratory practice	Delivery of memories of practices and/or results of the same	20	B3	C21	D6 D10 D16 D17	
Essay	Documentation and justification of the central cores of the project. Preparation of diagrams and figures. Clarity of the editorial of the text. Sources of documentation used.	20	B3	C21	D2 D6 D10 D14 D16 D17	

Other comments on the Evaluation

To surpass the subject, it is necessary to obtain a mark upper or the same to 50% and that any of the four parts was evaluated underneath of the 30 % of the maximum mark of each part. In the case that a student do not reach the minimum in any of the parts, his/her final mark would be fail (4.0). The students that renounce to his/her continuous assessment, will have the opportunity to pass the subject in a final exam, with the same parts and with the same weights as for the rest of students. The evaluations of each one of the parts will be kept along the same academic course, but this will not be true for the following ones. Ethics commitment: it is expected that the student has a suitable behaviour. In the case a non-proper behaviour is detected (copy, plagiarism, unauthorised use of electronic devices, and others) it would be considered that the student will not have the necessary requirements to surpass the subject. In this case, the mark in the current course will be a fail (0.0).

Sources of information

Basic Bibliography

Barrero, Fermín, **Sistemas de Energía Eléctrica.**, 2006,
Gómez Expósito y otros, **Análisis y Operación de Sistemas de Energía Eléctrica**, 2002,
D.P. Kothari e I.J. Nagrath,, **Sistemas Eléctricos de Potencia**, 2008,
Stevenson, Willian y Grainger John J., **Análisis de sistemas eléctricos de potencia**, 2004,

Complementary Bibliography

Cuadernos Técnicos, **Reglamento Electrotécnico para BT**, 2008,
Cuadernos Técnicos, **Aparatos de protección y maniobra. La instalación eléctrica**, 2010,
Manual Técnico 189, **Maniobra y protección de las baterías de condensadores de MT**, 2002,
Unión-Fenosa Distribución, **CENTRO DE TRANSFORMACIÓN INTemperie CTI**, 2010,
UNESA, **METODO DE CALCULO Y PROYECTO DE INSTALACIONES DE PUESTA A TIERRA PARA CENTROS DE TRANSFORMACIÓN CONECTADOS A REDES DE TERCERA CATEGORÍA**, 1989,
COMITE DE DISTRIBUCIÓN, **GUÍA TÉCNICA SOBRE CÁLCULO, DISEÑO MEDIDA DE LAS INSTALACIONES DE PUESTA A TIERRA EN REDES DE DISTRIBUCIÓN**, 1985,
MT 2.33.35, **DISEÑO DE PUESTAS A TIERRA EN APOYOS DE LAAT DE TENSION NOMINAL IGUAL O INFERIOR A 20 kV**, 2010,

IT.0110.ES.RE.PTP, **PROYECTO TIPO LÍNEAS ELÉCTRICAS AÉREAS DE BAJA TENSIÓN**, 2011,
Distribución, **PROYECTO TIPO LÍNEAS ELÉCTRICAS AÉREAS HASTA 20kV**, 2010,
MT 2.41.22, **RED AEREA TRENZADA DE BAJA TENSION**, 2009,
MT 2.21.60, **LÍNEA AÉREA DE MEDIA TENSIÓN Simple circuito con conductor de aluminio acero**, 2010,

Recommendations

Subjects that continue the syllabus

Electrical components in vehicles/V12G360V01902
Final Year Dissertation/V12G360V01991

Subjects that it is recommended to have taken before

Basics of circuit analysis and electrical machines/V12G360V01302
Applied electrotechnics/V12G360V01501
Electrical machines/V12G360V01605

IDENTIFYING DATA				
Control e automatización industrial				
Subject	Control e automatización industrial			
Code	V12G360V01801			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4	2c
Teaching language	Castelán			
Department				
Coordinator	Armesto Quiroga, José Ignacio			
Lecturers	Armesto Quiroga, José Ignacio			
E-mail	armesto@uvigo.es			
Web				
General description	Nesta materia preséntanse os conceptos básicos do control dixital en sistemas industriais así como as técnicas de análises, deseño e integración de proxectos de automatización.			

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.			
C24	CE24 Coñecementos de regulación automática e técnicas de control, e a súa aplicación á automatización industrial.			
D9	CT9 Aplicar coñecementos.			
D16	CT16 Razoamento crítico.			
D17	CT17 Traballo en equipo.			

Resultados previstos na materia

Expected results from this subject	Training and Learning Results	
Coñecementos xerais sobre o control dixital de sistemas dinámicos, das principais ferramentas de simulación de sistemas *muestreados	B3	
Capacidade para deseñar sistemas de regulación e control dixital.	C24	D9
Habilidade para a concibir, desenvolver e *modelar sistemas automáticos.	C24	D9 D16
Capacidade de analizar as necesidades dun proxecto de automatización e fixar as súas especificacións.		D9 D16 D17
Capacidade de *dimensionar e seleccionar un autómatas *programable industrial para unha aplicación específica de automatización así como determinar o tipo e características dos sensores e *actuadores necesarios.	C24	D9 D16
Capacidade de traducir un modelo de funcionamento a un programa de autómatas.	C24	D9
Ser capaz de integrar distintas tecnoloxías (electrónicas, eléctricas, *neumáticas, etc.) nunha única automatización.	C24	D9 D17

Contidos

Topic		
TEMA 1.- Sistemas de control dixital.	1.1 Esquemas de control por computador. 1.2 Secuencias e sistemas discretos. 1.3 Transformada Z. 1.4 Función de transferencia en z. 1.5 Ecuacións en diferenzas.	
TEMA 2.- Análise de sistemas muestreados de control.	2.1 Mostraxe. 2.2 Reconstrución. 2.3 Sistemas muestreados. 2.4 Estabilidade. 2.5 Análise de resposta transitoria. 2.6 Análise de resposta permanente.	
TEMA 3.- Síntese de reguladores digitais.	3.1 Discretización de reguladores continuos. 3.2 Reguladores PID discretos.	

TEMA 4.- Autómatas Programables Industriais (PLCs)	4.1 Principio de funcionamento. 4.2 Memoria de Entradas e Memoria de Saídas. 4.3 Ciclo de funcionamento do autómatas. Tempo de ciclo. 4.4 Programación estruturada. Tipos de módulos de programa.
TEMA 5.- Linguaxes normalizadas para a programación de autómatas.	5.1 Programación de autómatas co Standard IEC 61131. 5.2 Tipos de Datos Numéricos. Limitacións. Conversión. 5.3 Programación avanzada en Diagrama de Funcións e Diagrama de Contactos. Ampliación do conxunto de instrucións coñecidas.
TEMA 6.- Supervisión e Control de Procesos Industriais.	6.1 Tratamento de sinais analóxicos de E/S no autómatas. 6.2 Modelado de sistemas de supervisión e/ou control. 6.3 Do modelo funcional ao programa de autómatas. 6.4 Integración de Tecnoloxías.
P1. Matlab e Simulink para Sistemas Discretos.	Repaso e ampliación do programa Matlab e Simulink para a análise e deseño de sistemas de control.
P2. Introducción aos Sistemas Dixitais.	Procedementos de Mostraxe e Reconstrución. Influencia do período de mostraxe.
P3. Análise Dinámica de Sistemas Dixitais.	Obtención da resposta temporal dun sistema discreto. Implantación de Ecuacións en Diferenzas para a simulación de sistemas.
P4. Síntese de Reguladores Discretos.	Discretización de reguladores continuos: comparación dos diversos métodos de discretización. Implantación dun PID discreto.
P5. Tratamento de sinais analóxicos no Autómatas.	Realización dun programa sinxelo de autómatas para comprobar o tratamento e manexo de sinais analóxicos de E/S nun Autómatas Programable.
P6. Supervisión de Procesos con sinais analóxicos.	Modelado e implantación da Supervisión dun proceso sinxelo que teña varios sinais analóxicos de entrada.
P7. Supervisión de Procesos con sinais analóxicos.	Modelado e implantación da Supervisión dun proceso máis complexo con varios sinais analóxicos de entrada, distintas zonas de traballo e alarmas.
P8. Supervisión e Control de Procesos con sinais analóxicos.	Modelado e implantación da Supervisión e Control de procesos no que estean implicadas sinais analóxicos, tanto de entrada como de saída coas súas Leis de Control.

Planificación

	Class hours	Hours outside the classroom	Total hours
Actividades introdutorias	1	0	1
Lección maxistral	22	22	44
Resolución de problemas	10	20	30
Prácticas de laboratorio	18	27	45
Exame de preguntas de desenvolvemento	4	26	30

*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 introdutorias	Presentación de a materia a os alumnos: competencias, contidos, planificación, metodoloxía, atención personalizada, avaliación e bibliografía.
Lección maxistral	Desenvolveranse en os horarios fixados por a Escola. Consistirá en unha exposición e desenvolvemento por parte de o profesor de os temas que constitúen o contido de a materia. Durante o seu desenvolvemento alentarase a participación activa de o alumno. Será necesario que logo o alumno dedique un tempo aproximadamente igual a a duración de a sesión para asimilar e sentar os conceptos explicados e que lle servirá como preparación para a seguinte sesión.
Resolución de problemas	Durante as sesións de aula, cando resulte oportuno, procederase a a resolución de problemas e/ou exercicios que faciliten a comprensión de os contidos de a materia, ou que sirvan para desenvolver e aplicar os contidos apresetados. O alumnado deberá resolver exercicios similares para adquirir as capacidades necesarias.
Prácticas de laboratorio	Actividades de aplicación de os coñecementos adquiridos en as clases de teoría e situacións concretas que poidan ser desenvolvidas/simuladas en o laboratorio de a asignatura.

Atención personalizada

Methodologies	Description
Lección maxistral	En as clases de aula en que se imparta teoría se fomentara a participación de o alumnado, podendo interromper a exposición si algún punto non quedou suficientemente claro.
Resolución de problemas	En as clases de aula en as que se resolvan exercicios se fomentara especialmente a participación de o alumnado, cando non comprenda algún paso, ou suxerindo melloras e solucións alternativas.

Prácticas de laboratorio	En as clases de laboratorio farase un seguimento máis próximo de os grupos de prácticas, axudando a os que vaian un pouco máis lentos e suscitando novos retos ou melloras en o seu desenvolvemento a os máis avantaxados.
Actividades introdutorias	A primeira clase de a asignatura ten moita importancia, e debe ser o suficientemente aclaratoria e reveladora para o alumnado de o que vai aprender en a asignatura e a onde se pretende chegar ao final de a mesma.
Tests	Description
Exame de preguntas de desenvolvemento	Aquí os alumnos deberán demostrar os coñecementos adquiridos en a asignatura, resolvendo basicamente exercicios de o tipo que se desenvolveron en o aula e que eles mesmos implantaron en o laboratorio. Insistirase en a importancia de a solución correcta, pero tamén en a xustificación de o proceso de chegar a a mesma.

Avaliación				
	Description	Qualification	Training and Learning Results	
Prácticas de laboratorio	Valorarase cada práctica de laboratorio entre 0 e 10 puntos, en función do cumprimento dos obxectivos fixados no enunciado da mesma e da preparación previa e actitude do alumnado. Cada práctica terá unha *ponderación distinta sobre a nota final de prácticas. Así mesmo, controlarase e valorará o aproveitamento das prácticas por parte do alumnado. Nalgunha das prácticas poderase esixir a entrega dos resultados da mesma.	30	B3 C24	D9 D16 D17
Exame de preguntas de desenvolvemento	Exame final dos contidos da materia, que incluírá cuestións teóricas, problemas e exercicios.	70	B3 C24	D9 D16

Other comments on the Evaluation

EXAMES:

- Realizaranse varias probas de preguntas de desenvolvemento para que ningunha supere o 40% nas datas/horarios aprobados polo centro.

PRÁCTICAS:

- A asistencia a todas as sesións de prácticas é Obrigatoria, excepto para os alumnos cuxa renuncia a a Avaliación Continua sexa oficialmente admitida.

- Realizarase unha Avaliación Continua de o traballo de o alumnado en as sesións de prácticas a o longo de o cuatrimestre. Si un alumno non prepara adecuadamente as prácticas e/ou descoñece os coñecementos básicos explicados en clase para a realización de a mesma, obterá directamente a cualificación de suspenso con a mínima nota en dita práctica.

- Si a o longo das sesións de prácticas reglamentadas o traballo de o alumno é insuficiente e non consegue o Aprobado en prácticas, terá as prácticas Suspensas para a 1ª convocatoria.

- Si supera o exame escrito en a 2ª convocatoria o alumno deberá examinarse de prácticas si non as ten aprobadas de a 1ªconvocatoria.

- Tamén deberán examinarse de prácticas, na mesma convocatoria en que superen o exame escrito, os alumnos cuxa renuncia a Avaliación Continua sexa oficialmente admitida.

CUALIFICACIÓN:

- Para a consideración de "Presentados" ou "Non presentados" a unha convocatoria terase únicamente en conta a participación nas probas escritas.

- En as probas escritas poderase establecer unha puntuación mínima en un conxunto de preguntas/exercicios para superar o mesmo.

- Para aprobar a materia débense superar ambas partes, tanto o programa de prácticas (obtendo como mínimo o 33% de a puntuación asignada a as prácticas) como as probas escritas (50% de a puntuación asignada), obténdose en principio a nota total segundo a porcentaxe 30%-70% indicado anteriormente.

- En o caso de os Suspensos por non alcanzar algún de os mínimos establecidos ou non aprobar os exames escritos ou as prácticas, a nota final que figurará en o acta obterase de a expresión $0.7 \cdot (\text{Nota Prácticas}) + 0.7 \cdot (\text{Nota Exame Escrito})$ de tal forma que nunca poderá superar os 4.5 puntos.

Compromiso ético:

Espérase que o alumno presente un comportamento ético adecuado. En caso de detectar un comportamento non ético (por exemplo copia ou plagio, utilización de aparellos electrónicos non autorizados, e outros), considerarase que o alumno non reúne os requisitos necesarios para superar a materia. Ademais solicitarase a aplicación do Regulamento Disciplinario de a Escola a o alumno en cuestión.

Bibliografía. Fontes de información

Basic Bibliography

Complementary Bibliography

K. Ogata, **Sistemas de Control en Tiempo Discreto**, 2ª edición, Prentice-Hall, 1996

Guía usuario STEP7, SIEMENS,

Diagrama de Funciones (FUP) para S7-300 y S7-400, SIEMENS,

Diagrama de Contactos (KOP) para S7-300 y S7-400, SIEMENS,

Recomendacións

Subjects that it is recommended to have taken before

Fundamentos de automática/V12G360V01304

Other comments

Requisitos: Para matricularse en esta materia é necesario superar ou ben haber cursado todas as materias de os cursos inferiores a o curso en que está situada esta materia.

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

IDENTIFYING DATA				
Fundamentos de administración de empresas				
Subject	Fundamentos de administración de empresas			
Code	V12G360V01802			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4	2c
Teaching language	Castelán Galego			
Department				
Coordinator	Urgal González, Begoña			
Lecturers	González Santamaría, Pedro Urgal González, Begoña			
E-mail	burgal@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	O obxectivo desta materia é dar a coñecer os aspectos fundamentais da función de administración da empresa, incidindo na importancia do sistema de información económico-financeiro para analizar a situación patrimonial e competitiva da empresa, de maneira que sirva de apoio á toma de decisións empresariais.			

Resultados de Formación e Aprendizaxe	
Code	
B9	CG9 Capacidade de organización e planificación no ámbito da empresa, e outras institucións e organizacións.
D5	CT5 Xestión da información.
D8	CT8 Toma de decisións.
D9	CT9 Aplicar coñecementos.

Resultados previstos na materia		
Expected results from this subject	Training and Learning Results	
☐ Coñecer a base sobre a que se apoia a análise económica financeiro da empresa.	B9	D5
☐ Coñecer as ferramentas que se utilizan na análise económica financeiro.		D8
☐ Coñecer os aspectos básicos de xestión económica financeira.		D9
Coñecemento sobre os fundamentos da empresa e das ferramentas específicas para a súa análise financeira	B9	D5 D8 D9
Coñecemento sobre os fundamentos da administración e dirección de empresas e os procesos de xestión	B9	D5 D8 D9

Contidos	
Topic	
TEMA 1	A EMPRESA E A DIRECCIÓN DE EMPRESAS
TEMA 2	A PLANIFICACIÓN E O CONTROL
TEMA 3	A ORGANIZACIÓN E A DIRECCIÓN DE PERSOAS
TEMA 4	A INFORMACIÓN CORPORATIVA
TEMA 5	A TOMA DE DECISIONS NA EMPRESA
TEMA 6	A ANÁLISE ECONÓMICA E FINANCEIRA
TEMA 7	A EVOLUCIÓN DA EMPRESA

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	32.5	64.5	97
Prácticas de laboratorio	18	18	36
Exame de preguntas obxectivas	2	4	6
Exame de preguntas de desenvolvemento	3	8	11

*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 por parte do profesor dos contidos sobre a materia obxecto de estudo, bases teóricas e casos de estudo e exercicios que sirvan de complemento.
Prácticas de laboratorio	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e procedimentais relacionadas coa materia obxecto de estudo.

Atención personalizada

Methodologies	Description
Lección maxistral	Exposición por parte do profesor dos contidos sobre a materia obxecto de estudo, bases teóricas e casos de estudo e exercicios que sirvan de complemento.
Prácticas de laboratorio	Actividades de aplicación dos coñecementos a situacións concretas e de adquisición de habilidades básicas e procedimentais relacionadas coa materia obxecto de estudo.

Avaliación

	Description	Qualification	Training and Learning Results	
Prácticas de laboratorio	Resolución de problemas e/ou exercicios mediante a aplicación de rutinas, procedementos e fórmulas a partir da información dispoñible.	20	B9	D5 D8 D9
Exame de preguntas obxectivas	Dúas probas tipo test de escolla múltiple sobre contidos teóricos e prácticos.	50	B9	D5 D8 D9
Exame de preguntas de desenvolvemento	Proba con cuestións teóricas e prácticas, sobre os contidos impartidos ao longo de todo o período formativo.	30	B9	D5 D8 D9

Other comments on the Evaluation

1. AVALIACIÓN CONTINUA

A cualificación final no sistema de avaliación continua determinarase a través das seguintes probas e actividades:

- **Exame parcial 1.** Esta proba será tipo test, realizarase ao concluír o Tema 3, terá un carácter liberatorio e suporá o **20%** da cualificación final da materia.
- **Exame parcial 2.** Esta proba tamén será tipo test, realizarase ao concluír o período formativo vencellado á materia e suporá o **30%** da cualificación final da mesma.
- **Exame final.** Este exame consistirá no desenvolvemento de varios problemas, realizarase na data establecida polo Centro na planificación académica e suporá o **30%** da cualificación final da materia.
- **Prácticas.** O cumprimento das tarefas desenvolvidas durante as prácticas suporá o **20%** da cualificación final da materia. Cada práctica realizada por o/a alumno/a será avaliada, calculándose a cualificación de prácticas como a media aritmética das notas obtidas nestas.

2. AVALIACIÓN GLOBAL

Para os/as alumnos/as que opten por este sistema de avaliación, a cualificación final da materia será a obtida nunha proba global que se realizará na data establecida polo Centro na planificación académica. Este exame dará a posibilidade de obter o 100% da cualificación e constará de dúas partes:

- A primeira parte constituirá o 40% da nota final e tratarase dunha proba tipo test que abarcará todos os contidos teóricos e prácticos desenvolvidos ao longo do período formativo vencellado á materia. Unha condición necesaria, aínda que non suficiente, para superar a materia, será obter nesta parte unha puntuación mínima de 5, nunha escala do 0 a 10.
- A segunda parte completará o 60% restante e constará de varios problemas que o/a alumno/a deberá desenvolver.

3. RECUPERACIÓN DE XULLO

Nesta oportunidade aplicaranse os criterios de avaliación establecidos nos apartados anteriores en función do sistema de avaliación elixido polo/a alumno/a.

4. COMPROMISO ÉTICO

Esperase que o/a alumno/a actúe eticamente e con honestidade en todas as probas e actividades que se desenvolvan ao longo do período formativo.

No caso de detectar unha actuación fraudulenta nas actividades e probas de avaliación (copia, utilización de apuntamentos, libros, materiais, dispositivos electrónicos, medios telemáticos non autorizados, e outros) considerarase que o/a alumno/a non reúne os requisitos necesarios para superar a materia. Dito comportamento implicará a cualificación de cero (suspense) na acta da oportunidade de avaliación da convocatoria correspondente.

Bibliografía. Fontes de información

Basic Bibliography

Weihrich, M. et al., **ADMINISTRACIÓN**, McGraw Hill, 2022

Moyano Fuentes, J. et al., **ADMINISTRACIÓN DE EMPRESAS. UN ENFOQUE TEÓRICO-PRÁCTICO**, Prentice Hall, 2011

Iborra Juan, M. et al., **FUNDAMENTOS DE DIRECCIÓN DE EMPRESAS**, Thomson, 2007

Complementary Bibliography

Cuervo García, A., **INTRODUCCION A LA ADMINISTRACION DE EMPRESAS**, Civitas, 2008

Bueno Campos, E., **CURSO BÁSICO DE ECONOMÍA DE LA EMPRESA. UN ENFOQUE ORGANIZATIVO**, Pirámide, 2004

Recomendacións

Subjects that it is recommended to have taken before

Empresa: Introducción á xestión empresarial/V12G360V01201

Fundamentos de organización de empresas/V12G360V01305

Other comments

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

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

IDENTIFYING DATA				
Componentes eléctricos en vehículos				
Subject	Componentes eléctricos en vehículos			
Code	V12G360V01902			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
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	
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.
D3	CT3 Comunicación oral e escrita de coñecementos.
D5	CT5 Xestión da información.
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 el desenvolvemento histórico e retos futuros de la red eléctrica de abordó utilizada nos vehículos (*Kfz *Bornetz)	B3	D3 D5 D10 D17
Coñecer as variantes de red eléctrica de abordó co aumento de tensión.	B3	D3 D5 D10 D17
Coñecer propiedades, funcionamento e compoñentes que proceden de a red eléctrica de abordó tradicional en vehículos.	B3	D3 D5 D10 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 abordó.	Introducción. Sistemas eléctricos principais. Sistemas eléctricos auxiliares. Accionamiento. Tracción. Dispositivos auxiliares. Equipos de abordó. Sensores.

Tracción en vehículos eléctricos.	Introducción. Requisitos para a tracción eléctrica. Motor asíncrono. Motor síncrono. Motor de reluctancia. Motor de imáns permanentes. Control e accionamento. 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 en equipo, materializados nunha memoria.	40	B3	D3 D5 D10 D17
Presentación	Presentación individual dos resultados dos traballos tutelados, onde se puntuará: Motivación polo tema. Claridade da exposición. Medios utilizados. Resposta ás dúbidas e suxestións presentadas. Claridade de conceptos Precisión da información Achegas Resultados Conclusións	60	B3	D3 D5 D10 D17

Other comments on the Evaluation

El alumno/a podrá escoger entre una de las dos opciones, Opción A (Evaluación Final) o Opción B (Evaluación continua), para su evaluación, según se detalla a continuación. Opción A A esta Opción A podrá optar cualquier alumno/a matriculado/a en la asignatura. La evaluación de los conocimientos adquiridos por el alumno/a se hará de forma individual, y sin la utilización de ningún tipo de fuente de información, en un único examen escrito que englobará toda la materia recogida en el Temario relativa al Aula, Laboratorio y Salidas de estudios o Prácticas de campo. Los exámenes coincidirán con las convocatorias oficiales correspondientes. Para superar la asignatura, será necesario obtener una puntuación igual o superior al 50% de la puntuación asignada. Opción B A esta Opción B podrán optar sólo los alumnos/as que participen de forma presencial en todos los ejercicios y actividades que se propongan en el Aula, para realizar tanto de forma individual como en equipo, y que además asistan a todas y cada una de las actividades de Laboratorio y Salidas de estudio o Prácticas de campo programadas. Dichas actividades consistirán en: Trabajos tutelados individuales y en equipo, evaluados a través de una memoria escrita, con un peso de 60%. Presentaciones individuales y en equipo de los resultados de los trabajos tutelados, con un peso de 40%. Para superar la asignatura, es condición necesaria, pero no suficiente, obtener como mínimo el 30% de la nota máxima asignada a cada una de las partes, tanto en Trabajos tutelados (mínimo 2%), como en Presentaciones (mínimo 1,20%). La materia estará superada cuando la puntuación total (Trabajos tutelados + Presentaciones) resulta una nota final mínima del 50%. En aquellos casos en los que a pesar de no superar el 30% de la nota máxima asignada de alguna de las partes Trabajos tutelados y/o Presentaciones, resulte una nota igual o mayor al 50% requerido, la nota final se traducirá en un 30%, lo que significará un suspenso.

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 autorizado, e outros) considérase que o alumno non reúne os requisitos necesarios para superar a materia. Neste caso a cualificación global no actual curso académico será de suspenso (0.0). 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).

Bibliografía. Fontes de información

Basic Bibliography

TOM DENTON, **AUTOMOBILE ELECTRICAL AND ELECTRONIC SYSTEMS**, Fifth Edition, Taylor & Francis Ltd, 2017

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

Bosch, **Automotive Handbook**, 8th Edition

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

William B. Ribbens, **Understanding Automotive Electronics. An Engineering Perspective**, Elsevier Inc., 2017

Complementary Bibliography

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

Bruno Scrosati, J. Garce, 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

Subjects that it is recommended to have taken before

Fundamentos de teoría de circuitos e máquinas eléctricas/V12G360V01302

Electrotecnia aplicada/V12G360V01501

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	V12G360V01903			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
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

Topic

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 %133;); 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.
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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

Beigbeder Atienza, Federico, **Diccionario Técnico Inglés/Español; Español/Inglés**, Díaz de Santos,
Collazo, Javier, **Diccionario Collazo Inglés-Español de Informática, Computación y otras Materias**, McGraw-Hill,
Hornby, Albert Sidney, **Oxford Advanced Learner's Dictionary**, Oxford University Press,
Jones, Daniel, **Cambridge English Pronouncing Dictionary with CD**, Cambridge University Press,
Hewings, Martin, **English Pronunciation in Use, Advanced with Answers, Audio CDs and CD-ROM**, Cambridge University Press,
Murphy, Raymond, **English Grammar in Use 4th with Answers and CD-ROM**, Cambridge University Press,
Picket, Nell Ann; Laster, Ann A. & Staples Katherine E., **Technical English: Writing, Reading and Speaking**, Longman,

Complementary Bibliography

www.agendaweb.org,
www.bbc.co.uk/worldservice/learningenglish/,
www.edufind.com/english/grammar,
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	V12G360V01904			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
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,
Collazo, Javier, **Diccionario Collazo Inglés-Español de Informática, Computación y otras Materias**, McGraw-Hill,
Hornby, Albert Sidney, **Oxford Advanced Learner's Dictionary**, Oxford University Press,
Jones, Daniel, **Cambridge English Pronouncing Dictionary**, Cambridge University Press,
Hancock, Mark, **English Pronunciation in Use: Intermediate**, Cambridge University Press,
Murphy, Raymond, **English Grammar in Use: A Self-Study Reference and Practice Book for Intermediate Students**, Cambridge University Press,
Picket, Nell Ann; Laster, Ann A. & Staples Katherine E., **Technical English: Writing, Reading and Speaking**, Pearson Limited Education,

Complementary Bibliography

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	V12G360V01905			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
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 them to learn new methods and theories, and equip them with 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 *científico-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 & * (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. & *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 Maraño, 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

Brown, Fortunato, **TEXTOS INFORMATIVOS BREVES Y CLAROS: MANUAL DE REDACCIÓN DE DOCUMENTOS**, 1ª, Octaedro, 2003

Budinski, Kenneth G., **ENGINEER'S GUIDE TO TECHNICAL WRITING**, 1st, ASM International, 2001

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	V12G360V01906			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4	2c
Teaching language	Castelán			
Department				
Coordinator	Camaño Portela, José Luís			
Lecturers	Camaño Portela, José Luís López Fernández, Joaquín			
E-mail	cama@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 de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría 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 de 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 ás dúbidas do alumnado
Prácticas de laboratorio	Atención personalizada ás dúbidas do alumnado
Resolución de problemas	Atención personalizada ás dúbidas do alumnado
Tests	Description
Informe de prácticas, prácticum e prácticas externas	Atención personalizada ás dúbidas do alumnado

Avaliación

Avanacemento	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 enxeñería 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

N. Smyth, **Android Studio Development Essentials**,

http://www.techotopia.com/index.php/Android_Studio_Development_Essentials,

N. Smyth, **Android 4 app development essentials**,

http://www.techotopia.com/index.php/Android_4_App_Development_Essentials,

G. Allen, **Beginning Android 4**, 2012,

M. Aydin, **Android 4: new features for application development**, 2012,

J. Bryant, **Java 7 for absolute beginners**, 2012,

M. Burton, D. Felke, **Android application development for dummies**, 2012,

J. Friesen, **Learn Java for Android development**, 2013,

M.T. Goodrich, R. Tamassia, M.H. Goldwasser, **Data structures & algorithms in Java**, 2014,

J. Graba, **An introduction to network programming with Java**, 3rd edition, 2013,

I. Horton, **Beginning Java 7 Edition**, 2011,

J. Howse, **Android application programming with OpenCV**, 2013,

W. Jackson, **Android Apps for absolute beginners**, 2012,

L. Jordan, P. Greyling, **Practical Android Projects**, 2011,

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	V12G360V01907			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
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 de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría 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 relativa a instalacións industriais.
D2	CT2 Resolución de problemas.
D5	CT5 Xestión da información.
D7	CT7 Capacidade de 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.	B11	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

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 á semana dos 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	D7 D8 D9 D10 D14

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 ético Espérase 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), considerarase 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. M^a, **Técnicas de Prevención de Riesgos Laborales: Seguridad e Higiene del Trabajo**, 9^a,

Complementary Bibliography

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

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	V12G360V01908			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
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**Internships: Internships in companies**

Subject	Internships: Internships in companies			
Code	V12G360V01981			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
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 eguzaba@uvigo.es			

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

IDENTIFYING DATA				
Traballo de Fin de Grao				
Subject	Traballo de Fin de Grao			
Code	V12G360V01991			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	12	Mandatory	4	2c
Teaching language	Castelán Galego Inglés			
Department	Deseño na enxeñaría Física aplicada			
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 deseñar, desenvolver, implantar, xestionar e mellorar produtos e procesos nos distintos ámbitos industriais, por medio de técnicas analíticas, computacionais ou experimentais apropiadas.
B2	CG2 Capacidade para dirixir actividades relacionadas coa 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 de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial.
B10	CG10 Capacidade para traballar nun medio multilingüe e multidisciplinar.
B12	CG12 Capacidade para a integración das competencias CG1 a CG11 nos traballos e proxectos relacionados coas Tecnoloxías Industriais.
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
No momento de realizar a solicitude da defensa do TFG, o alumno deberá xustificar a adquisición dun nivel adecuado de competencia en lingua inglesa.		D4

Contidos

Topic

Proxectos clásicos de enxeñería	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	210	225
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.
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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 Enxeñería Industrial.	70	B1 B2 B3 B4 B10 B12	D4 D12 D13
Presentación	A defensa do Traballo Fin de Grao levará a cabo segundo o especificado no Regulamento do Traballo Fin de Grao da Escola de Enxeñería Industrial.	30	B1 B2 B3 B4 B10 B12	D4 D12 D13

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	V12G360V01999			
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
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 eguizaba@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 deseñar, desenvolver, implantar, xestionar e mellorar produtos e procesos nos distintos ámbitos industriais, por medio de técnicas analíticas, computacionais ou experimentais apropiadas.
B2	CG2 Capacidade para dirixir actividades relacionadas coa 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 de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría 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 integrárase 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.
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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 concluir 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 rexerá 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