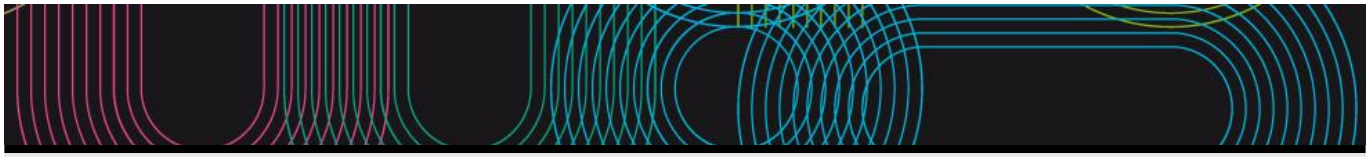

(*)Escola de Enxeñaría de Minas e Enerxía

Presentation

The Higher School of Mining Engineering and Energy offers for the academic course 2018-2019 totally adapted degrees and masters to the European Space of Upper Education:

DEGREE IN ENERGY ENGINEERING

This degree pretends to supply the suitable training and of high level to the professional futures that go to exert in the area of the engineering of the energetic processes from the generation of energy until his distinct applications, supplying, besides, the precise training to develop technologies and efficient and sustainable systems.

DEGREE IN MINING AND ENERGY RESOURCES ENGINEERING

This degree pretends to supply the suitable training and of high level to the professional futures for the exploration, investigation, exploitation, profit, preparation, transformation and utilisation of the mining resources (rocks and mineral, groundwaters,and thermal water, etc.) and energy resources (oil, natural gas, etc.) on Earth and other geological resources, like the subterranean space, activities all they that have to carry out of safe form, profitable and environmentally acceptable.

MASTER IN MINING ENGINEERING

This Master pretends to supply the suitable training and of high level to the professional futures for the exploration, investigation, exploitation, profit, preparation, transformation and utilisation of the mining resources (rocks and mineral, groundwaters,and thermal water, etc.) and energy resources (oil, natural gas, etc.) on Earth and other geological resources, like the subterranean space, activities all they that have to carry out of safe form, profitable and environmentally acceptable. The University Master□s Degree in Mining from the University of Vigo **enables holders to work in the regulated profession of Mining Engineering**.

GEOINFORMATICS MASTER´S DEGREE

The Master in Geoinformatics from the Universities of Vigo and Coruña born as a university program to train highly specialized professionals oriented to geospatial industry. The geospatial industry is one sector that has grown rapidly in recent years due to the different applications related to global positioning systems, geographic information systems, mobile devices, or remote sensing applications.

Management and Coordination

MANAGEMENT:

Director

Elena Alonso Prieto (eme.direccion@uvigo.es)

Sub director of External Relationship and Mobility

José Santiago Pozo Antonio (eme.internacional@uvigo.es)

Sub director for Infrastructures

David Patiño Vilas (eme.infraestructuras@uvigo.es)

Sub director Head of Studies

María Araújo Fernández (eme.orgdocente@uvigo.es)

Secretary

Guillermo García Lomba (eme.secretaria@uvigo.es)

COORDINATION:

The Teaching Coordination Procedure at **HS Mining Enginnering and Energy** is the instrument by which teaching activities and content for the centre□s qualifications are coordinated. Coordination is key in order for students to take full advantage of all the activities. The coordination system is a fundamental element for introducing new objectives and methodologies and, above all, provides more improved connections not only between teachers, but between teachers and the Centre.

EE DEGREE: David Patiño Vilas (patinho@uvigo.es)

MERE DEGREE: María Araújo Fernández (maraujo@uvigo.es)

ME MASTER: Elena Alonso Prieto (ealonso@uvigo.es)

G MASTER: Pedro Arias Sánzhez (parias@uvigo.es)

1ST YEAR DEGREES: Elena Gonzalez Rodriguez (elena@uvigo.es)

2ND YEAR DEGREES: Eduardo Giráldez Pérez (egiraldez@uvigo.es)

3RD & 4TH YEARS EE DEGREE: Pablo Eguía Oller (peguia@uvigo.es)

3RD & 4TH YEARS MERE DEGREE: Fernando García Bastante (bastante@uvigo.es)

INTERNSHIPS: Javier Taboada Castro (jtaboada@uvigo.es)

1ST YEAR ME MASTER: Teresa Rivas Brea (trivas@uvigo.es)

2ND YEAR ME MASTER: Marta Cabeza Simó (mcabeza@uvigo.es)

QUALITY ME MÁSTER: María Araújo Fernández (maraujo@uvigo.es)

MEET: Ángeles Saavedra González (saavedra@uvigo.es)

MEET: Itziar Goicoechea Castaño (igoicoechea@uvigo.es)

MEET: Eduardo Liz Marzán (eliz@dma.uvigo.es)

POPULARIZATION: José Santiago Pozo Antonio (ipozo@uvigo.es)

QUALITY: Guillermo García Lomba (eme.secretaria@uvigo.es)

GENDER EQUITY: Teresa Rivas Brea (trivas@uvigo.es)

PIUSN: Ángeles Saavedra González (saavedra@uvigo.es)

School Web Page

http://minasyenergia.uvigo.es/es/

Degree in Mining and Energy Resources Engineering

Subjects			
Year 2nd			
Code	Name	Quadmester	Total Cr.
V09G310V01301	Electrotechnology	1st	6
V09G310V01302	Physics: Thermal systems	1st	6
V09G310V01303	Materials technology	1st	6
V09G310V01304	Materials resistance	1st	6
V09G310V01305	Fluid mechanics	1st	6
V09G310V01401	Geomatics	2nd	6
V09G310V01402	Environmental technology	2nd	6
V09G310V01403	Health and safety	2nd	6
V09G310V01404	Soil mechanics	2nd	6
V09G310V01405	Heat and cool	2nd	6

IDENTIFYING DATA				
Electrotechnology				
Subject	Electrotechnology			
Code	V09G310V01301			
Study programme	Degree in Mining and Energy Resources Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Galician			
Department				
Coordinator	Feijóo Lorenzo, Andrés Elías			
Lecturers	Feijóo Lorenzo, Andrés Elías López Fernández, Xosé Manuel			
E-mail	afeijoo@uvigo.gal			
Web	http://faitic.uvigo.es/			
General description	(*)Electrotecnia			

Competencies	
Code	
B1	Scientific and technical training in order to work professionally as a Technical Mining Engineer, with knowledge of the functions of consultancy, analysis, design, calculation, planning, construction, maintenance, conservation and exploitation.
B2	Understanding of the many technical and legal considerations that arise during development within the field of mining engineering, according to section 5 of Order CIN7306/2009, which have to do with geological-mineral prospecting and research, mine exploitation of all types of geological resources, including groundwaters, underground works, underground stores, treatment and smelting plants, energy plants, mineral and iron and steel plants, construction materials plants, carbon-chemical, petro-chemical and gas plants, waste and effluent treatment plants, and explosives manufacturing plants. In addition, the capacity to employ proven methods and accredited technologies in order to attain improved efficiency while respecting the Environment and protecting the health and safety of workers and users.
B3	Capacity to design, write and plan partial or specific projects for the units described in the previous section, such as mechanical and electrical installations, together with their maintenance, energy transport networks, transport and storage facilities for solid, liquid and gaseous materials, dumping sites, pools or dams, supports and foundations, demolition, restoration, blasting and explosives logistics.
B4	Capacity to design, plan, operate, inspect, sign and manage projects, plants or installations within the field.
B5	Capacity to carry out land planning studies and environmental studies related to the projects, plants and installations within the field.
B6	Capacity to maintain, conserve and exploit the projects, plants and installations within the field.
B7	Knowledge required to undertake, within the scope of mining engineering knowledge as established in section 5 of Order CIN/306/2009, measurements, layouts, plans and maps, calculations, valuations, risk analyses, expert inspections, studies and reports, work plans, environmental and social impact studies, restorations plans, quality control systems, prevention systems, evaluation analyses of the properties of metal, ceramic, refractory, synthetic and other materials, soil and solid rock characterization and other similar tasks.
B8	Knowledge, understanding and capacity to apply the legislation needed when working professionally as a Technical Mining Engineer.
C17	Fundamental knowledge of the electric power system: power generation, transport, delivery and distribution networks as well as types of lines and conductors. Knowledge of regulations governing low and high voltage. Knowledge of basic electronics and control systems.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence.
D3	Propose and develop practical solutions, which develop suitable strategies based on theoretical knowledge, for problem phenomena and situations that arise as everyday realities in engineering.
D5	Know what sources are available for ongoing and continual updating of all the information required to undertake their work, with access to all the current and future tools for seeking information and adapting it in the light of technological and social changes.
D6	Know and handle legislation applicable to the sector, know the social and business environment and know how to work together with the Administration and use acquired knowledge to draw up engineering projects and develop any of the aspects of professional work required.
D7	Capacity to organise, interpret, assimilate, create and manage all the information needed to organise their work, handling the I.T., mathematical, physical and other tools required.

D10 Become aware of the need for training and continual improvement in quality, developing the values associated with scientific thinking and showing a flexible, open and ethical attitude towards diverse opinions and situations, particularly in matters of non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Learning outcomes

Expected results from this subject	Training and Learning Results	
Mastery analyzing single- and three-phase electric circuits in steady state. Knowledge of the functioning of electrical power systems, generation activities, electrical energy transport and distribution. Knowledge of the elements comprising a distribution network: lines, cables and switchgear. Knowledge of the basic principles of how electrical machines work. Knowledge of electronic control systems for electrical machines.	C17	D1 D3 D5 D7
Knowledge and mastery of the basic aspects of low-voltage installation design. Knowledge of the regulations applicable to high-voltage electrical systems.	B1 B2 B3 B4 B5 B6 B7 B8	D6 D10

Contents

Topic	
Single phase circuits	Two port circuits, references and Kirchoff laws. Active and passive elements. Definition of variables: voltage, current, power. Thevenin circuits. Steady-state sinusoidal circuits. Phasors. Definitions of power. Energy.
Three phase circuits.	Three phase systems: voltages, currents, power and energy. Use of per unit values.
Description of the electrical power network.	Transmission and distribution networks: devices and voltage levels. Line description and mathematical models.
Electric machines.	Synchronous and asynchronous generators: description and power balances. Electric transformers: description and power balances.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	27	89.5	116.5
Studies excursion	3	0	3
Problem solving	20	8	28
Essay questions exam	2.5	0	2.5

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

Methodologies

	Description
Lecturing	Explanation of theory.
Studies excursion	The realization of the formative activity studies excursion will be organized by the centre, taking as a starting point the proposals of the teaching staff of the class regarding the type of installation/company to be visited.
Problem solving	Numerical resolution of exercises.

Personalized assistance

Methodologies	Description
Lecturing	The sessions of titorización will be able to be by telematic means (e-mail, videoconference, forums of FAITIC), being previously concerted.
Problem solving	The sessions of titorización will be able to be by telematic means (e-mail, videoconference, forums of FAITIC), being previously concerted.

Assessment

	Description	Qualification	Training and Learning Results		
Lecturing	Written proof (final exam). Learning outcomes: Mastering the analysis of electric circuits in steady-state. Knowing the operation principles of electrical power systems: generation, transmission and distribution. Knowing the elements of a distribution network: lines, cables and other devices. Knowing the basic operation fundamentals of electric machines and their electronic devices. Mastering the principels of low voltage installations. Knowing standards associated with high voltage system operation.	100	B1 B2 B3 B4 B5 B6 B7 B8	C17	D1 D3 D5 D6 D7 D10

Other comments on the Evaluation

The class can be passed getting a mark equal or greater than 5 in the final exam, or even with a mark equal or greater than 4, when the difference with respect to 5 is obtained by means of the continuous assessment test.

The date of the final exam can be consulted through the web page of the centre.

http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Complementary Bibliography

Fermín Barrero González, **Sistemas de energía eléctrica**, 1ª ed., Paraninfo, 2002

José Fernández Moreno, **Teoría de circuitos**, 1ª ed., Paraninfo, 2011

Charles K. Aleksander, Mathew N. O. Sadiku, **Fundamentals of electric circuits**, 4th ed., Mc Graw Hlill, 2009

John Grainger, **Power system analysis**, Mc Graw Hlill, 1994

Recommendations

Contingency plan

Description

Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET.

1. Semi-presential modality

Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the centre, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it

is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, CampusRemoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, CampusRemoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
As the teaching methodologies have been conceived for the face-to-face teaching modality, the teaching methodologies that would be kept and those which would be modified or replaced in the online modality are indicated below.

The teaching methodologies that would be kept, since they can be used in face-to-face and online teaching mode

Campus remoto will be used for imparting as much hours as possible.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

2.4. Evaluation
In case this circumstance has to be activated, the exam would be an online test.

2.5. Bibliography or additional material to facilitate self-learning
The bibliography proposed and the documentation uploaded to the FAITIC system are enough.

IDENTIFYING DATA				
Physics: Thermal systems				
Subject	Physics: Thermal systems			
Code	V09G310V01302			
Study programme	Degree in Mining and Energy Resources Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Basic education	2nd	1st
Teaching language	English			
Department				
Coordinator	Granada Álvarez, Enrique Baqueiro Vidal, María			
Lecturers	Baqueiro Vidal, María Granada Álvarez, Enrique			
E-mail	egranada@uvigo.es m.baqueirovidal@gmail.com			
Web	http://faitic.uvigo.es/			
General description	The aim of the subject is that the students purchase the necessary knowledges to be able to tackle ingeneering projects where the thermal energy was involved taking into account the interaction between systems and as they affect the interactions the thermal properties of the substances that configure them. It looks for a macroscopic classical approach understanding, perfect and improve the performance of those processes in which there is exchange of energy in general and thermal in particular.			

Competencies	
Code	
C4	Understanding and mastery of basic concepts of the general laws of mechanics, thermodynamics, waves, fields and electromagnetism and how they can be applied to solve engineering problems.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence.
D2	Capacity to develop a complete project in any field included in this type of engineering, suitably combining acquired knowledge, accessing necessary information sources, undertaking the necessary enquiries and integrating into inter-disciplinary work teams.
D3	Propose and develop practical solutions, which develop suitable strategies based on theoretical knowledge, for problem phenomena and situations that arise as everyday realities in engineering.
D4	Encourage work based on cooperation, communication skills, organization, planning and recognition of responsibility in a multilingual and multidisciplinary working environment that fosters education in equality, peace and respect for fundamental rights.
D7	Capacity to organise, interpret, assimilate, create and manage all the information needed to organise their work, handling the I.T., mathematical, physical and other tools required.
D8	Conceive engineering within a framework of sustainable development with an awareness of environmental issues.

Learning outcomes		
Expected results from this subject		Training and Learning Results
To know the technological base that supports most of the recent investigations in applications of the thermodynamic engineering.	C4	D2 D3 D7 D8
To understand the basic concepts related to mass and energy balance in thermal systems.	C4	D1 D3
To know the experimental procedure used working with energy transference.		D1 D2 D7 D8
To master the available technicis for the analysis of thermal systems.	C4	D3 D4
To delve into the techniques use during the analysis of processes.	C4	D2 D4

Contents
Topic

INTRODUCTORY CONCEPTS AND DEFINITIONS	Thermodynamic system. Thermodynamic properties. Units. Temperature.
THERMAL EQUILIBRIUM AND TEMPERATURE	Thermal balance, principle zero of the thermodynamics. Concept of temperature.
THERMAL STATE EQUATIONS AND THERMAL PROPERTIES OF A SYSTEM.	Equation of thermal state. Thermal properties of a system. Ideal gases. Equations of state of the real gases.
WORK AND THE FIRST PRINCIPLE OF THE THERMODYNAMICS. ENERGETIC PROPERTIES OF A SYSTEM.	Mechanical concept of the energy. Work. Energy of a system. Transfer of energy by heat. Balance of energy in enclosed systems. Energetic properties of a system. Internal energy and enthalpy. Calorific Capacities
TRANSFORMATIONS OF A GASEOUS SYSTEM	Transformations of an ideal gas. Politropic Transformations
PROPERTIES OF A PURE SUBSTANCE, SIMPLE, AND COMPRESSIBLE	Thermodynamic state. The relation p-v-T. Calculation of thermodynamic properties. Calculation of variations of internal energy and enthalpy.
FIRST PRINCIPLE IN OPEN SYSTEMS. CYCLES.	Conservation of the mass. Conservation of the energy. Analysis of volumes of control in stationary state. Transitory states.
SECOND PRINCIPLE OF THE THERMODYNAMICS.	Formulation of the Second Principle. Irreversibilities. Application to thermodynamic cycles. Scale Kelvin of temperatures. Maximum performances. Cycle of Carnot.
ENTROPY	Inequality of Clausius. The thermodynamic property entropy. Variation of entropy. Calculation of entropy. Reversible processes. Balances of entropy in enclosed and open systems.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	22	45	67
Problem solving	15	52.5	67.5
Studies excursion	3	0	3
Laboratory practical	10	0	10
Essay questions exam	2.5	0	2.5

*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 by part of the professor of the contents of the matter *objecto of study. Bases in which *sustenta. Relation with other matters. Technological applications
Problem solving	Formulation, analysis and resolution of problems for the consolidation and application of the theoretical contents.
Studies excursion	The realisation of the formative activity Exit of Studies, will be organised and made by the centre, taking like starting point the proposals made by the *profesorado of the matter on the type of installation/company to visit.
Laboratory practical	Experimentation of real processes in the laboratory that complement the contents of the matter.

Personalized assistance

Methodologies	Description
Lecturing	All these activities will be *tuteladas by the professor; well during the hours *lectivas, well during the official hours of *tutorías, or during the review of the proofs and examinations. For all the modalities of teaching, the sessions of *tutorización will be able to make by telematic means (email, videoconference, forums of *FAITIC, ...) Under the modality of *concertación previous.
Problem solving	All these activities will be supervised by the professor; or during the lessons hours, or during the official hours of tutorials, or during the review of the proofs and examinations
Laboratory practical	All these activities will be supervised by the professor; or during the lessons hours, or during the official hours of tutorials, or during the review of the proofs and examinations

Assessment

Description	Qualification	Training and Learning Results

Lecturing	It values through three type test examinations of the theoretical lessons. The first when subject 6 ends, the second when finalising the subject 7 and the third will be coincident with the final exam and will be about subjects 8 and 9. Each one of these theoretical exams will mark 5% of the final note. RESULTS OF LEARNING: Comprise the concept of thermodynamic System and of the thermodynamic properties. Units in which they quantify the thermodynamic properties. Learn to measure temperatures. Comprise the concepts of work, heat and energy of enclosed systems. Transfer of energy of systems. Definition of thermodynamic cycle. Learn to define a thermodynamic state and to calculate the value of the thermodynamic properties strangers from the relations between them. Learn to distinguish an ideal gas and to calculate variations of internal energy and enthalpy. Learn to do balances of energy and mass in volumes of control, so much in stationary state as transient. Understanding of the Second Principle of the thermodynamics. Learn to identify reversible and irreversible processes. Understanding of the consequences of the cycle of Carnot. Comprise the concept of entropy and learn to calculate variations of entropy so much in enclosed systems like open. Isoentropic Performances. Applications of the entropy to calculate transfers of heat and work in reversible processes.	15	C4	D1 D2 D3 D4 D7
Laboratory practical	It values through a type test examination when lab practices end. RESULTS OF LEARNING: Comprise the concept of thermodynamic System and of the thermodynamic properties. Units in which they quantify the thermodynamic properties. Learn to measure temperatures. Comprise the concepts of work, heat and energy of enclosed systems. Transfer of energy of systems. Definition of thermodynamic cycle. Learn to define a thermodynamic state and to calculate the value of the thermodynamic properties strangers from the relations between them. Learn to distinguish an ideal gas and to calculate variations of internal energy and enthalpy. Learn to do balances of energy and mass in volumes of control, so much in stationary state as transient. Understanding of the Second Principle of the thermodynamics. Learn to identify reversible and irreversible processes. Understanding of the consequences of the cycle of Carnot. Comprise the concept of entropy and learn to calculate variations of entropy so much in enclosed systems like open. Isoentropic Performances. Applications of the entropy to calculate transfers of heat and work in reversible processes.	5	C4	D1 D2 D3 D4 D7 D8
Essay questions exam	Resolution of problems examination. RESULTS OF LEARNING: Comprise the concept of thermodynamic System and of the thermodynamic properties. Units in which they quantify the thermodynamic properties. Learn to measure temperatures. Comprise the concepts of work, heat and energy of enclosed systems. Transfer of energy of systems. Definition of thermodynamic cycle. Learn to define a thermodynamic state and to calculate the value of the thermodynamic properties strangers from the relations between them. Learn to distinguish an ideal gas and to calculate variations of internal energy and enthalpy. Learn to do balances of energy and mass in volumes of control, so much in stationary state as transient. Understanding of the Second Principle of the thermodynamics. Learn to identify reversible and irreversible processes. Understanding of the consequences of the cycle of Carnot. Comprise the concept of entropy and learn to calculate variations of entropy so much in enclosed systems like open. Isoentropic Performances. Applications of the entropy to calculate transfers of heat and work in reversible processes.	80	C4	D1 D2 D3 D4 D7 D8

Other comments on the Evaluation

The exams of theory and practices prior to the final exam will allow obtaining 1.5 points out of a total of 10 points. The third theory exam, coinciding in time with the final exam, will allow obtaining 0.5 additional points. ALL the exams of theory and practices previous to the final exam will be recoverable in the own final exam in the two existing calls of December and June. The marks obtained in the exams of theory and practices are maintained throughout the academic year.

The final exams will consist of 3 theory exams and 1 of test-type practices, each punctuating 0.5 points. The other 8 points are for problem resolutions.

Exam calendar. Verify / consult in an updated way on the website of the center:

http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Moran, M.J. y Shapiro, H. N., **Fundamentos de termodinámica técnica**, 2ª edición, Reverté, 2004

Moran, M.J. y Shapiro, H. N., **Fundamentals of Engineering Thermodynamics**, 5th edition, John Wiley & Sons, 2003

Çengel, Yunus A., **Termodinámica**, 8ª edición, MacGraw-Hill, 2015

Çengel, Yunus A., **Thermodynamics: An Engineering Approach**, 8th edition, McGraw-Hill, 2015

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Heat and cool/V09G310V01405
Generation and distribution of conventional and renewable thermal energy/V09G310V01533
Nuclear engineering/V09G310V01632

Subjects that are recommended to be taken simultaneously

Fluid mechanics/V09G310V01305

Contingency plan

Description

Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET.

1. Semi-presential modality
Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the centre, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, CampusRemoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, CampusRemoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
As the teaching methodologies have been conceived for the face-to-face teaching modality, the teaching methodologies that would be kept and those which would be modified or replaced in the online modality are indicated below.

The teaching methodologies that would be kept, since they can be used in face-to-face and online teaching mode are all except laboratory practices. Instrumental management in aboratory practices will be replaced by videos.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

2.4. Evaluation. Type of assessment tests and the weight in the final grade will not be modified.

2.5. Bibliography or additional material to facilitate self-learning would not be modified.

IDENTIFYING DATA				
Materials technology				
Subject	Materials technology			
Code	V09G310V01303			
Study programme	Degree in Mining and Energy Resources Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Galician English			
Department				
Coordinator	Pérez Pérez, María del Carmen			
Lecturers	Figueroa Martínez, Raúl Pérez Pérez, María del Carmen Riobó Coya, Cristina			
E-mail	cperez@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	Material Technology is a second-year subject with a marked technological character. It is common for all students, regardless of the specific orientation. The objective is to present the fundamentals of Materials Science and Technology in a comprehensible way to students, focusing on the relationship between internal structure - properties - processing of materials. The learning outcomes are focused on: 1. Understanding the fundamental concepts of bonds, structure and microstructure of different types of materials. 2. Understanding the relationship between the microstructure of the material and its mechanical, electrical, thermal and magnetic behaviour. 3. Knowing the main techniques of structural characterization of materials. 4. Acquiring skills in the handling of diagrams and graphics. 5. Be able to interpret and implement material testing standards. 6. Acquiring skill in performing tests. 7. Analyzing the results obtained taking the corresponding conclusions. 8. Developing scientific view point and experimental methodology in the approach andsolution of problems related to Materials Technology.			

Competencies	
Code	
B1	Scientific and technical training in order to work professionally as a Technical Mining Engineer, with knowledge of the functions of consultancy, analysis, design, calculation, planning, construction, maintenance, conservation and exploitation.
B2	Understanding of the many technical and legal considerations that arise during development within the field of mining engineering, according to section 5 of Order CIN7306/2009, which have to do with geological-mineral prospecting and research, mine exploitation of all types of geological resources, including groundwaters, underground works, underground stores, treatment and smelting plants, energy plants, mineral and iron and steel plants, construction materials plants, carbon-chemical, petro-chemical and gas plants, waste and effluent treatment plants, and explosives manufacturing plants. In addition, the capacity to employ proven methods and accredited technologies in order to attain improved efficiency while respecting the Environment and protecting the health and safety of workers and users.
B3	Capacity to design, write and plan partial or specific projects for the units described in the previous section, such as mechanical and electrical installations, together with their maintenance, energy transport networks, transport and storage facilities for solid, liquid and gaseous materials, dumping sites, pools or dams, supports and foundations, demolition, restoration, blasting and explosives logistics.
B4	Capacity to design, plan, operate, inspect, sign and manage projects, plants or installations within the field.
B5	Capacity to carry out land planning studies and environmental studies related to the projects, plants and installations within the field.
B6	Capacity to maintain, conserve and exploit the projects, plants and installations within the field.
B7	Knowledge required to undertake, within the scope of mining engineering knowledge as established in section 5 of Order CIN/306/2009, measurements, layouts, plans and maps, calculations, valuations, risk analyses, expert inspections, studies and reports, work plans, environmental and social impact studies, restorations plans, quality control systems, prevention systems, evaluation analyses of the properties of metal, ceramic, refractory, synthetic and other materials, soil and solid rock characterization and other similar tasks.
B8	Knowledge, understanding and capacity to apply the legislation needed when working professionally as a Technical Mining Engineer.
C11	Capacity to learn, understand and use the principles and technologies of materials.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence.

D4	Encourage work based on cooperation, communication skills, organization, planning and recognition of responsibility in a multilingual and multidisciplinary working environment that fosters education in equality, peace and respect for fundamental rights.
D5	Know what sources are available for ongoing and continual updating of all the information required to undertake their work, with access to all the current and future tools for seeking information and adapting it in the light of technological and social changes.
D7	Capacity to organise, interpret, assimilate, create and manage all the information needed to organise their work, handling the I.T., mathematical, physical and other tools required.
D10	Become aware of the need for training and continual improvement in quality, developing the values associated with scientific thinking and showing a flexible, open and ethical attitude towards diverse opinions and situations, particularly in matters of non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Learning outcomes

Expected results from this subject	Training and Learning Results		
To understand the basic concepts related to bonding, structure, and microstructure of the different types of materials.		C11	D1
To understand the relationship between the material microstructure and its mechanical, electrical, thermal and magnetic behaviour.		C11	D1
To know the basis of the mechanical behaviour of the materials.		C11	D4 D5
To know the main techniques for structural characterization of materials.	B1 B7	C11	D1 D4 D5 D7 D10
To acquire skills for handling diagrams and plots.	B1 B3 B7	C11	D1
Capacity to apply standards for materials testing.	B1 B2 B3 B4 B5 B6 B7 B8	C11	D1 D4 D5
To acquire skills for performing tests.	B1 B2 B3 B4 B5 B6 B7 B8		D4

Contents

Topic	
CHAPTER I. INTRODUCTION	I.1. The Science and Engineering Materials. Definitions. I.2. Type of materials. Evolution and trends. I.3. Structure - Properties - Processing relationships. I.4. Introduction to the concept of design and selection of materials.
CHAPTERT II. CRYSTAL STRUCTURES. UNIT CELLS	I.1. Crystal / amorphous arrangements. Differences. II.2. Characteristics of crystals structures. Metallic, ionic and covalent crystals. II.3. Parameters of metallic structures: BCC, FCC, HCP. II.4. Crystallographic directions. Crystallographic planes (Miller indices). II.5. X-Ray diffraction: Determination of crystal structures.
CHAPTER III. IMPERFECTIONS IN SOLIDS. DIFFUSION.	III.1. Point defects. III.2. Linear defects: dislocations. Physical meaning of the dislocations. III.3. Surface defects. III.4. Diffusion: definition and mechanisms. III. 5. Fick's laws (first and second laws). III.6. Industrial application of diffusion phenomena.

CHAPTER IV. TESTING AND MECHANICAL PROPERTIES	IV.1. Elastic deformation. Young modulus. IV.2. Plastic deformation. IV.3. The tensile test: use of stress-strain diagram. IV.4. The compression and bend tests for brittle materials. IV.5. Hardness of materials. Hardness tests. IV.6. Impact test: toughness. IV.7. Fracture toughness: fracture mechanics. IV.8. Fatigue tests.
CHAPTER V. MECHANISMS OF DEFORMATION	V.1. Slipping mechanism: dislocations and plastic deformation. V.2. Deformation by twinning. V.3. Strain hardening by cold working. V.4. Annealing: recovery, recrystallization and grain growth.
CHAPTER VI. SOLIDIFICATION AND SOLID STATE TRANSFORMATION	VI.1. Principles of solidification: pure metals. Nucleation and growth steps. VI.2. Mechanism of strengthening by grain size reduction. VI.3. Solidification in ingot casting: cast structure. VI.4. Alloys: solid solution and intermediate phases. Solid-Solution Strengthening. VI.5. Cooling curves: pure materials and alloys. VI.6. Phase diagrams (I). Total solubility (binary isomorphous systems). Microsegregation. Eutectic and peritectic systems. VI.7. Phase diagrams (II). Solid state transformations. Partial solubility in solid state. Dispersion strengthening. Eutectoid reaction. VI.8. Introduction of ternary phase diagrams.
CHAPTER VII. MATERIALS FOR ENGINEERING (I): METALLIC MATERIALS	VII.1. Ferrous alloys: steels and cast irons. VII.2. The Iron-Iron Carbide (Fe-Fe3C) Phase Diagram. VII.3. Isothermal Transformation Diagrams (TTT). Continuous Cooling Transformation Diagrams (CCT). Microstructures. VII.4. Heat treatment of steels: annealing, normalizing, quenching, tempering. VII.5. Cast irons. Types: white cast iron, gray cast iron, ductile cast iron and compacted graphite cast iron. VII.6. Nonferrous alloys. Light alloys (based on Al, Ti). Alloys based on Cu, Pb, Sn, Zn and Ni.
CHAPTER VIII. MATERIALS FOR ENGINEERING (II): CERAMIC MATERIALS	VIII: 1. Crystal structures. VIII.2. Traditional ceramics: clay products, refractories, abrasives, cement and concrete. VIII.3. Advanced ceramics. VIII.4. Glass ceramics: Characteristics, viscous deformation. VIII.5. Heat treatments and vitroceramics.
CHAPTER IX. MATERIALS FOR ENGINEERING (III): POLYMERIC MATERIALS	IX.1. Polymerization. Types of polymers. IX.2. General characteristics: thermal, mechanical and chemical behaviour. IX.3. Thermoplastic plastics: structure, crystallinity. Types. IX.4. Thermosetting plastics: structure. Types. IX.5. Elastomeric materials: structure, vulcanization. Rubbers, thermoplastic elastomers. Types.
CHAPTER X. MATERIALS FOR ENGINEERING (IV): COMPOSITE MATERIALS	X.1. Classification and general characteristics. Matrix and disperse phases. X.2. Polymer matrix composites reinforced with fiber. X.3. Metal matrix composites and ceramic matrix composites. X.4. Laminar composites and sandwich structures.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	23	33.25	56.25
Problem solving	11.5	19	30.5
Studies excursion	3	0	3
Laboratory practical	10	26.25	36.25
Essay questions exam	0.5	6	6.5
Report of practices, practicum and external practices	0	8	8
Objective questions exam	0.5	0	0.5
Problem and/or exercise solving	1.5	7	8.5
Objective questions exam	0	0.5	0.5

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

Methodologies

	Description

Lecturing	Presentation by the teacher of the contents on the subject under study, theoretical and / or guidelines for a job, exercise or project to be developed by the student.
Problem solving	Activity which formulated problem and / or exercises related to the course. The student should develop appropriate solutions or right through the exercise routines, application of formulas or algorithms, application processing procedures available information and interpretation of the results. It is often used to complement the lecture
Studies excursion	The carrying out of the "Studies excursion" activity will be organised and carried out by the Centre, taking as a starting point the proposals made by the teaching staff of the subject and related to the type of facility / company to visit.
Laboratory practical	Activities application of knowledge to specific situations and basic skills acquisition and related procedural matter under study. They are developed in specific spaces with specialized equipment (Laboratories, computer rooms, etc ...)

Personalized assistance

Methodologies	Description
Lecturing	Time devoted to attend and resolve doubts related to the main topics of the subject. In general, it will be developed individually, in the office hours, which will be provided in the presentation of the subject and it will be available to students in the online platform used by the teacher and the students. Doubts will also be solved directly in class, during the lectures. The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.
Problem solving	Time devoted to attend and resolve doubts related to the main topics of the subject. In general, it will be developed individually, in the office hours, which will be provided in the presentation of the subject and it will be available to students in the online platform used by the teacher and the students. Doubts will also be solved directly in class, during the lectures. The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.
Laboratory practical	Time devoted to attend and resolve doubts related to the main topics of the subject. Generally, students will be advised in small groups, although it can be done individually. This activity can be developed directly during laboratory activity or in office hours. Useful information (office hours) will be provided at the beginning of the course. The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Assessment

	Description	Qualification	Training and Learning Results		
Essay questions exam	They consist in short questions included in the final exam. The learning outcomes achieved are: The understanding of the basic concepts related to bonding, structure, and microstructure of the different types of materials. The understanding of the relationship between the material microstructure and its mechanical, electrical, thermal and magnetic behaviour. The knowledge of the main techniques for structural characterization of materials and the acquisition of skills for handling diagrams and plots.	30		C11	D1 D7 D10
Report of practices, practicum and external practices	Each laboratory session generates a report that must be done by the students individually. The learning outcomes achieved are: the knowledge of the basis of the mechanical behaviour of the materials. The knowledge of the main techniques for structural characterization of materials. The acquisition of skills for handling diagrams and plots. The capacity to apply standards for materials testing and the developments of skills for performing tests.	10	B1 B2 B3 B4 B5 B6 B7 B8	C11	D4 D5
Objective questions exam	It will consist of a set of test-type questions related to the practices that were carried out in the laboratory. The learning outcomes achieved are: the understanding of the basic concepts related to bonding, structure, and microstructure of the different types of materials. The understanding of the relationship between the material microstructure and its behaviour, and the capacity to apply standards for materials testing.	10		C11	D1 D4 D5 D7 D10
Problem and/or exercise solving	They will be included in the final exam. These are exercises to put into practice the contents explained in the classroom. The learning outcomes achieved are: the understanding of the basic concepts related to bonding, structure, and microstructure of the different types of material. The understanding of the relationship between the material microstructure and its behaviour. The knowledge of the main techniques for structural characterization of materials, and the development of skills for handling diagrams and plots.	40		C11	D1 D4 D5 D7 D10

Objective questions exam	Tests that assess knowledge that includes closed with response alternatives questions (true/false, multiple choice, matching of elements...). The learning outcomes achieved are: The understanding of the basic concepts related to bonding, structure, and microstructure of the different types of materials. The understanding of the relationship between the material microstructure and its mechanical, electrical, thermal and magnetic behaviour. The knowledge of the main techniques for structural characterization of materials and the acquisition of skills for handling diagrams and plots.	10	C11	D1 D7 D10

Other comments on the Evaluation

In the first call, to pass the subject a minimum mark of 40% in the official exam must be reached.

In the second call (July), the continuous assessment will not be taken into account and the final exam is worth 10 points.

For checking the exams calendar, visit the webpage of the School: http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Callister, William D.; Rethwisch, David G., **Ciencia e Ingeniería de Materiales**, 2ª Ed., Reverté, 2016

Callister, William D.; Rethwisch, David G., **Materials Science and Engineering. An Introduction**, 9th Ed., Wiley, 2014

Asleland, Donald R. ; Fulay, Pradeep P. ; Wright, Wendelin J., **Ciencia e Ingeniería de Materiales**, 6ª Ed., CENGAGE Learning, 2012

Asleland, Donald R. ; Fulay, Pradeep P. ; Wright, Wendelin J., **Science and Engineering of Materials**, 7th Ed., CENGAGE Learning, 2015

Smith, W.; Hashemi, Javad, **Fundamentos de la ciencia e ingeniería de materiales**, 5ª ed., McGraw-Hill, 2010

Smith, W.; Hashemi, Javad, **Foundations Of Materials Science And Engineering,**, 5th ed., McGraw-Hill Education, 2009

Complementary Bibliography

J.M. Montes; F.G. Cuevas; J. Cintas, **Ciencia e Ingeniería de los Materiales**, 1ª Ed., Paraninfo, 2014

Shackelford, James F., **Introducción a la ciencia de materiales para ingenieros**, 7ª Ed., Pearson Educación, S.A, 2010

Shackelford, James F., **Introduction to Materials Science for Engineers**, 8th Ed., Pearson Education, S.A, 2016

Pero-Sanz, Antonio J., **Ciencia e Ingenieria de Materiales. Estructura, transformaciones, propiedades y selección**, 5ª ed., CIE-Dossat 2000, 2000

Recommendations

Subjects that are recommended to be taken simultaneously

Physics: Thermal systems/V09G310V01302
Materials resistance/V09G310V01304

Contingency plan

Description

Given the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University of Vigo establishes an extraordinary planning that will be activated when the administrations and the institution itself determine it, considering safety, health and responsibility criteria both in distance and blended learning. These already planned measures guarantee, at the required time, the development of teaching in a more agile and effective way, as it is known in advance (or well in advance) by the students and teachers through the standardized tool.

1. Semi-presential modality
Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the center, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, Campus Remoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, Campus Remoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
As the teaching methodologies have been conceived for the face-to-face teaching modality, the teaching methodologies that would be kept and those which would be modified or replaced in the online modality are indicated below.

The teaching methodologies that would be kept, since they can be used in face-to-face and online teaching mode
Lecturing and problem-solving. Both methodologies can be used through Campus Remoto platform.

The teaching methodologies that would be modified are the following
Laboratory and studies excursion. These methodologies must be modified. The use of videos that illustrate the objectives pursued with these methodologies is proposed as an alternative. As far as possible, online resources will be sought that allow student interaction with laboratory practice.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

2.4. Evaluation
The short questions exam is removed and the weight of the objective questions exam is increased by up to 50%. This test may consist of several tests distributed throughout the semester, depending on the evolution of the circumstances. In the extraordinary call for July, the same qualification criteria will be maintained as in the ordinary call.
2.5. Bibliography or additional material to facilitate self-learning
Self-appraisal tests will be proposed.

IDENTIFYING DATA				
Resistencia de materiais				
Subject	Resistencia de materiais			
Code	V09G310V01304			
Study programme	Grao en Enxeñaría dos Recursos Mineiros e Enerxéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	1c
Teaching language	Castelán			
Department	Enxeñaría dos materiais, mecánica aplicada e construción			
Coordinator	García González, Marcos			
Lecturers	García González, Marcos Lorenzo Mateo, Jaime Alberto Pérez Riveiro, Adrián			
E-mail	marcos.g.glez@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	Obxectivo da asignatura: Calcular tensións e deformacións xeradas en elementos resistentes elásticos sometidos a accións exteriores			

Competencias	
Code	
B1	Capacitación científico-técnica para o exercicio da profesión de Enxeñeiro Técnico de Minas e coñecemento das funcións consultivas, análise, deseño, cálculo, proxecto, construción, mantemento, conservación e explotación.
B2	Comprender os múltiples condicionamentos de carácter técnico e legal que xorden no desenvolvemento, no ámbito da enxeñaría de minas, que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o previsto no parágrafo 5 da orde CIN7306 / 2009, a prospección e investigación xeolóxica-mineira, as explotacións de todo tipo de recursos xeolóxicos, incluíndo as augas subterráneas, as obras subterráneas, os almacenamentos subterráneos, as plantas de tratamento e beneficio, as plantas de enerxía, as plantas mineralúrxicas e siderúrxicas, as plantas de materiais para a construción, as plantas de carboquímica, petroquímica e gas, as plantas de tratamentos de residuos e efluentes e fábricas de explosivos e capacidade para empregar métodos contrastados e tecnoloxías acreditadas, co obxectivo de acadar unha maior eficacia dentro do respecto polo Medio Ambiente e a protección da seguridade e saúde dos traballadores e usuarios das mesmas.
B3	Capacidade para deseñar, redactar e planificar proxectos parciais ou específicos das unidades definidas no parágrafo anterior, tales como instalacións mecánicas e eléctricas e o seu mantemento, redes de transmisión de enerxía, instalacións transporte e almacenamento para materiais sólidos, líquidos ou gasosos, entullarías, balsas ou encoros, sostemento e cimentación, demolición, restauración, voaduras e loxística de explosivos.
B4	Capacidade para deseñar, planificar, operar, inspeccionar, asinar e dirixir proxectos, plantas ou instalacións, no seu ámbito.
B5	Capacidade de realización de estudos de ordenación do territorio e dos aspectos medioambientais relacionados cos proxectos, plantas e instalacións, no seu ámbito.
B6	Capacidade para o mantemento, conservación e explotación dos proxectos, plantas e instalacións, no seu ámbito.
B7	Coñecemento para realizar, no ámbito da enxeñaría de minas, de acordo cos coñecementos adquiridos segundo o disposto no apartado 5 da orde CIN /306/2009, medicións, replanteos, planos e mapas, cálculos, valoracións, análise riscos, peritaxes, estudos e informes, plans de traballo, estudos de impacto ambiental e social, plans de restauración, sistema control de calidade, sistema de prevención, análise e avaliación das propiedades dos materiais metálicos, cerámicos, refractarios, sintéticos e outros materiais, caracterización de solos e macizos rochosos e outros traballos semellantes.
B8	Coñecemento, comprensión e capacidade de aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico de Minas.
C13	Coñecemento de resistencia de materiais e teoría de estruturas.
D1	Capacidade de interrelacionar todos os coñecementos adquiridos, interpretándoos como compoñentes dun corpo do saber cunha estrutura clara e unha forte coherencia interna.
D3	Propoñer e desenvolver solucións prácticas, utilizando os coñecementos teóricos, a fenómenos e situacións-problema da realidade cotiá propios da enxeñaría, desenvolvendo as estratexias adecuadas.
D9	Entender a transcendencia dos aspectos relacionados coa seguridade e saber transmitirlle esta sensibilidade ás persoas do seu ámbito.

Resultados de aprendizaxe		
Expected results from this subject	Training and Learning Results	
Coñecer as diferencias entre o sólido ríxido e o sólido elástico	C13	D1 D9

Aplicar o coñecemento adquirido a determinación dos valores máximos da tensión dun punto dun sólido deformable	B1 B2 B3 B4 B5 B7 B8	C13	D1 D3
Conocer os estados de tensións e deformacións nun sólido deformable e a relación entre eles	B2 B3 B4 B7 B8	C13	
Conocer os principios básicos que rixen a Resistencia de Materiais	B2 B3 B4	C13	
Coñecer as relacións entre as diferentes solicitacións e as tensiones que éstas orixinan	B1 B8	C13	D3
Aplicar o coñecemento adquirido sobre tensións ó cálculo das mesmas en elementos barra e en estructuras isostáticas sinxelas.	B2 B3 B4 B5 B6 B7	C13	D3
Coñecer as deformacións de elementos barra e de algunas estructuras isostáticas sinxelas	B2 B3 B4 B5 B6 B7	C13	D3
Aplicar o coñecemento adquirido sobre deformacións e a resolución de problemas hiperestáticos	B2 B3 B4 B5 B6 B7	C13	D3
Coñecer o fenómeno do pandeo	B1 B2 B7	C13	D1 D3 D9
Aplicar os coñecementos adquiridos ó dimensionamiento de elementos barra	B2 B3 B4 B5 B6 B7	C13	D3

Contidos

Topic	
Introdución á materia	Xeneralidades Definicións
Fundamentos de elasticidade	Introdución ao estudo da elasticidade Tensións en sólidos elásticos (Vector tensión, compoñentes intrínsecas do vector tensión, matriz de tensións, tensións e direccións principais, círculos de Mohr en tensións) Deformacións (Matriz de deformación, deformacións principais, vector deformación unitaria, compoñentes intrínsecas do vector deformación unitaria, círculos de Mohr en deformacións) Relacións entre tensións e deformacións Elasticidade bidimensional (Estado de deformación plana, Estado tensional plano, Depósitos de parede delgada)
Criterios de fallo	Criterio da tensión normal máxima Criterio de Saint-Venant Criterio de Tresca Criterio de Von-Mises Coeficiente de seguridade

Tracción-compresión	Tracción e compresión isostática. Cálculo de tensións e deformacións. Tracción e compresión hiperestáticas. Tensións orixinadas por variacións térmicas ou defectos de montaxe.
Cortadura	Aplicación ao cálculo básico de unións
Diagramas de solicitacións	Solicitacións Relación entre esforzo cortante, momento flector e densidade de carga Diagramas de solicitacións Concepto de deformada ou elástica
Flexión	Tipos de flexión Flexión pura. Tensión de Navier Flexión desviada Flexión simple. Fórmula de Zhuravski Ecuación da elástica. Aplicación a algúns casos particulares Teoremas 1º, 2º, 3º e 4º de Mohr Efecto do esforzo cortante na deformación das vigas. Simetría e antisimetría. Flexión hiperestática. Método xeral de cálculo. Vigas continuas
Torsión	Definición Teoría elemental de Coulomb Diagramas de momentos torsores Análise de tensións e de deformacións Torsión hiperestática
Solicitacións compostas	Flexión e torsión combinadas en eixos de sección circular. Cálculo de tensións e de deformacións. Concepto de centro de cortadura. Flexión composta en corpos de pouca esbeltez. Cálculo de tensións e determinación da liña neutra. Cálculo de tensións e deformacións en estruturas plano-espaciais.
Columnas. Fundamentos de pandeo	O fenómeno do pandeo Tipos de equilibrio Carga crítica de Euler Lonxitude de pandeo Límites de aplicación da teoría de Euler

Planificación

	Class hours	Hours outside the classroom	Total hours
Estudo previo	0.5	5	5.5
Lección maxistral	15	15	30
Resolución de problemas	18.5	41.5	60
Prácticas de laboratorio	10	5	15
Resolución de problemas de forma autónoma	0	20	20
Saídas de estudo	3	0	3
Seminario	2	2.5	4.5
Resolución de problemas e/ou exercicios	2	2	4
Autoavaliación	0	5	5
Práctica de laboratorio	1.5	1.5	3

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

Metodoloxía docente

	Description

Estudo previo	Actividades previas ás clases de aula. Exporanse exercicios cuxa finalidade é o mellor aproveitamento da clase de aula e/ou laboratorio que terá lugar con posterioridade á súa entrega. Estes exercicios deberán subirse á plataforma de teledocencia no prazo estipulado para iso. A entrega destes exercicios determinará a cualificación correspondente ás prácticas de laboratorio e ás probas de seguimento, tal como explícase no apartado de "Outros comentarios e segunda convocatoria" da guía docente.
Lección maxistral	Presentaranse os aspectos xerais da asignatura de forma estructurada, facendo especial énfasis nos fundamentos e aspectos máis importantes ou de máis difícil comprensión para o alumno. Utilizarase como guía o primeiro libro citado na bibliografía e cada semana indicarase na plataforma Tem@ o contido que se traballará durante a seguinte semana, para que o alumno póidao traballar previamente e seguir así as explicacións con maior aprovechamiento.
Resolución de problemas	Cada semana dedicarase un tempo á resolución por parte do alumno de exercicios ou problemas propostos, relacionados co contido que se estea vendo no momento.
Prácticas de laboratorio	Prácticas de laboratorio cooperativas coas que se poñerán en práctica os conceptos teóricos vistos no aula. Trala súa realización deberase facer unha análise dos resultados obtidos.Recollerase un informe das mesmas.
Resolución de problemas de forma autónoma	Suscitaranse exercicios e/ou problemas para resolver de forma autónoma, dando os resultados dos mesmos, que permitirán avaliar ao alumno o grado de consecución das competencias da materia.
Saídas de estudo	A realización da actividade formativa Salida de Estudos, será organizada e realizada polo centro, tomando como punto de partida as propuestas realizadas polo profesorado da materia sobre o tipo de instalación/empresa a visitar
Seminario	Actividades enfocadas ao traballo sobre un tema específico, que permiten profundar ou complementar os contidos da materia. Distribuiranse en tres sesións ao longo do curso.

Atención personalizada

Methodologies	Description
Resolución de problemas de forma autónoma	Plantexaranse ós alumnos boletins de exercicios nos cales dáse únicamente o resultado do mesmo para que eles poidan desenrolar os conceptos adquiridos de cada tema. Para todas las modalidades de docencia, las sesiones de tutorización podrán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) bajo la modalidad de concertación previa.

Avaliación

Description	Qualification	Training and Learning Results

Prácticas de laboratorio	Valorarase a entrega dos informes das prácticas e o seu contido segundo as pautas dadas antes da súa realización. Só se terá en conta a cualificación derivada da entrega dos informes, se estes representan o 50% ou máis da totalidade. Para que a cualificación obtida nas prácticas de laboratorio se sume á alcanzada no exame, será necesario obter neste unha puntuación mínima de 4/10. A cualificación das prácticas verase afectada co coeficiente que se explica no apartado de "Outros comentarios e segunda convocatoria" da guía. RESULTADOS DE APRENDIZAXE: Coñecer as diferencias entre o sólido ríxido e o sólido elástico. Aplicar o coñecemento adquirido a determinación dos valores máximos da tensión dun punto dun sólido deformable. Conocer os estados de tensións e deformacións nun sólido deformable e a relación entre eles. Conocer os principios básicos que rixen a Resistencia de Materiais. Coñecer as relacións entre as diferentes solicitacións e as tensiones que éstas orixinan. Aplicar o coñecemento adquirido sobre tensións ó cálculo das mesmas en elementos barra e en estructuras isostáticas sinxelas. Aplicar o coñecemento adquirido sobre deformacións e a resolución de problemas hiperestáticos. Coñecer o fenómeno do pandeo. Aplicar os coñecementos adquiridos ó dimensionamiento de elementos barra. Coñecer as deformacións de elementos barra e de algunas estructuras isostáticas sinxelas.	10	B1 C13 D1 B3 D3 D9
Resolución de problemas e/ou exercicios	Proba para a avaliación das competencias adquiridas na materia, consistente na resolución por parte do alumno de problemas e/ou cuestións teóricas breves. A duración da proba, así como o peso de cada cuestión, daranse a coñecer no momento de realización da mesma. RESULTADOS DE APRENDIZAXE: Coñecer as diferencias entre o sólido ríxido e o sólido elástico. Aplicar o coñecemento adquirido a determinación dos valores máximos da tensión dun punto dun sólido deformable. Conocer os estados de tensións e deformacións nun sólido deformable e a relación entre eles. Conocer os principios básicos que rixen a Resistencia de Materiais. Coñecer as relacións entre as diferentes solicitacións e as tensiones que éstas orixinan. Aplicar o coñecemento adquirido sobre tensións ó cálculo das mesmas en elementos barra e en estructuras isostáticas sinxelas. Aplicar o coñecemento adquirido sobre deformacións e a resolución de problemas hiperestáticos. Coñecer o fenómeno do pandeo. Aplicar os coñecementos adquiridos ó dimensionamiento de elementos barra. Coñecer as deformacións de elementos barra e de algunas estructuras isostáticas sinxelas.	80	B1 C13 D1 B2 D3 B4 B5 B6 B7 B8
Práctica de laboratorio	Plantexaranse exercicios curtos e/ou tests conceptuais ao longo do curso nas horas de aula. A súa valoración será de 0 a 10 puntos. Para que a cualificación obtida nestas probas sómese á alcanzada no exame, será necesario obter neste unha puntuación mínima de 4/10. A cualificación desta actividade verase afectada co coeficiente que se explica no apartado de "Outros comentarios e segunda convocatoria" da guía. RESULTADOS DE APRENDIZAXE: Coñecer as diferencias entre o sólido ríxido e o sólido elástico. Aplicar o coñecemento adquirido a determinación dos valores máximos da tensión dun punto dun sólido deformable. Conocer os estados de tensións e deformacións nun sólido deformable e a relación entre eles. Conocer os principios básicos que rixen a Resistencia de Materiais. Coñecer as relacións entre as diferentes solicitacións e as tensiones que éstas orixinan. Aplicar o coñecemento adquirido sobre tensións ó cálculo das mesmas en elementos barra e en estructuras isostáticas sinxelas. Aplicar o coñecemento adquirido sobre deformacións e a resolución de problemas hiperestáticos. Coñecer o fenómeno do pandeo. Aplicar os coñecementos adquiridos ó dimensionamiento de elementos barra. Coñecer as deformacións de elementos barra e de algunas estructuras isostáticas sinxelas.	10	B1 C13 D1

Other comments on the Evaluation

Para superar a materia será necesario obter unha puntuación mínima de 5 sobre 10.

O alumno poderá optar a unha avaliación final, previa xustificación das súas causas, que terá un peso do 100% da nota. Nesta proba valoraranse as competencias do conxunto da materia. Abrirase un prazo a principio de curso para solicitar a renuncia xustificada á avaliación continua. Dita solicitude entregarase en papel e asinada aos profesores da materia.

Durante o curso actual gardarase a cualificación obtida con anterioridade nas prácticas de laboratorio (10% da cualificación), para aqueles alumnos que así o soliciten no prazo que se fixará ao comezo de curso.

Así mesmo, durante o curso actual gardarase a cualificación obtida no curso anterior nas probas de seguimento (10% da cualificación), para aqueles alumnos que así o soliciten no prazo que se fixará ao comezo de curso.

Comentarios sobre as actividades relativas á avaliación continua:

A entrega das actividades previas (Estudos/actividades previos das apartado Metodoloxías da guía docente) determinará a cualificación obtida nas prácticas de laboratorio e nas probas de seguimento do seguinte modo:

Cualificación das prácticas de laboratorio = K (Suma das cualificacións das prácticas)/(Nº de prácticas)

Cualificación das probas de seguimento = K (Suma das Cualificacións das probas de seguimento)/(Nº de probas de seguimento)

Onde K = (Nº de exercicios previos entregados)/(Nº total de exercicios previos solicitados)

A falta de entrega de informes de prácticas, por causa xustificada ou non, non suporá a repetición da práctica nunha data distinta.

A falta de asistencia a unha proba de seguimento, por causa xustificada ou non, non suporá a realización da proba en data diferente.

Calendario de exames. Verificar/consultar de forma actualizada na páxina web do centro:

http://minaseenerxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

José Antonio González Taboada, **Tensiones y deformaciones en materiales elásticos**, 1ª ed., Tórculo,

José Antonio González Taboada, **Fundamentos y problemas de tensiones y deformaciones en materiales elásticos**, 1ª ed., Tórculo,

Complementary Bibliography

Recomendacións

Other comments

Conocimientos previos necesarios: vectores, centros de gravedad e momentos de inercia.

Plan de Continxencias

Description

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

1. Modalidade semipresencial
No caso de activarse a ensinanza semipresencial suporía unha redución dos aforos dos espazos docentes empregados na modalidade presencial, polo que como primeira medida o centro proporcionaría ao profesorado da materia a información relativa aos novos aforos dos espazos docentes, ao obxecto de que poida proceder a reorganizar as actividades formativas do que resta do cuadrimestre. Cabe sinalar que a reorganización dependerá do momento ao longo do cuadrimestre en que se activase dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

Informar a todo o alumnado a través da plataforma FaiTIC das condicións en que se desenvolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.

No caso de que parte do alumnado tiña realizadas prácticas de laboratorio instrumental ou de informática de forma presencial, realizar presencialmente, de ser posible, estas actividades ou equivalentes para o alumnado que non as realizou.

Das actividades que resten para rematar o cuadrimestre, identificar aquelas actividades formativas que poidan ser realizadas por todo o alumnado de forma presencial e as actividades formativas que se realizarán en modo remoto.

En relación as ferramentas para a empregar para as actividades formativas que se realicen en modo non presencial, contarase co uso de CampusRemoto e a plataforma FaiTIC.

2. Modalidade no presencial

No caso en que se active a modalidade de ensino non presencial (suspensión de todas as actividades formativas e de avaliación presenciais) empregaranse as ferramentas dispoñibles na actualidade na Universidade de Vigo: Campus Remoto e FaiTIC. As condicións de reorganización dependerán do momento ao longo do cuadrimestre en que se active dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

2.1. Comunicación
Informar a todo o alumnado a través da plataforma FaiTIC das condicións nas que se devolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

2,2. Adaptación e/ ou modificación de metodoloxías docentes
Dado que as metodoloxías docentes están concibidas para a modalidade de ensino presencial indícanse a continuación as metodoloxías docentes que se manterían e cales se modificarían ou substituirán na modalidade non presencial.

As metodoloxías docentes que se manteñen son as seguintes, dado que poden empregarse en modalidade presencial e non presencial:
Todas excepto as contempladas no seguinte punto

As metodoloxías docentes que se modifican son as seguintes:
As prácticas de laboratorio de manexo instrumental reemplazaranse por vídeos interactivos

2.3. Adaptación de atención de titorías e atención personalizada
As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa..

2.4. Avaliación
Non se prevé modificación

2.5. Bibliografía ou material adicional para facilitar a auto-aprendizaxe
Non se prevé modificación

IDENTIFYING DATA				
Fluid mechanics				
Subject	Fluid mechanics			
Code	V09G310V01305			
Study programme	Degree in Mining and Energy Resources Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	Spanish English			
Department				
Coordinator	Conde Fontenla, Marcos			
Lecturers	Conde Fontenla, Marcos Molares Rodríguez, Alejandro			
E-mail	mfontenla@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	Previous knowledge on differential equations, physics and mechanics is strongly recomended. The course is intended to acquire essential knowledge needed to analyze devices with fluid as a workingmaterial, such us hydraulic machinery, lubrication devices, heating and cooling systems, piping systems, pneumatic systems, aero and hydrodynamics devices, wind turbines, etc. The course includes stress and strain rate descriptions, fluid statics, differential and finite control volume analysis with continuity, momentum, and energy equations, Bernoulli and Euler equations, dimensional analysis, and laminar and turbulent one-dimensional pipe flow.			

Competencies	
Code	
C15	Knowledge of the principles of fluid mechanics and hydraulics.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence.
D2	Capacity to develop a complete project in any field included in this type of engineering, suitably combining acquired knowledge, accessing necessary information sources, undertaking the necessary enquiries and integrating into inter-disciplinary work teams.
D3	Propose and develop practical solutions, which develop suitable strategies based on theoretical knowledge, for problem phenomena and situations that arise as everyday realities in engineering.
D4	Encourage work based on cooperation, communication skills, organization, planning and recognition of responsibility in a multilingual and multidisciplinary working environment that fosters education in equality, peace and respect for fundamental rights.
D5	Know what sources are available for ongoing and continual updating of all the information required to undertake their work, with access to all the current and future tools for seeking information and adapting it in the light of technological and social changes.
D10	Become aware of the need for training and continual improvement in quality, developing the values associated with scientific thinking and showing a flexible, open and ethical attitude towards diverse opinions and situations, particularly in matters of non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Learning outcomes		
Expected results from this subject		Training and Learning Results
Understanding of the basic aspects of Fluid Mechanics and Hydraulics.	C15	D1 D3 D4
Capacity to apply that knowledge to solve fluid mechanics and hydraulics problems.	C15	D1 D2 D3 D4 D5
Knowledge of the most commonly used experimental processes when working with fluid flows.	C15	D3 D4 D5 D10
Mastery of current techniques available for analyzing fluid flows.	C15	D4 D5 D10

Acquisition of skills for the process of analyzing industrial problems where fluids are the means of work.	C15	D2 D5 D10

Contents	
Topic	
I. FLUIDS FUNDAMENTALS	1. Shear stress 2. Continuum hypothesis 3. Fluid's characteristics 4. Viscosity 5. Forces on a fluid
II. GENERAL STUDY ABOUT FLUID FLOW	1. Velocity field 2. Stream lines 3. Flow types 4. Sytem and control volume definition 5. Reynolds transport theorem 6. Continuity equation 7. Momentum equation 8. Navier-poisson law 9. Energy equation
III. DIMENSIONLESS ANALYSIS AND SIMILARITY IN FLUID DYNAMICS	1. Dimensionless magnitudes 2. Basics on dimensionless analysis 3. Buckingham's Pi theorem 4. Important non-dimensional groups in Fluid Mechanics 5. Similarity
IV. LAMINAR FLOW	1. Introduction 2. One-directional, steady laminar flow of liquids 3. Finite pipe length effect 4. Head loss in laminar flow 5. Laminar flow stability
V. TURBULENT FLOW	1. Introduction 2. Head loss in turbulent flow 3. Empirical formulae for flow through pipes
VI. FLOW OF LIQUID THROUGH VARIABLE CROSS-SECTIONAL DUCTS	1. Introduction 2. Secondary losses 3. Pump-pipe system coupling 4. Piping systems 5. Piping arrangement: series 6. Piping arrangement: parallel 7. Piping network
VII. OPEN-CHANNEL STEADY-FLOW	1. Introcuction 2. Free surface flow classification 3. Common geometries 4. Equations for uniform flow 5. Most efficient section design 6. Energy approach analysis 7. Generalized cross section 8. Energy analysis for sub-critical, transitional and supercritical 9. Head loss 10. Flow measurement 11. Momentum equation 12. Hydraulic jump

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	25	50	75
Autonomous problem solving	0	37	37
Laboratory practical	2	5.5	7.5
Studies excursion	3	0	3
Problem solving	20	0	20
Essay questions exam	2.5	0	2.5
Report of practices, practicum and external practices	0	5	5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Lecturing	Mainly lectures, but can also include: Readings Literature Review Solution of problems Conferences Oral Presentations Class notes will be previously given to the students in order to ask any doubt during class time.
Autonomous problem solving	To fix the concepts tackled in lectures, including activities such as: Readings Seminars Solution of problems Team working Study of actual cases
Laboratory practical	Experimental activities with actual facilities and/or computer models
Studies excursion	The realization of the formative activity Studies excursion, will be organized by the School board, according to the porposal of the teaching staff about the type of facility or company to visit.
Problem solving	Exercises are previously given to the students, bringing them a try to solve by themselves. Later, some of them will be solved in class by the students and/or the teacher

Personalized assistance

Methodologies	Description
Autonomous problem solving	Personalized attention will be given to the students during class (throughout the possible questions that could arise) and during the specific timetable of the teacher for tutorships. Updated information of the tutorships timetables will be given to the students during first week of class. Tutorshiping will take place both in face-to-face or distance modes, by means of the e-learning applications offered by the University of Vigo or equivalent methods. The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement, in all teaching modalities.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	Each practical lesson will be assessed by means of a brief quiz or a written report. The weigth of this part in the final grade will be 10% maximum. LEARNING OUTCOMES: Understanding of the basic aspects of Fluid Mechanics and Hydraulics. Capacity to apply that knowledge to solve fluid mechanics and hydraulics problems. Knowledge of the most commonly used experimental processes when working with fluid flows. Mastery of current techniques available for analyzing fluid flows. Acquisition of skills for the process of analyzing industrial problems where fluids are the means of work.	10	C15	D1 D2 D3 D4 D5 D10
Essay questions exam	This test will represent the final exam to be done at the end of the couurse, according to the official course schedule. It will cover the 80% of the final grade (maximum). LEARNING OUTCOMES: Understanding of the basic aspects of Fluid Mechanics and Hydraulics. Capacity to apply that knowledge to solve fluid mechanics and hydraulics problems. Knowledge of the most commonly used experimental processes when working with fluid flows. Mastery of current techniques available for analyzing fluid flows. Acquisition of skills for the process of analyzing industrial problems where fluids are the means of work.	90	C15	D1 D2 D3 D4 D5 D10

Other comments on the Evaluation

- There will be two continuous assessment quizzes, each of them assessed from 0 to 1 points (2 points maximum). [C_pec]

- There will be two lab sessions, with handed over labwork and report, each of them assessed up to 0.5 points (1 point maximum).[C_lab]- There will be a final exam, to be graded from 0 to 10points. [C_ex]To compute the final grade (C_actas), the followingformula will be used, where C_actas has to equal 5 or above to pass the course:Continuous assessment mode: C_actas = (C_pec + C_lab) +C_ex * (1 - (C_pec + C_lab)/10)Non-attendance mode (officially aproved): C_actas = C_ex

The same assessment methodology will apply in summer exam.

Exam Timetable: Exam dates and rooms must be verified in the official webpage of the school:

http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

White, Frank M., **Mecánica de fluidos**, 6ª ed., McGraw-Hill, 2009

White, Frank M., **Fluid Mechanics**, 6ª ed., McGraw-Hill, 2009

Crespo Martinez, Antonio, **Mecánica de fluidos**, 1ª ed., Thomson, 2006

Complementary Bibliography

Streeter, Victor L. et al., **Fluid Mechanics**, 9ª ed., McGraw-Hill, 2000

Heras, Salvador de las, **Mecánica de fluidos en ingeniería**, 1ª ed., Iniciativa Digital Politècnica, 2012

Barrero Ripoll, Antonio et al., **Fundamentos y Aplicaciones de la Mecánica de Fluidos**, 1ª ed., McGraw-Hill, 2005

Batchelor, G. K., **An introduction to fluid dynamics**, Cambridge Mathematical Library edition, Cambridge University Press, 2000

Hernández Krahe, J. M., **Mecánica de Fluidos y Máquinas Hidráulicas**, 1ª ed., Servicio de publicaciones de la UNED, 2000

Agüera Soriano, José, **Mecánica de fluidos incompresibles y turbomáquinas hidráulicas**, 1ª ed., Ciencia 3, 1996

Fox, Robert W.; McDonald, Alan T., **Introducción a la Mecánica de Fluidos**, 2ª ed., Interamericana - Mc-Graw Hill, 1995

Recommendations

Subjects that continue the syllabus

Resources, installations and hydro-power plants/V09G310V01631

Contingency plan

Description

Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET.

1. Semi-presential modality
Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the centre, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, CampusRemoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, CampusRemoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities

and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
As the teaching methodologies have been conceived for the face-to-face teaching modality, the teaching methodologies that would be kept and those which would be modified or replaced in the online modality are indicated below.

The teaching methodologies that would be kept, since they can be used in face-to-face and online teaching mode

Conventional lectures, practicum and seminars will be substituted by virtual ones, in the UVigo e-learning system. Practicum lessons contents will be adapted to allow the development of the self-tasks in common computers. New activities will focus in algorithms development and knowledge application to common tasks, basic skill adquisition and know-how adquisition, closely related with the main topics of the course. Tasks under evaluation will be performed at home, using GNU software or licensed software to the student available at the university at no extra charge.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement

2.4. Evaluation
The same weights for the different parts of the course will remain unchanged.
All the remaining tests and quizzes will be developed in the e-learnig platform of the UVigo (Moodle and so).

2.5. Bibliography or additional material to facilitate self-learning
Additional references (students self-learning improvement)
Mastering VBA for Microsoft Office 365 - Autor: Richard Mansfield; 944 páginas, Editor: John Wiley & Sons Inc; Edición: 2019; ISBN-10: 1119579333; ISBN-13: 978-1119579335)
Introducción a la programación en Matlab: para ingenieros civiles y mecánicos Autor: Luis E. Suarez; 168 páginas; Publisher: CreateSpace Independent Publishing Platform; 1 edition; ISBN-10: 1490482393; ISBN-13: 978-1490482392)

IDENTIFYING DATA				
Geomatics				
Subject	Geomatics			
Code	V09G310V01401			
Study programme	Degree in Mining and Energy Resources Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Martínez Sánchez, Joaquín			
Lecturers	Garrido González, Iván Liñares Méndez, Patricia Martínez Sánchez, Joaquín			
E-mail	joaquin.martinez@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	The objective of this subject is that the students acquire the main concepts about data acquisition with different kinds of sensors (topographic, photogrammetric and LiDAR, GPS...) oriented to gathering maps and/or planes and presenting the results making use of Geographical Information Systems (GIS).			

Competencies	
Code	
B1	Scientific and technical training in order to work professionally as a Technical Mining Engineer, with knowledge of the functions of consultancy, analysis, design, calculation, planning, construction, maintenance, conservation and exploitation.
B2	Understanding of the many technical and legal considerations that arise during development within the field of mining engineering, according to section 5 of Order CIN7306/2009, which have to do with geological-mineral prospecting and research, mine exploitation of all types of geological resources, including groundwaters, underground works, underground stores, treatment and smelting plants, energy plants, mineral and iron and steel plants, construction materials plants, carbon-chemical, petro-chemical and gas plants, waste and effluent treatment plants, and explosives manufacturing plants. In addition, the capacity to employ proven methods and accredited technologies in order to attain improved efficiency while respecting the Environment and protecting the health and safety of workers and users.
B3	Capacity to design, write and plan partial or specific projects for the units described in the previous section, such as mechanical and electrical installations, together with their maintenance, energy transport networks, transport and storage facilities for solid, liquid and gaseous materials, dumping sites, pools or dams, supports and foundations, demolition, restoration, blasting and explosives logistics.
B4	Capacity to design, plan, operate, inspect, sign and manage projects, plants or installations within the field.
B5	Capacity to carry out land planning studies and environmental studies related to the projects, plants and installations within the field.
B6	Capacity to maintain, conserve and exploit the projects, plants and installations within the field.
B7	Knowledge required to undertake, within the scope of mining engineering knowledge as established in section 5 of Order CIN/306/2009, measurements, layouts, plans and maps, calculations, valuations, risk analyses, expert inspections, studies and reports, work plans, environmental and social impact studies, restorations plans, quality control systems, prevention systems, evaluation analyses of the properties of metal, ceramic, refractory, synthetic and other materials, soil and solid rock characterization and other similar tasks.
B8	Knowledge, understanding and capacity to apply the legislation needed when working professionally as a Technical Mining Engineer.
C14	Knowledge of topography, photogrammetry and cartography.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence.
D3	Propose and develop practical solutions, which develop suitable strategies based on theoretical knowledge, for problem phenomena and situations that arise as everyday realities in engineering.
D4	Encourage work based on cooperation, communication skills, organization, planning and recognition of responsibility in a multilingual and multidisciplinary working environment that fosters education in equality, peace and respect for fundamental rights.
D5	Know what sources are available for ongoing and continual updating of all the information required to undertake their work, with access to all the current and future tools for seeking information and adapting it in the light of technological and social changes.
D7	Capacity to organise, interpret, assimilate, create and manage all the information needed to organise their work, handling the I.T., mathematical, physical and other tools required.

Learning outcomes

Expected results from this subject	Training and Learning Results		
Understanding of the basic aspects needed to draw up plans at different scales.	B1 B2 B3 B4 B5 B6 B7 B8	C14	
Mastery of current techniques for data collection in the field using different sensor types which enable map and plan creation.	B1 B3 B5 B7	C14	D1 D3 D4 D5 D7
Knowledge of topographic techniques for data collection.	B1 B3 B5 B6 B8	C14	
Ability to handle the main topographic instruments.	B1 B3 B5 B6 B8	C14	D3
Knowledge of photogrammetric techniques for collecting and processing data.	B1 B3 B5 B6	C14	
Acquisition of skills to use data from different sources to obtain point clouds which can later allow the creation of plans at different scales.	B1 B3 B5 B7	C14	D3

Contents	
Topic	
Geodesy and Cartography Basic concepts. Data sources and means for capturing information and obtaining topographical planes	Concept of Geodesy, Geoid and ellipsoid. Concept of Cartography. Geographical and cartographic coordinates. Coordinate Reference Systems . Datum. Cartographic projections. UTM. Classical, digital and online data sources. Available information through Internet
Aerial and terrestrial Photogrammetry basics.	Photogrammetry Principles of , basic concepts, relation between space image - and object 3D space. General photogrammetric Processing: relative and absolute orientation. Photogrammetric Cameras: interior orientation and calibration. Photogrammetric restitution. Rectification and orthorectification. Photogrammetric survey: project and flight planning and management.
Introduction to LiDAR sensors	Introduction to laser scanning devices. Aerial, Terrestrial and Mobile Laser scanners and basics of the method.
Topography basics. Topographical instruments and methods.	Key concepts: scales, limits of visual perception, units, planimetrics and altimetrics. Simple instruments and components. Radiation Methodology. Planimetric and altimetric surveying. Error theory.
Global Navigation Satellite Systems , GNSS	Examples of current GNSS systems: GPS, GLONASS, GALILEO, COMPASS. System description, components and segments. Measurment methodology and acquistion methods. Precision discussion.

Planning			
	Class hours	Hours outside the classroom	Total hours
Problem solving	7.5	17.5	25
Laboratory practical	8	15	23
Practices through ICT	13	21	34
Seminars	1.5	4	5.5

Lecturing	19.5	20	39.5
Problem and/or exercise solving	2	10	12
Objective questions exam	0.5	5	5.5
Report of practices, practicum and external practices	0.5	5	5.5

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

Methodologies

	Description
Problem solving	Activity in which a number of problems and/or exercises related with the subject are presented to the students. The student must develop suitable and correct solutions by means of routines, the application of formulas or algorithms, the application of procedures of transformation of the available information and the interpretation of the resulted. It usually employ how supplement of the master class lessons.
Laboratory practical	Application of the learnt concepts to concrete situations and acquisition of basic and procedural skills related with the subject object of study. Developmetnt in special spaces with specialized equipment.
Practices through ICT	Application of the knowledge to concrete situations, and of acquisition of basic and procedural skills related with the subject object of study, developed in classrooms of computing.
Seminars	Interviews between the lecturer and the students focused on consulting and development of activities and /or the learning process.
Lecturing	Exposition by the lecturer of the theoretical concepts and basics of the subject and/or guidelines for exercises or projects to be developed by the students.

Personalized assistance

Methodologies	Description
Laboratory practical	It will provide orientation, support and motivation for the process of learning of face-to-face form in the classroom and in the moments that the professor has assigned to tutorials. For all the modalities of teaching, the sessions of tutorials will be able to make by telematic means (email, videoconference, forums of *FAITIC, ...) Under the modality of previous agrreement.
Practices through ICT	It will provide orientation, support and motivation for the process of learning of face-to-face form in the classroom and in the moments that the professor has assigned to tutorials. For all the modalities of teaching, the sessions of tutorials will be able to make by telematic means (email, videoconference, forums of *FAITIC, ...) Under the modality of previous agrreement.
Seminars	It will provide orientation, support and motivation for the process of learning of face-to-face form in the classroom and in the moments that the professor has assigned to tutorials. For all the modalities of teaching, the sessions of tutorials will be able to make by telematic means (email, videoconference, forums of *FAITIC, ...) Under the modality of previous agrreement.

Assessment

	Description	Qualification	Training and Learning Results		
Practices through ICT	A continuous evaluation process will be followed by monitoring the work in the computer classroom practices. Learning outcomes: Understanding of the basic aspects needed to draw up plans at different scales.- Mastery of current techniques for data collection in the field using different sensor types which enable map and plan creation. - Ability to handle the main topographic instruments. Knowledge of topographic techniques for data collection. Acquisition of skills to use data from different sources to obtain point clouds which can later allow the creation of plans at different scales.	20	B1 B5 B7	C14	D1 D4 D5 D7
Problem and/or exercise solving	Overall assessment of the teaching-learning process and the acquisition of competencies and knowledge through resolutions of problems and exercises. Learning outcomes: - Understanding of the basic aspects needed to draw up plans at different scales. - Mastery of current techniques for data collection in the field using different sensor types which enable map and plan creation. - Ability to handle the main topographic instruments. Knowledge of topographic techniques for data collection.	50	B1	C14	D3

Objective questions exam	Overall assessment of the teaching-learning process and the acquisition of competencies and knowledge through test-type tests. Learning outcomes: - Understanding of the basic aspects needed to draw up plans at different scales. Knowledge of topographic techniques for data collection. Knowledge of photogrammetric techniques for collecting and processing data. Acquisition of skills to use data from different sources to obtain point clouds which can later allow the creation of plans at different scales.	10	B3	C14	D1 D7
Report of practices, practicum and external practices	Overall assessment of the teaching-learning process and the acquisition of competencies and knowledge through the realization of works and / or projects. Learning outcomes: Mastery of current techniques for data collection in the field using different sensor types which enable map and plan creation. Knowledge of photogrammetric techniques for collecting and processing data. Ability to handle the main topographic instruments. Acquisition of skills to use data from different sources to obtain point clouds which can later allow the creation of plans at different scales.	20	B1	C14	D3

Other comments on the Evaluation

It will be necessary to reach a minimum mark for both practical and theoretical parts of the subject. This mark will be set during the lectures and only the students that reach both minima will pass the ordinary examination call. The final mark will be the average of theoretical and practical marks.

Marks could be kept for those students that had reached a minimum mark during the ordinary call. On the contrary, students would have to pass the extraordinary examination. The theoretical extraordinary call will consist of problem solving and test assessment on the official date.For practical contents assessment, students would have to present a report about the pending parts of the subject or pass a pratical examination that will be described during the lectures.

Again, the final mark will be the average of theoretical and pratical marks.

Exam Timetable: Exam dates and rooms must be verified in the official webpage of the school:

http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Wolf, Paul R. y Brinker, Russell C., **Topografía**, 11ª ed., Alfaomega, 2009 reimp. 2014

de Sanjosé Blasco, José Juan; López González, Mariló; Atkinson, Alan D.J., **Topografía para estudios de grado: geodesia, cartografía, fotogrametría, topografía (instrumentos, métodos y aplicaciones), replanteo, seguridad del topógrafo en el trabajo**, 3ª ed., Bellisco, 2015

Delgado Pascual, Mercedes (et al.), **Problemas resueltos de topografía**, 1ª ed., Universidad de Salamanca, 2006 reimp. 2011

Lerma García, José Luis, **Fotogrametría moderna: analítica y digital**, 1ª ed., Universidad Politécnica de Valencia, 2002

Chuvieco Salinero, Emilio, **Fundamentos de la teledetección espacial**, 3ª ed., Rialp, 1996

Complementary Bibliography

de Corral Manuel de Villena, Ignacio, **Topografía de obras**, 1ª ed. reimp., Universitat Politécnica de Catalunya, 2001 reimp 2009

Carpio Hernández, Juan Pedro, **Redes topométricas**, 1ª ed., Bellisco, 2001

Santamaría Peña, Jacinto, **Problemas resueltos de topografía práctica**, 2ª ed., Universidad de La Rioja, 1999

Luhmann, Thomas y Robson, Stuart, **Close Range Photogrammetry: Principles, Methods and Applications**, 1ª ed., Whittles Publishing, 2011

Vosselman, George y Maas, Hans-Gerd, **Airborne and Terrestrial Laser Scanning**, 1ª ed., CRC Press, 2010

Recommendations

Subjects that continue the syllabus

Construction management and on-site layout/V09G310V01601
Resources, installations and hydro-power plants/V09G310V01631
Projects/V09G310V01802
GIS and land management/V09G310V01701
Final Year Dissertation/V09G310V01991

Subjects that are recommended to be taken simultaneously

Environmental technology/V09G310V01402

Contingency plan

Description

=== EXCEPTIONAL PLANNING ===
Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET.

1. Semi-presential modality
Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the centre, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, CampusRemoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, CampusRemoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
Laboratory practices that require specialized material will be replaced by online alternatives based on simulators and the resolution of these practices using software tools.
The rest of the teaching methodologies will be maintained since they can be used in face-to-face and non-face-to-face mode.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

2.4. Evaluation

The assessment tests in non-attendance learning will include the resolution of practical and theoretical tests based on reasoned discussion and justified themes relating to the course.

IDENTIFYING DATA				
Tecnoloxía ambiental				
Subject	Tecnoloxía ambiental			
Code	V09G310V01402			
Study programme	Grao en Enxeñaría dos Recursos Mineiros e Enerxéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	2c
Teaching language	Castelán			
Department	Enxeñaría dos recursos naturais e medio ambiente			
Coordinator	Barrionuevo Giménez, Rafael			
Lecturers	Barrionuevo Giménez, Rafael			
E-mail	rbarrio@uvigo.es			
Web	http://ambiental.uvigo.es			
General description	Visión xeral da tecnoloxía ambiental.			

Competencias	
Code	
B1	Capacitación científico-técnica para o exercicio da profesión de Enxeñeiro Técnico de Minas e coñecemento das funcións consultivas, análise, deseño, cálculo, proxecto, construción, mantemento, conservación e explotación.
B2	Comprender os múltiples condicionamentos de carácter técnico e legal que xorden no desenvolvemento, no ámbito da enxeñaría de minas, que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o previsto no parágrafo 5 da orde CIN7306 / 2009, a prospección e investigación xeolóxica-mineira, as explotacións de todo tipo de recursos xeolóxicos, incluíndo as augas subterráneas, as obras subterráneas, os almacenamentos subterráneos, as plantas de tratamento e beneficio, as plantas de enerxía, as plantas mineralúrxicas e siderúrxicas, as plantas de materiais para a construción, as plantas de carboquímica, petroquímica e gas, as plantas de tratamentos de residuos e efluentes e fábricas de explosivos e capacidade para empregar métodos contrastados e tecnoloxías acreditadas, co obxectivo de acadar unha maior eficacia dentro do respecto polo Medio Ambiente e a protección da seguridade e saúde dos traballadores e usuarios das mesmas.
B3	Capacidade para deseñar, redactar e planificar proxectos parciais ou específicos das unidades definidas no parágrafo anterior, tales como instalacións mecánicas e eléctricas e o seu mantemento, redes de transmisión de enerxía, instalacións transporte e almacenamento para materiais sólidos, líquidos ou gasosos, entullarías, balsas ou encoros, sostemento e cimentación, demolición, restauración, voaduras e loxística de explosivos.
B4	Capacidade para deseñar, planificar, operar, inspeccionar, asinar e dirixir proxectos, plantas ou instalacións, no seu ámbito.
B5	Capacidade de realización de estudos de ordenación do territorio e dos aspectos medioambientais relacionados cos proxectos, plantas e instalacións, no seu ámbito.
B6	Capacidade para o mantemento, conservación e explotación dos proxectos, plantas e instalacións, no seu ámbito.
B7	Coñecemento para realizar, no ámbito da enxeñaría de minas, de acordo cos coñecementos adquiridos segundo o disposto no apartado 5 da orde CIN /306/2009, medicións, replanteos, planos e mapas, cálculos, valoracións, análise riscos, peritaxes, estudos e informes, plans de traballo, estudos de impacto ambiental e social, plans de restauración, sistema control de calidade, sistema de prevención, análise e avaliación das propiedades dos materiais metálicos, cerámicos, refractarios, sintéticos e outros materiais, caracterización de solos e macizos rochosos e outros traballos semellantes.
B8	Coñecemento, comprensión e capacidade de aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico de Minas.
C18	Capacidade para aplicar metodoloxías de estudos e avaliacións de impacto ambiental e, en xeral, de tecnoloxías ambientais, sustentabilidade e tratamento de residuos.
D2	Capacidade de desenvolver un proxecto completo en calquera campo desta enxeñaría, combinando de forma adecuada os coñecementos adquiridos, accedendo ás fontes de información necesarias, realizando as consultas precisas e integrándose en equipos de traballo interdisciplinar.
D4	Favorecer o traballo cooperativo, as capacidades de comunicación, organización, planificación e aceptación de responsabilidades nun ambiente de traballo multilingüe e multidisciplinar, que favoreza a educación para a igualdade, para a paz e para o respecto dos dereitos fundamentais.
D6	Coñecer e manexar a lexislación aplicable ao sector, coñecer o medio social e empresarial e saber relacionarse coa administración competente integrando este coñecemento na elaboración de proxectos de enxeñaría e no desenvolvemento de calquera dos aspectos do seu labor profesional.
D7	Capacidade para organizar, interpretar, asimilar, elaborar e xestionar toda a información necesaria para desenvolver o seu labor, manexando as ferramentas informáticas, matemáticas, físicas, etc. necesarias para iso.
D8	Concibir a enxeñaría nun marco de desenvolvemento sostible con sensibilidade cara temas ambientais.

D9	Entender a transcendencia dos aspectos relacionados coa seguridade e saber transmitirlle esta sensibilidade ás persoas do seu ámbito.
D10	Tomar conciencia da necesidade dunha formación e mellora continua de calidade, desenvolvendo valores propios da dinámica do pensamento científico, mostrando unha actitude flexible, aberta e ética ante opinións ou situacións diversas, en particular en materia de non discriminación por sexo, raza ou relixión, respecto aos dereitos fundamentais, accesibilidade, etc.

Resultados de aprendizaxe

Expected results from this subject	Training and Learning Results		
Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes en Técnicas ambientais	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10
Comprender os aspectos básicos dos sistemas de Xestión da calidade total	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10
Coñecer o proceso experimental utilizado cando se traballa con ferramentas informáticas	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10
Dominar as técnicas actuais dispoñibles para a análise dos problemas medioambientais	B1 B2 B3 B4 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10
Profundar nas técnicas de realización dun EIA	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10
Coñecer as novas técnicas de minería de datos medio ambientais e materia de seguridade	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10
Adquirir habilidades sobre o proceso de análise de datos ambientais	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10

Contidos

Topic	
PROXECTOS AMBIENTAIS. E.I.A.	A MINERÍA E O MEDIO AMBIENTE TIPOS DE EXPLOTACIÓNS MINEIRAS VERTEDOIROS PRESOS DE RESIDUOS IDENTIFICACIÓN DE ALTERACIÓNS E AVALIACIÓN DO I.A. CONTROL E PREVENCIÓN DO PO CONTROL E PREVENCIÓN DO RUÍDO EN EXPLOTACIÓNS CONTROL E PREVENCIÓN DA CONTAMINACIÓN DA AUGA CONTROL DAS VIBRACIÓNS E ONDA AÉREA PRODUCIDAS POR VOADURAS CONTROL DE AFUNDIMENTOS MINEIROS CONTROL DA EROSIÓN E SEDIMENTACIÓN. OBRAS ESTRUTURAIS INTEGRACIÓN PAISAXÍSTICA, CRITERIOS E TÉCNICAS USOS POTENCIAIS DOS TERREOS AFECTADOS POLAS ACTIVIDADES MINEIRAS FACTORES AMBIENTAIS QUE AFECTAN Á RESTAURACIÓN DA VEXETACIÓN ANÁLISE E PREPARACIÓN DOS TERREOS PARA EFECTUAR A REVEXETACIÓN SELECCIÓN DE ESPECIES VEXETAIS IMPLANTACIÓN DA VEXETACIÓN AVALIACIÓN ECONÓMICA DOS PROXECTOS DE RESTAURACIÓN SEGUIMENTO E CONTROL DESEÑO DE ESCALAS DE PECES OUTROS PROXECTOS AMBIENTAIS
Xeneralidades sobre Residuos urbanos	Impactos ambientais dos residuos sólidos urbanos. Impactos sobre o sistema adoito-planta. Contaminación por metais nos chans urbanos. O papel dos microorganismos nas actividades. Focos potenciais de contaminación puntual en augas subterráneas. Impacto ambiental da vertedura de residuos sólidos urbanos en poboacións pequenas. Determinación da permanencia dos efectos contaminantes dun vertedoiro de residuos sólidos urbanos. Contido en compostos nitroxenados das augas subterráneas debido aos residuos sólidos urbanos. Fontes difusas de contaminación. Recuperación dos residuos sólidos urbanos. Recuperación e reciclado. Utilización agrícola dos residuos sólidos urbanos e técnicas de compostaxe. Efectos dos lodos residuais sobre as propiedades dos chans. O papel e os residuos urbanos. O reciclaxe do papel e cartón. Usos do papel e do cartón reciclado. A reciclaxe do vidro. Sensibilidade social fronte á recollida selectiva. Sistemas pasivos de depuración mediante de lagunaxe. Marco legal dos residuos urbanos
Xestión de residuos: Cálculo e Dimensionamento. Deseño e almacenamento de vertedoiros de residuos e plantas de tratamento	Territorialización e xestión. Produción de R.S.U. Determinación da produción de residuos. Recollida. Instalacións de transporte e transferencia. Instalacións complementarias. Instalacións complementarias para o tratamento de residuos tóxicos e perigosos. Plantas tipo. Deseño de vertedoiros controlados. Tratamento de lixiviados. Planta de lixiviados. Aproveitamento do Biogás. Plantas futuras Cálculo e dimensionado de persoais e equipos. Custos asociados

Residuos sanitarios sólidos	Introdución. Problemática actual dos residuos sanitarios sólidos. Política e lexislación na Unión Europea. Clasificación e definición dos residuos sanitarios sólidos. Riscos derivados dos residuos sanitarios sólidos. Envasado dos residuos sanitarios sólidos. Tratamento e eliminación dos residuos sanitarios sólidos. Residuos radioactivos sólidos. Residuos citostáticos. Plantas incineradoras de residuos sólidos sanitarios
RESIDUOS RADIOACTIVOS DE ALTA ACTIVIDADE	Introdución Almacenamento en formacións xeolóxicas profundas Deseño conceptual do repositorio Residuos considerados: formas e cantidades. Almacenamento en formacións graníticas. O emprazamento de referencia: idoneidade e formación aloxante. Características do repositorio: Descrición xeral Cápsula, Instalacións de superficie, Instalacións subterráneas, Operación do repositorio, Clausura do repositorio, A seguridade do repositorio Custos. Almacenamento en formacións salinas. O emprazamento de referencia: idoneidade e formación aloxante. Características do repositorio. Descrición xeral: Cápsula, Instalacións de superficie, Instalacións subterráneas, Operación do repositorio, Clausura do repositorio, A seguridade do repositorio: observacións xerais, seguridade operacional, seguridade post-clausura. Custos.
INTRODUCIÓN Á CONTAMINACIÓN ATMOSFÉRICA	Aspectos xerais A circulación xeral atmosférica Ciclóns e anticiclóns Conceptos e criterios de emisión e inmisión Conceptos e criterios de difusión: Introdución, Principais criterios de difusión, Fórmulas de sobreelevación de penachos, Fundamentos teóricos Introdución á altura da capa de mestura. O sol. Coordenadas uranográficas e azimutales. Ángulo sidéreo. Ángulo no polo elevado. Horizontes. Métodos e procesos de cálculo.Índices de radiación neta IRN. Ecuación do tempo. Ecuacións solares e triángulo de posición. Horas. Horario dunha estrela. Declinación solar. Azimut. Almanaques. Orto, ocaso e meridiana solar. Avaliación da difusión atmosférica de contaminantes: Obxecto, Ámbito de aplicación, Fórmulas de cálculo Sistemas de eliminación de particular en efluentes gaseosos contaminados. Sistemas de eliminación de contaminantes gaseosos nos efluentes. Custos asociados ao tratamento de efluentes gaseosos contaminados. Prevención da contaminación atmosférica. Control e Vixilancia Medio Ambiental
AUGAS INDUSTRIAIS	Introdución ás augas residuais Industriais. Augas industriais e aproveitamento dos residuos industriais. Introdución á modelización e simulación de procesos ambientais. Lexislación ambiental na industria.
CONTAMINACIÓN SUPERFICIAL DO MAR E ACCIDENTES MAIORES	Ventos e correntes no mar. Posicionamento e velocidade. Cáculos con vento e corrente: Trigonometría e números complexos. Apartamiento. Deriva. Distancias. Loxodromía e Ortodromía. Seguimento de manchas e loita contra a contaminación. Accidentes: Explosións, radiación térmica, distancias

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	25	37.5	62.5
Estudo de casos	12.5	45	57.5
Seminario	5	5	10
Prácticas con apoio das TIC	10	10	20
*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	Composta por: -pizarra -vídeo e multimedia -presentacións
Estudo de casos	Disponse dunha gran cantidade de casos que foron subidos á nube de tecnoloxías do medio ambiente. https://nubetecma.uvigo.es. Acceso desde o servidor
Seminario	Resolución de casos prácticos para profundar no coñecemento da materia
Prácticas con apoio das TIC	Estarán conformadas por casos e exemplos prácticos subidos á nube de tecnoloxías do medioambiente. https://nubetecma.uvigo.es

Atención personalizada	
Methodologies	**Description**
Lección maxistral	O alumno dispón de titorías personalizadas no horario oficial. Así mesmo tamén as pode solicitar a través do formulario WEB. Para todas as modalidades de docencia, as sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.
Estudo de casos	O alumno dispón de titorías personalizadas no horario oficial. Así mesmo tamén as pode solicitar a través do formulario WEB. A maiores ten gran número de exemplos na nube que lle axudan a orientarse segundo as situacións e casos. Para todas as modalidades de docencia, as sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.
Seminario	O alumno dispón de titorías personalizadas no horario oficial. Así mesmo tamén as pode solicitar a través do formulario WEB. Para todas as modalidades de docencia, as sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.
Prácticas con apoio das TIC	O alumno dispón de titorías personalizadas no horario oficial. Así mesmo tamén as pode solicitar a través do formulario WEB. Para todas as modalidades de docencia, as sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.

Avaliación				
	Description	Qualification	Training and Learning Results	
Estudo de casos	Exame final escrito de problemas/casos. RESULTADOS DE APRENDIZAXE: Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes en Técnicas ambientais. Comprender os aspectos básicos dos sistemas de Xestión da calidade total. Coñecer o proceso experimental utilizado cando se traballa con ferramentas informáticas. Dominar as técnicas actuais dispoñibles para a análise dos problemas medioambientais. Profundar nas técnicas de realización dun EIA. Coñecer as novas técnicas de minería de datos medio ambientais e materia de seguridade. Adquirir habilidades sobre o proceso de análise de datos ambientais.	100	B1 B2 B3 B4 B5 B6 B7 B8	C18 	D2 D4 D6 D7 D8 D9 D10

Prácticas con apoio das TIC	Asistencia a clases prácticas ou exame equivalente. Introdución aos diferentes tipos de ficheiros Fontes de datos na nube de Tecnoloxías do Medio Ambiente Ferramentas básicas de civil 3D MDT Exportación de ficheiros de datos MS Excel MS Project/Gantt Project Conexións externas RESULTADOS DE APRENDIZAXE: Coñecer a base tecnolóxica sobre a que se apoian as investigacións máis recentes en Técnicas ambientais. Comprender os aspectos básicos dos sistemas de Xestión da calidade total. Coñecer o proceso experimental utilizado cando se traballa con ferramentas informáticas. Dominar as técnicas actuais dispoñibles para a análise dos problemas medioambientais. Profundar nas técnicas de realización dun EIA. Coñecer as novas técnicas de minería de datos medio ambientais e materia de seguridade. Adquirir habilidades sobre o proceso de análise de datos ambientais.	0	B1 B2 B3 B4 B5 B6 B7 B8	C18	D2 D4 D6 D7 D8 D9 D10

Other comments on the Evaluation

MÉTODO DOCENTE E SISTEMA DE AVALIACIÓN:

Bolonia é un sistema baseado na práctica. Nas clases teóricas explícase a teoría indispensable para a realización de problemas.

Por tanto son clases prácticas onde se resolven casos (problemas).

A súa asistencia é ***altamente recomendable***. Existe control de asistencia con fins estatísticos.

EXAME

As prácticas pódense aprobar, ben por asistencia (85% das mesmas) ou ben realizando un exame final das mesmas. Aínda que non contribúen á nota final (0%), é necesario superalas para presentarse ao exame de problemas.

Os alumnos repetidores non terán que volver realizar as prácticas.

A convocatoria extraordinaria de Xullo réxese polos mesmos criterios que a ordinaria.

Calendario de exames. Verificar/consultar de forma actualizada na páxina web do centro:

http://minaseenerxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

Real instituto observatorio de la Armada en San Fernando, **Almanaque náutico**, Ministerio de Defensa, 2017

Rafael Barrionuevo Giménez, **Saving Energy**, PA Nova SA., 2017

Complementary Bibliography

Gerard Kiely, **Ingeniería Ambiental: Fundamentos, entornos, tecnologías y sistemas de gestión**, Mc Graw Hill, 1999

Francisco Ayala Carcedo, Carlos López Jimeno, et. Al, **Manual de restauración de terrenos y evaluación de impactos ambientales en minería**, ITGE, 1989

Carlos López Jimeno, et. Al, **Manual de estabilización y Revegetación de taludes**, Carlos López Jimeno, 1999

Iván Vaquero Díaz, **Manual de diseño y construcción de vertederos de residuos sólidos urbanos**, U.D.Proyectos ETSI Minas de Madrid, 2003

Chongrak Polprasert, **Organic Waste Recycling**, 2ª, Wiley, 1996

George Tchobanoglous, et al., **Gestión Integral de Residuos Sólidos**, Mc Graw Hill, 1994

Nelson L. Nemerow/Avijit Dasgupta, **Tratamiento de vertidos industriales y peligrosos**, Diaz de Santos, 1998

Carlos López Jimero, Osvaldo Aduvire, **Manual de Construcción y Restauración de Escombreras**, U.D.Proyectos ETSI Minas de Madrid, 2006

Jean Meus, **Astronomical Algorithms**, 2ª, Willman-Nel, 1998

Michael D.LaGrega, Phillip L. Buckingham, Jeffrey C. Evans, **Manual de seguridad industrial en plantas químicas y petroleras**, Mc Graw Hill,

Recomendacións

Subjects that it is recommended to have taken before

Mecánica de fluídos/V09G310V01305

Plan de Continxencias

Description

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

1. Modalidade semipresencial

No caso de activarse a ensinanza semipresencial suporía unha redución dos aforos dos espazos docentes empregados na modalidade presencial, polo que como primeira medida o centro proporcionaría ao profesorado da materia a información relativa aos novos aforos dos espazos docentes, ao obxecto de que poida proceder a reorganizar as actividades formativas do que resta do cuadrimestre. Cabe sinalar que a reorganización dependerá do momento ao longo do cuadrimestre en que se activase dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

Informar a todo o alumnado a través da plataforma FaiTIC das condicións en que se desenvolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.

No caso de que parte do alumnado tiña realizadas prácticas de laboratorio instrumental ou de informática de forma presencial, realizar presencialmente, de ser posible, estas actividades ou equivalentes para o alumnado que non as realizou.

Das actividades que resten para rematar o cuadrimestre, identificar aquelas actividades formativas que poidan ser realizadas por todo o alumnado de forma presencial e as actividades formativas que se realizarán en modo remoto.

En relación as ferramentas para a empregar para as actividades formativas que se realicen en modo non presencial, contarase co uso de CampusRemoto e a plataforma FaiTIC.

2. Modalidade non presencial

No caso en que se active a modalidade de ensino non presencial (suspensión de todas as actividades formativas e de avaliación presenciais) empregaranse as ferramentas dispoñibles na actualidade na Universidade de Vigo: Campus Remoto e FaiTIC. As condicións de reorganización dependerán do momento ao longo do cuadrimestre en que se active dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

2.1. Comunicación

Informar a todo o alumnado a través da plataforma FaiTIC das condicións nas que se devolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

2.2. Adaptación e/ ou modificación de metodoloxías docentes

Dado que as metodoloxías docentes están concibidas para a modalidade de ensino presencial indícanse a continuación as metodoloxías docentes que se manterían e cales se modificarían ou substituirán na modalidade non presencial.

Todas as metodoloxías empregadas nesta guía pódense aplicarse tanto en modalidade presencial como en no presencial:

As metodoloxías Lección Maxistral, Estudo de casos e Seminarios pódense impartir dende o Campus Remoto, empregando as diferentes ferramentas de apoio á docencia dispoñibles no entorno Moodle de FAITIC e titorizándoas a través de foros.

As prácticas en aulas de informática, xa que se empregarán programas informáticos de acceso gratuíto, plantexaranse en sesións remotas no Campus remoto e desenvolveranse de xeito non presencial titorizándoas a través de foros.

2.3. Adaptación de atención de titorías e atención personalizada

As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa..

2.4. Avaliación

No caso da docencia non presencial, procederase á seguinte modificación na avaliación:
Estudo de casos (exame final): esta proba consistirá nun exame que se realizará en modo en liña, coas ferramentas dispoñibles en Moodle, e que consistirá en preguntas tipo test e de curto desenvolvemento, tanto teóricas coma prácticas, sobre os conceptos teóricos e prácticos traballados nas metodoloxías de Estudo de casos, Lección maxistral e Seminarios. O peso deste exame na avaliación total pasa a ser dun 60 sobre 100%.

O resto do peso da avaliación, o 40%, consistirá na entrega por parte do alumnado de boletíns que inclúan o desenvolvemento e resolución das prácticas realizadas co apoio das TIC.

2.5. Bibliografía ou material adicional para facilitar a auto-aprendizaxe
Non se considera necesaria bibliografía adicional.

IDENTIFYING DATA				
Seguridade e saúde				
Subject	Seguridade e saúde			
Code	V09G310V01403			
Study programme	Grao en Enxeñaría dos Recursos Mineiros e Enerxéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	2c
Teaching language	Castelán			
Department	Enxeñaría dos recursos naturais e medio ambiente			
Coordinator	Giráldez Pérez, Eduardo			
Lecturers				
E-mail				
Web	http://faitic.uvigo.es/			
General description	Nesta materia introdúcense aspectos básicos sobre a seguridade e saúde no traballo.			

Competencias	
Code	
B1	Capacitación científico-técnica para o exercicio da profesión de Enxeñeiro Técnico de Minas e coñecemento das funcións consultivas, análise, deseño, cálculo, proxecto, construción, mantemento, conservación e explotación.
B2	Comprender os múltiples condicionamentos de carácter técnico e legal que xorden no desenvolvemento, no ámbito da enxeñaría de minas, que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o previsto no parágrafo 5 da orde CIN7306 / 2009, a prospección e investigación xeolóxica-mineira, as explotacións de todo tipo de recursos xeolóxicos, incluíndo as augas subterráneas, as obras subterráneas, os almacenamentos subterráneos, as plantas de tratamento e beneficio, as plantas de enerxía, as plantas mineralúrxicas e siderúrxicas, as plantas de materiais para a construción, as plantas de carboquímica, petroquímica e gas, as plantas de tratamentos de residuos e efluentes e fábricas de explosivos e capacidade para empregar métodos contrastados e tecnoloxías acreditadas, co obxectivo de acadar unha maior eficacia dentro do respecto polo Medio Ambiente e a protección da seguridade e saúde dos traballadores e usuarios das mesmas.
B3	Capacidade para deseñar, redactar e planificar proxectos parciais ou específicos das unidades definidas no parágrafo anterior, tales como instalacións mecánicas e eléctricas e o seu mantemento, redes de transmisión de enerxía, instalacións transporte e almacenamento para materiais sólidos, líquidos ou gasosos, entullarías, balsas ou encoros, sostemento e cimentación, demolición, restauración, voaduras e loxística de explosivos.
B4	Capacidade para deseñar, planificar, operar, inspeccionar, asinar e dirixir proxectos, plantas ou instalacións, no seu ámbito.
B5	Capacidade de realización de estudos de ordenación do territorio e dos aspectos medioambientais relacionados cos proxectos, plantas e instalacións, no seu ámbito.
B6	Capacidade para o mantemento, conservación e explotación dos proxectos, plantas e instalacións, no seu ámbito.
B7	Coñecemento para realizar, no ámbito da enxeñaría de minas, de acordo cos coñecementos adquiridos segundo o disposto no apartado 5 da orde CIN /306/2009, medicións, replanteos, planos e mapas, cálculos, valoracións, análise riscos, peritaxes, estudos e informes, plans de traballo, estudos de impacto ambiental e social, plans de restauración, sistema control de calidade, sistema de prevención, análise e avaliación das propiedades dos materiais metálicos, cerámicos, refractarios, sintéticos e outros materiais, caracterización de solos e macizos rochosos e outros traballos semellantes.
B8	Coñecemento, comprensión e capacidade de aplicar a lexislación necesaria no exercicio da profesión de Enxeñeiro Técnico de Minas.
C16	Capacidade de análise da problemática da seguridade e saúde nos proxectos, plantas ou instalacións.
D1	Capacidade de interrelacionar todos os coñecementos adquiridos, interpretándoos como compoñentes dun corpo do saber cunha estrutura clara e unha forte coherencia interna.
D2	Capacidade de desenvolver un proxecto completo en calquera campo desta enxeñaría, combinando de forma adecuada os coñecementos adquiridos, accedendo ás fontes de información necesarias, realizando as consultas precisas e integrándose en equipos de traballo interdisciplinar.
D3	Propoñer e desenvolver solucións prácticas, utilizando os coñecementos teóricos, a fenómenos e situacións-problema da realidade cotiá propios da enxeñaría, desenvolvendo as estratexias adecuadas.
D5	Coñecer as fontes necesarias para dispoñer dunha actualización permanente e continua de toda a información precisa para desenvolver o seu labor, accedendo a todas as ferramentas, actuais e futuras, de busca de información e adaptándose aos cambios tecnolóxicos e sociais.
D6	Coñecer e manexar a lexislación aplicable ao sector, coñecer o medio social e empresarial e saber relacionarse coa administración competente integrando este coñecemento na elaboración de proxectos de enxeñaría e no desenvolvemento de calquera dos aspectos do seu labor profesional.

D9 Entender a transcendencia dos aspectos relacionados coa seguridade e saber transmitirlle esta sensibilidade ás persoas do seu ámbito.

Resultados de aprendizaxe			
Expected results from this subject	Training and Learning Results		
Comprender e analizar os aspectos lexislativos da xestión da seguridade no sector da minaría, construción e industria.	B1 B2 B8	C16	D1 D3 D5 D6
Coñecer, distinguir e interpretar o proceso de xestión do mantemento dos equipos de calquera instalación extractiva, de transformación e de elaboración.	B3 B4 B5 B6 B7		D2
Recoñecer, examinar e asociar os riscos laborais neste tipo de actividades así como xestionar os medios (humanos e materiais) e as ferramentas (técnicas e baseadas no comportamento) necesarios para minimizar os riscos.	B8	C16	D1 D5 D9
Habilidades de comportamento fronte á seguridade laboral. Destreza e análise na avaliación de riscos e/ou investigación de accidentes.	B1 B8		D1 D3 D5 D6 D9

Contidos	
Topic	
CAPÍTULO I. Conceptos básicos sobre seguridade e saúde no traballo.	a. O traballo e a saúde: Os riscos profesionais. Factores de risco. b. Danos derivados de traballo. Os Accidentes de Traballo e as Enfermidades Profesionais. Outras patoloxías derivadas do traballo. c. Marco normativo básico en materia de prevención de riscos laborais
CAPÍTULO II. Aspectos lexislativos sobre a Prevención de Riscos Laborais	a. Reais decretos máis representativos relacionados coa seguridade laboral, hixiene, ergonomía e xestión do mantemento. b. Plans de emerxencias e evacuación.
CAPITULO III. Riscos específicos e a súa prevención no sector correspondente á actividade da empresa.	a. Riscos específicos e a súa prevención no sector da Industria, Minería e Construción.
CAPÍTULO IV: Investigación de accidentes e inspeccións de seguridade	a. A investigación de accidentes. b. Procedementos de investigación de accidentes. c. Xestión do accidente. d. Índices estatísticos. e. Tipos de Inspeccións de seguridade.

Planificación	Class hours	Hours outside the classroom	Total hours
Seminario	5	5	10
Estudo de casos	5	13.5	18.5
Traballo tutelado	9.5	20	29.5
Lección maxistral	30	44	74
Exame de preguntas obxectivas	1	5	6
Exame de preguntas de desenvolvemento	1	5	6
Estudo de casos	1	5	6
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Metodoloxía docente	
	Description
Seminario	Exporanse os estudos en investigación, desenvolvemento e innovación máis actuais no ámbito da prevención dos riscos laborais a nivel nacional e internacional.
Estudo de casos	Nos seminarios proporanse supostos sobre a xestión de prevención de riscos laborais en empresas mineiras e do sector da construción. Abordaranse os problemas do día a día dunha empresa en materia de prevención de riscos laborais.

Traballo tutelado	Exporanse exercicios prácticos e teóricos sobre: -Investigación de accidentes e inspeccións de seguridade -Elaboracións de Plan de prevención, Estudos de seguridade e Documentos de seguridade e saúde. -Cálculo de custos dos accidentes acaecidos nunha empresa. -Estudos ruído. -Estudos de manipulación manual de cargas -Cálculo de índices de sinistralidade (incidencia, gravidade e frecuencia) -Elaboración de manuais de autoprotección, procedementos de posta en práctica de simulacros e primeiros auxilios.
Lección maxistral	Exposición por parte do profesor dos contidos sobre a materia obxecto de estudo, bases teóricas e/ou directrices dun traballo, exercicio ou proxecto a desenvolver polo estudante.

Atención personalizada

Methodologies	Description
Estudo de casos	Atenderase as dúbidas dos alumnos durante o curso académico xa sexa presencialmente ou a través do correo electrónico ou plataforma docente. Para todas as modalidades de docencia, as sesións de tutorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.

Avaliación

	Description	Qualification	Training and Learning Results
Estudo de casos	Nos seminarios proporanse supostos sobre a xestión de prevención de riscos laborais en empresas mineiras e do sector da construción. Abordaranse os problemas do día a día dunha empresa en materia de prevención de riscos laborais. RESULTADOS DE APRENDIZAXE Comprender e analizar os aspectos lexislativos da xestión da seguridade no sector da minaría, construción e industria. Coñecer, distinguir e interpretar o proceso de xestión do mantemento dos equipos de calquera instalación extractiva, de transformación e de elaboración. Recoñecer, examinar e asociar os riscos laborais neste tipo de actividades así como xestionar os medios (humanos e materiais) e as ferramentas (técnicas e baseadas no comportamento) necesarios para minimizar os riscos. Habilidades de comportamento fronte á seguridade laboral. Destreza e análise na avaliación de riscos e/ou investigación de accidentes.	60	B1 C16 D1 B2 D2 B3 D3 B4 D5 B5 D6 B6 D9 B7 B8
Exame de preguntas obxectivas	Probas para avaliación das competencias adquiridas que inclúen preguntas pechadas con diferentes alternativas de resposta (verdadeiro/falso, elección múltiple, emparejamiento de elementos...). Os alumnos seleccionan unha resposta entre un número limitado de posibilidades. RESULTADOS DE APRENDIZAXE Comprender e analizar os aspectos lexislativos da xestión da seguridade no sector da minaría, construción e industria. Coñecer, distinguir e interpretar o proceso de xestión do mantemento dos equipos de calquera instalación extractiva, de transformación e de elaboración. Recoñecer, examinar e asociar os riscos laborais neste tipo de actividades así como xestionar os medios (humanos e materiais) e as ferramentas (técnicas e baseadas no comportamento) necesarios para minimizar os riscos. Habilidades de comportamento fronte á seguridade laboral. Destreza e análise na avaliación de riscos e/ou investigación de accidentes.	15	B1 C16 D1 B2 D2 B3 D3 B4 D5 B5 D6 B6 D9 B7 B8

Exame de preguntas de desenvolvemento	Probas para avaliación das competencias que inclúen preguntas abertas sobre un tema. Os alumnos deben desenvolver, relacionar, organizar e presentar os coñecementos que teñen sobre a materia nunha resposta extensa. Para superar a materia é condición indispensable obter o 50% da cualificación máxima neste epígrafe (12.5 sobre 25). RESULTADOS DE APRENDIZAXE Comprender e analizar os aspectos lexislativos da xestión da seguridade no sector da minaría, construción e industria. Coñecer, distinguir e interpretar o proceso de xestión do mantemento dos equipos de calquera instalación extractiva, de transformación e de elaboración. Recoñecer, examinar e asociar os riscos laborais neste tipo de actividades así como xestionar os medios (humanos e materiais) e as ferramentas (técnicas e baseadas no comportamento) necesarios para minimizar os riscos. Habilidades de comportamento fronte á seguridade laboral. Destreza e análise na avaliación de riscos e/ou investigación de accidentes.	25	B1 C16 D1 B2 D2 B3 D3 B4 D5 B5 D6 B6 D9 B7 B8	

Other comments on the Evaluation

Na convocatoria ordinaria, para superar globalmente a materia, é condición indispensable obter un 50% da cualificación máxima do exame de preguntas de desenvolvemento (12.5 sobre 25).

Na convocatoria extraordinaria de Xullo, avaliarase novamente de todas as probas/metodoloxías contempladas na convocatoria ordinaria. Nesta edición extraordinaria, é condición indispensable obter un 50% da cualificación máxima suma do exame de preguntas de desenvolvemento e do exame de preguntas obxectivas (20 sobre 40).

Calendario de exames. Verificar/consultar de forma actualizada na páxina web do centro:

http://minaseenerxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

Oficina Internacional del Trabajo, **Enciclopedia de Salud y Seguridad en el Trabajo**, 1ª ed., Centro de Publicaciones Ministerio de Trabajo y As, 1989

Ley de Prevención de Riesgos Laborales. Ley 31/1995, B.O.E., 1995

Ley 54/2003, de 12 de diciembre, de reforma del marco normativo de la prevención de riesgos laborales, B.O.E., 2003

REAL DECRETO 171/2004, de 30 de enero, por el que se desarrolla el artículo 24 de la Ley 31/1995, de Prevención de Riesgos Laborales, B.O.E., 2004

REAL DECRETO 39/1997, de 17 de enero, por el que se aprueba el Reglamento de los Servicios de Prevención, B.O.E., 1997

REAL DECRETO 604/2006, de 19 de mayo, por el que se modifican el Real Decreto 39/1997, B.O.E., 2006

Real Decreto 1627/1997, de 24 de octubre, por el que se establecen las disposiciones mínimas de seguridad y salud en las obras de construcción, B.O.E., 1997

REAL DECRETO 780/1998, de 30 de abril, por el que se modifica el Real Decreto 39/1997, B.O.E., 1998

REAL DECRETO 485/1997, de 14 de abril, sobre disposiciones mínimas en materia de señalización de seguridad y salud en el trabajo, B.O.E., 1997

REAL DECRETO 486/1997, de 14 de abril, por el que se establecen las disposiciones mínimas de seguridad y salud en los lugares de trabajo, B.O.E., 1997

REAL DECRETO 487/1997, de 14 de abril, sobre disposiciones mínimas de seguridad y salud relativas a la manipulación manual de cargas que entrañe riesgos, en particular dorsolumbares, para los trabajad, B.O.E., 1997

REAL DECRETO 773/1997, de 30 de mayo, sobre disposiciones mínimas de seguridad y Salud relativas a la utilización por los trabajadores de equipos de protección individual, B.O.E., 1997

REAL DECRETO 1215/1997, de 18 de julio, por el que se establecen las disposiciones mínimas de seguridad y salud para la utilización por los trabajadores de los equipos de trabajo, B.O.E., 1997

REAL DECRETO 2177/2004, de 12 de noviembre, por el que se modifica el Real Decreto 1215/1997, de 18 de julio, por el que se establecen las disposiciones mínimas de seguridad y salud para la utilizació, B.O.E., 2004

Ley 32/2006, de 18 de octubre, reguladora de la subcontratación en el Sector de la Construcción, B.O.E., 2006

Real Decreto 1627/1997, de 24 de octubre, por el que se establecen disposiciones mínimas de seguridad y de salud en las obras de construcción, B.O.E., 1997

Real Decreto 1109/2007, de 24 de agosto, por el que se desarrolla la Ley 32/2006, de 18 de octubre, reguladora de la subcontratación en el Sector de la Construcción, B.O.E., 2007

Real Decreto 1389/1997 de 5 de septiembre, por el que se aprueban las disposiciones mínimas destinadas a proteger la seguridad y la salud de los trabajadores en las actividades mineras, B.O.E., 1997

ITC/101/2006 "Documento sobre Seguridad y Salud" de la industria extractiva, B.O.E., 2006

Real Decreto 863/1985, de 2 de abril, por el que se aprueba el reglamento general de normas básicas de seguridad minera, B.O.E., 1985
Bird F. E and Germain G. L, **Liderazgo Práctico en el Control de Pérdidas**, 1ª ed., Institute Publishing, 1990

Complementary Bibliography

Recomendacións

Plan de Continxencias

Description

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

1. Modalidade semipresencial
No caso de activarse a ensinanza semipresencial suporía unha redución dos aforos dos espazos docentes empregados na modalidade presencial, polo que como primeira medida o centro proporcionaría ao profesorado da materia a información relativa aos novos aforos dos espazos docentes, ao obxecto de que poida proceder a reorganizar as actividades formativas do que resta do cuadrimestre. Cabe sinalar que a reorganización dependerá do momento ao longo do cuadrimestre en que se activase dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

Informar a todo o alumnado a través da plataforma FaiTIC das condicións en que se desenvolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.

No caso de que parte do alumnado tiña realizadas prácticas de laboratorio instrumental ou de informática de forma presencial, realizar presencialmente, de ser posible, estas actividades ou equivalentes para o alumnado que non as realizou.

Das actividades que resten para rematar o cuadrimestre, identificar aquelas actividades formativas que poidan ser realizadas por todo o alumnado de forma presencial e as actividades formativas que se realizarán en modo remoto.

En relación as ferramentas para a empregar para as actividades formativas que se realicen en modo non presencial, contarase co uso de CampusRemoto e a plataforma FaiTIC.

2. Modalidade non presencial

No caso en que se active a modalidade de ensino non presencial (suspensión de todas as actividades formativas e de avaliación presenciais) empregaranse as ferramentas dispoñibles na actualidade na Universidade de Vigo: Campus Remoto e FaiTIC. As condicións de reorganización dependerán do momento ao longo do cuadrimestre en que se active dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

2.1. Comunicación
Informar a todo o alumnado a través da plataforma FaiTIC das condicións nas que se devolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

2.2. Adaptación e/ ou modificación de metodoloxías docentes
Dado que as metodoloxías docentes están concibidas para a modalidade de ensino presencial indícanse a continuación as metodoloxías docentes que se manterían e cales se modificarían ou substituirán na modalidade non presencial.
As metodoloxías docentes que se manteñen son as seguintes, dado que poden empregarse en modalidade presencial e non presencial:

- Seminario
- Estudo de casos

- Traballo tutelado
- Lección maxistral

Non se modifican metodoloxías docentes.

2.3. Adaptación de atención de titorías e atención personalizada
As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa..

2.4. Avaliación
A avaliación correspondente os estudos de casos mantense de forma similar á modalidade de docencia presencial.
O exame de preguntas obxetivas, tipo test, realizarase a través da plataforma Faitic.
O exame de preguntas de desenvolvemento será en modalidade oral, con avaliación similar a da modalidade presencial.

2.5. Bibliografía ou material adicional para facilitar a auto-aprendizaxe
A bibliografía completarase con bibliografía accesible en plataformas online e demáis contidos online.

IDENTIFYING DATA				
Soil mechanics				
Subject	Soil mechanics			
Code	V09G310V01404			
Study programme	Degree in Mining and Energy Resources Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	#EnglishFriendly Spanish			
Department				
Coordinator	Araújo Fernández, María			
Lecturers	Araújo Fernández, María Delgado Marzo, Fernando Laredo Rodríguez, Roberto Carlos			
E-mail	maraujo@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	In this subject it is intended that the student knows the technological principles in the field of geotechnics (soil and rock mechanics). The knowledge about this area will focus on understanding the basic aspects of elasticity, elasto-plasticity, water flow in continuous media, consolidation and resistance behavior of soils and rocks. Another target will be to know the different experimental process for characterization, classification, resistance and consolidation in soils and rocks. To know how to design and calculate retaining walls and foundations. These theoretical and practical notions should allow the student to solve real problems and understand the singularity of the technology developed in this field. The principles of rock and soil mechanics are based on scientific knowledge, but the technical works are projected in a natural environmental where the variability of the input parameters is very relevant and has a very significant influence on the results. The knowledge of the peculiarities of this discipline will enable to solve and make good decisions into this geological context. English Friendly subject: International students may request from the teachers: a) materials and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.			

Competencies	
Code	
B1	Scientific and technical training in order to work professionally as a Technical Mining Engineer, with knowledge of the functions of consultancy, analysis, design, calculation, planning, construction, maintenance, conservation and exploitation.
B2	Understanding of the many technical and legal considerations that arise during development within the field of mining engineering, according to section 5 of Order CIN7306/2009, which have to do with geological-mineral prospecting and research, mine exploitation of all types of geological resources, including groundwaters, underground works, underground stores, treatment and smelting plants, energy plants, mineral and iron and steel plants, construction materials plants, carbon-chemical, petro-chemical and gas plants, waste and effluent treatment plants, and explosives manufacturing plants. In addition, the capacity to employ proven methods and accredited technologies in order to attain improved efficiency while respecting the Environment and protecting the health and safety of workers and users.
B3	Capacity to design, write and plan partial or specific projects for the units described in the previous section, such as mechanical and electrical installations, together with their maintenance, energy transport networks, transport and storage facilities for solid, liquid and gaseous materials, dumping sites, pools or dams, supports and foundations, demolition, restoration, blasting and explosives logistics.
B4	Capacity to design, plan, operate, inspect, sign and manage projects, plants or installations within the field.
B5	Capacity to carry out land planning studies and environmental studies related to the projects, plants and installations within the field.
B6	Capacity to maintain, conserve and exploit the projects, plants and installations within the field.
B7	Knowledge required to undertake, within the scope of mining engineering knowledge as established in section 5 of Order CIN/306/2009, measurements, layouts, plans and maps, calculations, valuations, risk analyses, expert inspections, studies and reports, work plans, environmental and social impact studies, restorations plans, quality control systems, prevention systems, evaluation analyses of the properties of metal, ceramic, refractory, synthetic and other materials, soil and solid rock characterization and other similar tasks.
B8	Knowledge, understanding and capacity to apply the legislation needed when working professionally as a Technical Mining Engineer.
C12	Knowledge of geotechnics and mechanics of soils and rocks.
D1	Capacity to interrelate all the acquired knowledge and interpret it as components in a body of knowledge with a clear structure and strong internal coherence.
D2	Capacity to develop a complete project in any field included in this type of engineering, suitably combining acquired knowledge, accessing necessary information sources, undertaking the necessary enquiries and integrating into inter-disciplinary work teams.

D3	Propose and develop practical solutions, which develop suitable strategies based on theoretical knowledge, for problem phenomena and situations that arise as everyday realities in engineering.
D4	Encourage work based on cooperation, communication skills, organization, planning and recognition of responsibility in a multilingual and multidisciplinary working environment that fosters education in equality, peace and respect for fundamental rights.
D5	Know what sources are available for ongoing and continual updating of all the information required to undertake their work, with access to all the current and future tools for seeking information and adapting it in the light of technological and social changes.
D6	Know and handle legislation applicable to the sector, know the social and business environment and know how to work together with the Administration and use acquired knowledge to draw up engineering projects and develop any of the aspects of professional work required.
D7	Capacity to organise, interpret, assimilate, create and manage all the information needed to organise their work, handling the I.T., mathematical, physical and other tools required.
D8	Conceive engineering within a framework of sustainable development with an awareness of environmental issues.
D9	Understanding of the importance of safety-related issues and knowledge of how to make the people around them aware of those aspects.
D10	Become aware of the need for training and continual improvement in quality, developing the values associated with scientific thinking and showing a flexible, open and ethical attitude towards diverse opinions and situations, particularly in matters of non-discrimination on the grounds of gender, race or religion, respect for fundamental rights, accessibility, etc.

Learning outcomes

Expected results from this subject	Training and Learning Results		
To have the capacity for consulting the technological base related with the most recent investigations within the scope of geotechnical engineering (soil and rock mechanics).	B1 B8	C12	D5 D6 D7
To apply for the calculation and design the basic principles of the laws of the elasticity, elasto-plasticity, water flow in continuous media, consolidation and resistance behavior of soils and rocks.	B2 B3 B4 B6 B7	C12	D3 D7 D8
To know how characterise, classify and interpret experimental tests of resistance and consolidation in soil-rocks.	B1 B2 B3 B4 B7 B8	C12	D2 D3 D4 D5 D6 D8 D9 D10
To know how to design and calculate retaining walls and foundations.	B1 B2 B3 B4 B5 B6 B7 B8	C12	D1 D2 D3 D5 D6 D7 D9
To make design decisions and resolve problems appllying the scientific knowledges purchased.	B1 B2 B3 B4 B5 B6 B7 B8	C12	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10
To integrate the basic principle of rock and soil mechanics: the geotechnical engineer does not select the materials because it works into a natural context, and the influence of the variability of the input parameters is very relevant and has a very significant influence on the final results.	B1 B2 B3 B4 B5 B6 B7 B8	C12	D1 D2 D3 D6 D7 D8 D9

To resolve problems adjusting the design to the specificities of the project and to the natural context where it works.	B1 B2 B3 B4 B5 B6 B7 B8	C12	D1 D2 D3 D4 D5 D6 D7 D8 D9 D10

Contents	
Topic	
GEOTECHNICS AND ROCK MECHANICS	Geotechnical characterization of rock masses. Behaviour and mechanical properties of rocks, discontinuities and rock masses.
DEFINITION, CLASSIFICATION AND INDEX PROPERTIES OF SOIL	Definition of soil and description of its geological origin. Granulometry. Plasticity of soils. Atterberg limits. Soil classification systems (Casagrande, H.R.B.). Index properties.
STRESS AND DEFORMATION IN A MASS OF SOIL	Effective and total stress in a soil. Tensional states in the soil mass. Elastic settlements.
THEORY OF GROUNDWATER FLOW IN A MASS OF SOIL	Steady state flow. Ascending flow under structures of containment. Water flow through small earth dams.
THEORY OF CONSOLIDATION AND SETTLEMENT ANALYSIS.	Theory of vertical consolidation (Terzaghi). The oedometer test. Settlement analysis. Shear strength of a soil.
LATERAL EARTH PRESSURE AND RETAINING WALLS	Rankine's lateral earth pressure. Active and passive soil states. Gravity Retaining walls. Reinforced soil wall. Anchored walls. Diaphragm walls.
FOUNDATIONS	Bearing capacity of shallow foundations. Cone and standard penetration tests (CPT and SPT). Design of shallow foundations (introduction). Bearing capacity of deep foundations.
GEOTECHNICAL SITE INVESTIGATION	Trial pits. Penetrometers. Borehole drilling. Geotechnnical reports.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	22	30	52
Problem solving	12.5	30	42.5
Laboratory practical	10	27.5	37.5
Studies excursion	3	0	3
Seminars	2.5	10	12.5
Problem and/or exercise solving	1.5	0	1.5
Objective questions exam	1	0	1
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Lecturing	Exhibition of the basic contents of the matter.
Problem solving	Formulation, analysis and resolution of a problem or exercise related with the subject.
Laboratory practical	Activities developed in laboratory for the application of basic skills related with the matter. A practices report will be evaluated.
Studies excursion	The realization of the formative activity "Studies excursion", will be organized by the School board, according to the porposal of the teaching staff about the type of facility or company to visit.
Seminars	Formulation, analysis and resolution of real cases related with the contents of the subject.

Personalized assistance	
Methodologies	**Description**
Lecturing	Doubts, questions and clarifications will be addressed by email when the students can not attend the tutorials in person. The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement, in all teaching modalities.
Problem solving	Doubts, questions and clarifications will be addressed by email when the students can not attend the tutorials in person. The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement, in all teaching modalities.
Laboratory practical	Doubts, questions and clarifications will be addressed by email when the students can not attend the tutorials in person. The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement, in all teaching modalities.

Seminars	Doubts, questions and clarifications will be addressed by email when the students can not attend the tutorials in person. The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement, in all teaching modalities.

Assessment

	Description	Qualification	Training and Learning Results
Lecturing	Written exam of questions of short answer or type test. Written exam to solve problems and / or exercises. Each of the parts of the exam evaluates 35%. Learning outcomes: all the learning outcomes of the subject are worked on	65	B1 C12 D1 B2 D2 B3 D3 B4 D5 B5 D6 B6 D7 B7 D8 B8 D9
Problem solving	Written proofs formulating basic problems related to the matter. Learning outcomes: To apply for the calculation and design the basic principles of the laws of the elasticity, elasto-plasticity, water flow in continuous media, consolidation and resistance behavior of soils and rocks. To know how to design and calculate retaining walls and foundations. To make design decisions and resolve problems appllying the scientific knowledges purchased. To integrate the basic principle of rock and soil mechanics: the geotechnical engineer does not select the materials because it works into a natural context, and the influence of the variability of the input parameters is very relevant and has a very significant influence on the final results. To resolve problems adjusting the design to the specificities of the project and to the natural context where it works.	20	B1 C12 D1 B2 D2 B3 D3 B4 D5 B5 D6 B6 D7 B7 B8
Laboratory practical	Two practices reports will be evaluated. Learning outcomes: To have the capacity for consulting the technological base related with the most recent investigations within the scope of geotechnical engineering (soil and rock mechanics). To know how characterise, classify and interpret experimental tests of resistance and consolidation in soil-rocks. To make design decisions and resolve problems applying the scientific knowledges purchased. To integrate the basic principle of rock and soil mechanics: the geotechnical engineer does not select the materials because it works into a natural context, and the influence of the variability of the input parameters is very relevant and has a very significant influence on the final results. To resolve problems adjusting the design to the specificities of the project and to the natural context where it works.	15	B1 C12 D1 B2 D2 B3 D4 B5 D5 B7 D6 B8 D7 D8 D9 D10

Other comments on the Evaluation

In the ordinary call, the complete evaluation of the laboratory practices requires the assistance to the laboratory, the delivery of a group memory and the exhibition and public discussion of the main results obtained. At the same time, attendance and resolution of exercises / problems proposed during the course is mandatory to qualify for the total qualification associated with this section. In any case, the final grade will be the sum of the grades of the works proposed during the course (up to 35%) and the exam (up to 65%).

In subsequent calls of the same course, the exam will score 85% of the final grade and the grade obtained in the laboratory practices will be saved, considering the qualification of this non-recoverable.

Students who do not take the course for the first time will be kept, for a year, the laboratory practices qualification previously obtained.

Exam Timetable: Exam dates and rooms must be verified in the official webpage of the school:

http://minaseenerxia.uvigo.es/es/docencia/examenes

Sources of information

Basic Bibliography

Berry, P.L. y Reid, D., **Mecánica de Suelos**, McGraw-Hill, 1993

González de Vallejo, L.; Ferrer, M.; Ortuño L. y Oteo, C., **Ingeniería Geológica**, Prentice Hall, 2002

Jiménez Salas, J.; de Justo Alpañes, J.L., **Geotecnia y Cimientos**, 2ª ed., Editorial Rueda, 1981

Verruijt, A., **An Introduction to Soil Mechanics**, Springer, 2017

Complementary Bibliography

Das, Braja M., **Fundamentos de Ingeniería de Cimentaciones**, 7ª ed., Cengage Learning, 2012
Calavera, J, **Cálculo de estructuras de cimentación**, 5ª ed., INTEMAC, D.L., 2015
Craig, R. F., **Craig's soil mechanics. Solutions manual**, 7th ed., Taylor & Francis e-Library, 2004

Recommendations

Subjects that continue the syllabus

Rock mechanics/V09G310V01513
Underground works/V09G310V01704

Subjects that are recommended to be taken simultaneously

Fluid mechanics/V09G310V01305
Materials resistance/V09G310V01304

Contingency plan

Description

Considering the uncertain and unpredictable evolution of the health alert caused by COVID-19, the University establishes an extraordinary planning that will be activated when the administrations and the institution determine it. It is based on safety, health and responsibility, and it guarantees teaching in an online or semi-presential modalities. These already planned measures will guarantee, at the required time, the development of teaching in a more agile and effective way, because they will be known in advance by students and teachers through the standardized tool for teaching guides DOCNET.

1. Semi-presential modality
Once the semi-presential teaching is required, it would mean a reduction of the capacity of the teaching spaces used in the face-to-face modality. Therefore, as the first measure of the centre, the capacity of the teaching spaces would be reformulated and informed to the teachers, in order to proceed to reorganize the formative activities for the rest of the semester. It should be noted that the reorganization will depend on the moment throughout the semester in which this semi-presential modality is activated. For the reorganization of the teaching activities, the following guidelines would be followed:

Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

The tutorial sessions will be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

Once some of the students have carried out experimental or computer laboratory practices in the face-to-face modality, if it is possible, the rest of the students will have the possibility to perform the same or equivalent activities in the same modality.

For the rest of the activities until the end of the semester, it should be done a proper identification of those formative activities which can be done under face-to-face modality and those which will be carried out remotely.

Regarding the potential tools to be applied for the formative activities during the online mode, CampusRemoto and the FaiTIC platform will be used.

2. Online modality
In the event that the non-face-to-face teaching modality is required (suspension of all face-to-face formative and assessment activities), the tools currently available at the University of Vigo, CampusRemoto and the FaiTIC platform will be used. The reorganization will depend on the moment throughout the semester in which this online modality is activated. In the reorganization of the teaching activities, the following guidelines would be followed:

2.1. Communication
Through the FaiTIC platform, all the students will be informed about the new conditions under which the formative activities and assessment tests will be carried out at the end of the semester.

2.2. Adaptation and / or modification of teaching methodologies
As the teaching methodologies have been conceived for the face-to-face teaching modality, the teaching methodologies that would be kept and those which would be modified or replaced in the online modality are indicated below.

The teaching methodologies that would be kept, since they can be used in face-to-face and online teaching mode are:
Lecturing

Problem solving
Seminars

The teaching methodologies that would be modified are the following:

Field trips to industrial facilities or companies will be replaced by interactive or explanatory videos of technological processes, or instrumental laboratory practices will be replaced by interactive videos or explanatory documents of the tests to be performed.

2.3. Adaptation of tutorial sessions and personalized attention
The tutorial sessions may be carried out by telematic means (email, videoconference, FAITIC forums, ...) with prior agreement.

2.4. Evaluation

Depending on the degree of development of the face-to-face methodologies (laboratory practical), in face-to-face modality, the suitability of increasing the weight of this methodology in the final evaluation of the subject will be assessed (detriment of the associated % to the final exam of the subject). The planning of partial exams with greater weight in the final grade will also be assessed. These changes in the evaluation will be communicated to the students through the Faitic platform or Remote Campus.

2.5. Bibliography or additional material to facilitate self-learning
Additional interactive, documentary or audiovisual material may be provided to support student self-learning.

IDENTIFYING DATA				
Calor e frío				
Subject	Calor e frío			
Code	V09G310V01405			
Study programme	Grao en Enxeñaría dos Recursos Mineiros e Enerxéticos			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2	2c
Teaching language	Castelán Galego			
Department	Enxeñaría mecánica, máquinas e motores térmicos e fluídos			
Coordinator	Morán González, Jorge Carlos			
Lecturers	Morán González, Jorge Carlos			
E-mail	jmoran@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	Termodinámica			

Competencias	
Code	
B1	Capacitación científico-técnica para o exercicio da profesión de Enxeñeiro Técnico de Minas e coñecemento das funcións consultivas, análise, deseño, cálculo, proxecto, construción, mantemento, conservación e explotación.
B2	Comprender os múltiples condicionamentos de carácter técnico e legal que xorden no desenvolvemento, no ámbito da enxeñaría de minas, que teñan por obxecto, de acordo cos coñecementos adquiridos segundo o previsto no parágrafo 5 da orde CIN7306 / 2009, a prospección e investigación xeolóxica-mineira, as explotacións de todo tipo de recursos xeolóxicos, incluíndo as augas subterráneas, as obras subterráneas, os almacenamentos subterráneos, as plantas de tratamento e beneficio, as plantas de enerxía, as plantas mineralúrxicas e siderúrxicas, as plantas de materiais para a construción, as plantas de carboquímica, petroquímica e gas, as plantas de tratamentos de residuos e efluentes e fábricas de explosivos e capacidade para empregar métodos contrastados e tecnoloxías acreditadas, co obxectivo de acadar unha maior eficacia dentro do respecto polo Medio Ambiente e a protección da seguridade e saúde dos traballadores e usuarios das mesmas.
B3	Capacidade para deseñar, redactar e planificar proxectos parciais ou específicos das unidades definidas no parágrafo anterior, tales como instalacións mecánicas e eléctricas e o seu mantemento, redes de transmisión de enerxía, instalacións transporte e almacenamento para materiais sólidos, líquidos ou gasosos, entullarías, balsas ou encoros, sostemento e cimentación, demolición, restauración, voaduras e loxística de explosivos.
B4	Capacidade para deseñar, planificar, operar, inspeccionar, asinar e dirixir proxectos, plantas ou instalacións, no seu ámbito.
B5	Capacidade de realización de estudos de ordenación do territorio e dos aspectos medioambientais relacionados cos proxectos, plantas e instalacións, no seu ámbito.
B6	Capacidade para o mantemento, conservación e explotación dos proxectos, plantas e instalacións, no seu ámbito.
B7	Coñecemento para realizar, no ámbito da enxeñaría de minas, de acordo cos coñecementos adquiridos segundo o disposto no apartado 5 da orde CIN /306/2009, medicións, replanteos, planos e mapas, cálculos, valoracións, análise riscos, peritaxes, estudos e informes, plans de traballo, estudos de impacto ambiental e social, plans de restauración, sistema control de calidade, sistema de prevención, análise e avaliación das propiedades dos materiais metálicos, cerámicos, refractarios, sintéticos e outros materiais, caracterización de solos e macizos rochosos e outros traballos semellantes.
C10	Comprensión e dominio dos conceptos básicos sobre as leis xerais da mecánica e da termodinámica e a súa aplicación para a resolución dos problemas propios da enxeñaría. Transferencia de calor e materia e máquinas térmicas.
D1	Capacidade de interrelacionar todos os coñecementos adquiridos, interpretándoos como compoñentes dun corpo do saber cunha estrutura clara e unha forte coherencia interna.
D2	Capacidade de desenvolver un proxecto completo en calquera campo desta enxeñaría, combinando de forma adecuada os coñecementos adquiridos, accedendo ás fontes de información necesarias, realizando as consultas precisas e integrándose en equipos de traballo interdisciplinar.
D3	Propoñer e desenvolver solucións prácticas, utilizando os coñecementos teóricos, a fenómenos e situacións-problema da realidade cotiá propios da enxeñaría, desenvolvendo as estratexias adecuadas.
D4	Favorecer o traballo cooperativo, as capacidades de comunicación, organización, planificación e aceptación de responsabilidades nun ambiente de traballo multilingüe e multidisciplinar, que favoreza a educación para a igualdade, para a paz e para o respecto dos dereitos fundamentais.
D7	Capacidade para organizar, interpretar, asimilar, elaborar e xestionar toda a información necesaria para desenvolver o seu labor, manexando as ferramentas informáticas, matemáticas, físicas, etc. necesarias para iso.
D8	Concibir a enxeñaría nun marco de desenvolvemento sostible con sensibilidade cara temas ambientais.

Resultados de aprendizaxe

Expected results from this subject	Training and Learning Results		
Comprender o concepto de Exerxía diferenciado do concepto de Enerxía, e aprender a calcular a exergía dispoñible, a exerxía aproveitada e a exerxía perdida en procesos de sistemas termodinámicos	B1 B2 B3 B4 B5 B7	C10	D1 D2 D3 D4 D7 D8
Comprender os aspectos básicos termodinámicos dos motores de combustión alternativos e das centrais térmicas de gas, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas	B1 B2 B3 B4 B6	C10	D1 D2 D3 D4 D7 D8
Demostrar coñecemento nos métodos de obtención, purificación e refino dos metais (metalurxia)			
Comprender os aspectos básicos termodinámicos das centrais térmicas de vapor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas	B1 B2 B3 B4 B6	C10	D1 D2 D3 D4 D7 D8
Comprender os aspectos básicos termodinámicos das máquinas frigoríficas e bombas de calor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas	B1 B2 B3 B4 B6	C10	D1 D2 D3 D4 D7 D8
Comprender as bases físicas da transmisión de calor por condución, e aprender a determinar fluxos de calor e distribución de temperaturas principalmente en medios en fase sólida	B1 B2 B3 B4 B6	C10	D1 D2 D3 D4 D7 D8
Comprender as bases físicas da transmisión de calor por radiación, e aprender a determinar fluxos de calor e distribución de temperaturas en medios sólidos e fluidos	B1 B2 B3 B4 B6	C10	D1 D2 D3 D4 D7 D8
Comprender as bases físicas da transmisión de calor por conveción, e aprender a determinar fluxos de calor e distribución de temperaturas en medios fluidos	B1 B2 B3 B4 B6	C10	D1 D2 D3 D4 D7 D8

Contidos	
Topic	
EXERXÍA	EXERXÍA
CICLOS TERMODINÁMICOS	CICLOS MOTORES CICLOS FRIGORÍFICOS
MOTORES TÉRMICOS	MOTORES DE COMBUSTIÓN E EXPLOSIÓN TURBINAS DE VAPOR E DE GAS
MÁQUINAS FRIGORÍFICAS E BOMBAS DE CALOR	MÁQUINAS FRIGORÍFICAS E BOMBAS DE CALOR
TRANSMISIÓN DE CALOR POR CONDUCCIÓN	TRANSMISIÓN DE CALOR POR CONDUCCIÓN. LEY DE FOURIER CONDUCCIÓN ESTACIONARIA UNIDIMENSIONAL CONDUCCIÓN MULTIDEMSIONAL NO ESTACIONARIA
TRANSMISIÓN DE CALOR POR RADIACIÓN	RADIACIÓN TÉRMICA RADIACIÓN SOLAR
TRANSMISIÓN DE CALOR POR CONVECCIÓN	FUNDAMENTOS E CORRELACIÓNS DA CONVECCIÓN FLUXOS LAMINAR E TURBULENTO
MESTURAS NON REACTIVAS	MESTURAS NON REACTIVAS

Planificación			
	Class hours	Hours outside the classroom	Total hours
Lección maxistral	17.5	35	52.5

Resolución de problemas	12.5	52.5	65
Prácticas de laboratorio	15	0	15
Seminario	5	10	15
Exame de preguntas de desenvolvemento	2.5	0	2.5

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

Metodoloxía docente

	Description
Lección maxistral	Exposición por parte do profesor dos contidos da materia obxecto de estudo. Bases nas que se sustenta. Relación con outras materias. Aplicacións tecnolóxicas
Resolución de problemas	Resolución de problemas-exemplo e problemas que se lles propón facer ós alumnos ó longo do curso
Prácticas de laboratorio	Experimentación de procesos reais no laboratorio que complementan os contidos da materia.
Seminario	Resolución de dudas dos contidos teóricos da materia. Discusión participativa dos alumnos en relación ó entendemento dos conceptos e ideas que vertebran o contido da materia

Atención personalizada

Methodologies	Description
Resolución de problemas	Todas estas actividades estarán titeladas polo profesor; ben durante as horas lectivas, ben durante as horas oficiais de titorías, ou durante a revisión das probas e exames. Para todas as modalidades de docencia, as sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.
Prácticas de laboratorio	Todas estas actividades estarán titeladas polo profesor; ben durante as horas lectivas, ben durante as horas oficiais de titorías, ou durante a revisión das probas e exames
Seminario	Todas estas actividades estarán titeladas polo profesor; ben durante as horas lectivas, ben durante as horas oficiais de titorías, ou durante a revisión das probas e exames

Avaliación

	Description	Qualification	Training and Learning Results
Lección maxistral	Valórase a atención do alumno na clase e o seu aproveitamento progresivo da materia. Valorarase mediante exame de preguntas tipo test ou de resposta corta, e tamén terase en conta as respostas dos alumnos ás preguntas feitas polo profesor ase como as preguntas interesantes que poda facer en clase a alumno/a. RESULTADOS DE APRENDIZAXE: Comprender o concepto de Exerxía diferenciado do concepto de Enerxía, e aprender a calcular a exergía dispoñible, a exerxía aproveitada e a exerxía perdida en procesos de sistemas termodinámicos. Comprender os aspectos básicos termodinámicos dos motores de combustión alternativos e das centrais térmicas de gas, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender os aspectos básicos termodinámicos das centrais térmicas de vapor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender os aspectos básicos termodinámicos das máquinas frigoríficas e bombas de calor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender as bases físicas da transmisión de calor por condución, e aprender a determinar fluxos de calor e distribución de temperaturas principalmente en medios en fase sólida Comprender as bases físicas da transmisión de calor por radiación, e aprender a determinar fluxos de calor e distribución de temperaturas en medios sólidos e fluídos Comprender as bases físicas da transmisión de calor por convección, e aprender a determinar fluxos de calor e distribución de temperaturas en medios fluídos.	10	C10 D1

Resolución de problemas	Valorarase, mediante exame, a capacidade do alumno para atopar solucións a problemas e exercicios. O longo do curso poderase facer probas de avaliación continua combinados ou non con probas de avaliación das leccións maxistrais. A suma de todas as probas de avaliación continua será de máximo 30% da nota final. RESULTADOS DE APRENDIZAXE: Comprender o concepto de Exerxía diferenciado do concepto de Enerxía, e aprender a calcular a exergía dispoñible, a exerxía aproveitada e a exerxía perdida en procesos de sistemas termodinámicos. Comprender os aspectos básicos termodinámicos dos motores de combustión alternativos e das centrais térmicas de gas, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender os aspectos básicos termodinámicos das centrais térmicas de vapor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender os aspectos básicos termodinámicos das máquinas frigoríficas e bombas de calor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender as bases físicas da transmisión de calor por condución, e aprender a determinar fluxos de calor e distribución de temperaturas principalmente en medios en fase sólida Comprender as bases físicas da transmisión de calor por radiación, e aprender a determinar fluxos de calor e distribución de temperaturas en medios sólidos e fluídos Comprender as bases físicas da transmisión de calor por convección, e aprender a determinar fluxos de calor e distribución de temperaturas en medios fluídos.	85	C10	D1 D2 D3 D4 D7
Prácticas de laboratorio	Para aqueles alumnos que realicen o 100% das prácticas de laboratorio. Valórase a implicación do alumno na realización das prácticas e a súa capacidade para aplicar os contidos teóricos na realización das prácticas experimentais. RESULTADOS DE APRENDIZAXE: Comprender o concepto de Exerxía diferenciado do concepto de Enerxía, e aprender a calcular a exergía dispoñible, a exerxía aproveitada e a exerxía perdida en procesos de sistemas termodinámicos. Comprender os aspectos básicos termodinámicos dos motores de combustión alternativos e das centrais térmicas de gas, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender os aspectos básicos termodinámicos das centrais térmicas de vapor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender os aspectos básicos termodinámicos das máquinas frigoríficas e bombas de calor, e aprender a determinar rendementos e eficiencias enerxéticas e exerxéticas. Comprender as bases físicas da transmisión de calor por condución, e aprender a determinar fluxos de calor e distribución de temperaturas principalmente en medios en fase sólida Comprender as bases físicas da transmisión de calor por radiación, e aprender a determinar fluxos de calor e distribución de temperaturas en medios sólidos e fluidos Comprender as bases físicas da transmisión de calor por conveción, e aprender a determinar fluxos de calor e distribución de temperaturas en medios fluídos.	5	C10	D1 D4 D8

Other comments on the Evaluation

Aqueles alumnos que realicen as tarefas que encarga o profesor ó longo do curso, e superen as probas de avaliación continua, poderán chegar ó examen final cunha renta de tres con cinco puntos sobre dez, e poderán alcanzar coa resolución do exame a nota máxima de dez.

Aqueles alumnos que non realicen as tarefas que encarga o profesor ó longo do curso, a máxima puntuación que poderán obter no examen final é un sete.

Dependendo da dispoñibilidade de tempo e programación do curso, poderanse facer exames parciais da materia.

Na convocatoria extraordinaria de Xullo o exame valorarase sobre 10.

Calendario de exames. Verificar/consultar de forma actualizada na páxina web do centro:

http://minaseenerxia.uvigo.es/gl/docencia/exames

Bibliografía. Fontes de información

Basic Bibliography

Moran, M.J. y Shapiro, H. N., **Fundamentos de termodinámica técnica**, 2ª ed., Reverté, 2004

Çengel, Yunus A., **Termodinámica**, 8ª ed., MacGraw-Hill, 2015

Kreith, Frank, **Principios de transferencia de calor**, 7ª ed., Cengage Learning, 2012

Çengel, Yunus A., **Transferencia de calor y masa : fundamentos y aplicaciones**, 4ª ed., McGraw-Hill, 2011

Complementary Bibliography

Recomendacións

Subjects that continue the syllabus

Explosivos/V09G310V01633
Xeración e distribución de enerxía térmica convencional e renovable/V09G310V01533
Enxeñaría nuclear/V09G310V01632

Subjects that it is recommended to have taken before

Física: Sistemas térmicos/V09G310V01302
Mecánica de fluídos/V09G310V01305

Other comments

Non se recomenda a matriculación nesta materia mentras non se teña superada a materia Sistemas Térmicos

Plan de Continxencias

Description

Ante a incerta e imprevisible evolución da alerta sanitaria provocada pola COVID-19, a Universidade establece una planificación extraordinaria que se activará no momento en que as administracións e a propia institución o determinen atendendo a criterios de seguridade, saúde e responsabilidade, e garantindo a docencia nun escenario non presencial ou non totalmente presencial. Estas medidas xa planificadas garanten, no momento que sexa preceptivo, o desenvolvemento da docencia dun xeito mais áxil e eficaz ao ser coñecido de antemán (ou cunha ampla antelación) polo alumnado e o profesorado a través da ferramenta normalizada e institucionalizada das guías docentes DOCNET.

1. Modalidade semipresencial

No caso de activarse a ensinanza semipresencial suporía unha redución dos aforos dos espazos docentes empregados na modalidade presencial, polo que como primeira medida o centro proporcionaría ao profesorado da materia a información relativa aos novos aforos dos espazos docentes, ao obxecto de que poida proceder a reorganizar as actividades formativas do que resta do cuadrimestre. Cabe sinalar que a reorganización dependerá do momento ao longo do cuadrimestre en que se activase dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

Informar a todo o alumnado a través da plataforma FaiTIC das condicións en que se desenvolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa.

No caso de que parte do alumnado tiña realizadas prácticas de laboratorio instrumental ou de informática de forma presencial, realizar presencialmente, de ser posible, estas actividades ou equivalentes para o alumnado que non as realizou.

Das actividades que resten para rematar o cuadrimestre, identificar aquelas actividades formativas que poidan ser realizadas por todo o alumnado de forma presencial e as actividades formativas que se realizarán en modo remoto.

En relación as ferramentas para a empregar para as actividades formativas que se realicen en modo non presencial, contarase co uso de CampusRemoto e a plataforma FaiTIC.

2. Modalidade non presencial

No caso en que se active a modalidade de ensino non presencial (suspensión de todas as actividades formativas e de avaliación presenciais) empregaranse as ferramentas dispoñibles na actualidade na Universidade de Vigo: Campus Remoto e FaiTIC. As condicións de reorganización dependerán do momento ao longo do cuadrimestre en que se active dita modalidade de ensino. Na reorganización das ensinanzas seguiríanse as seguintes pautas:

2.1. Comunicación
Informar a todo o alumnado a través da plataforma FaiTIC das condicións nas que se devolverán as actividades formativas e as probas de avaliación que resten para finalizar o cuadrimestre.

2,2. Adaptación e/ ou modificación de metodoloxías docentes
Dado que as metodoloxías docentes están concibidas para a modalidade de ensino presencial indícanse a continuación as

metodoloxías docentes que se manterían e cales se modificarían ou substituirán na modalidade non presencial.

As metodoloxías docentes que se manteñen son as seguintes, dado que poden empregarse en modalidade presencial e non presencial

- Lección maxistral--> En vez de presencialmente farase virtualmente por medio de Campus Remoto (ou a plataforma semellante que decida a Uvigo) ou tamén mediante presentacions con voz grabada

- Resolución de problemas --> En vez de presencialmente, farase virtualmente por medio de videos, onde os problemas se desenvolveran sobre unha tablet mentras se graba o video, ou alternativamente, por medio de Campus Remoto (ou a plataforma semellante que decida a Uvigo)

As metodoloxías docentes que se modifican son as seguintes

- Prácticas de laboratorio--> serán sustituidas por resolución de problemas por parte do profesor e do alumno

- Seminario --> serán sustituidas por resolución de problemas por parte de profesor e do alumno

2.3. Adaptación de atención de titorías e atención personalizada
As sesións de titorización poderán realizarse por medios telemáticos (correo electrónico, videoconferencia, foros de FAITIC, ...) baixo a modalidade de concertación previa..

2.4. Avaliación
Ao longo do curso as probas de teoría ou problemas ou laboratorio que xa se teñan feito se conservaran ca puntuación prevista. As probas previstas que non se ponderan facer presencialmente serán sustituidas por probas do mesmo valor que se farán virtualmente por medio de Campus Remoto (ou a plataforma semellante que decida a Uvigo)