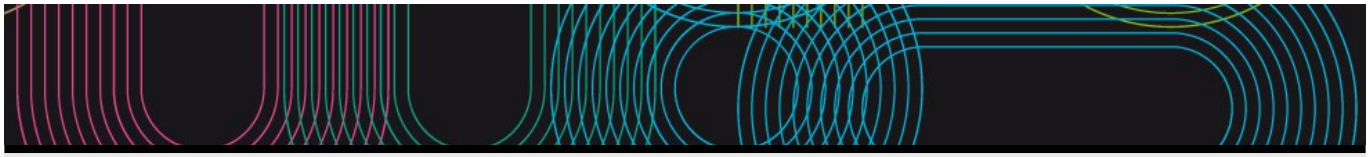

IDENTIFYING DATA				
Water Engineering				
Subject	Water Engineering			
Code	V09M148V01202			
Study programme	(*)Máster Universitario en Enxeñaría de Minas			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Caparrini Marín, Natalia Ricoy Alonso, Juan			
Lecturers	Caparrini Marín, Natalia Ricoy Alonso, Juan			
E-mail	jricoy@uvigo.es nataliac@uvigo.es			
Web	http://faitic.uvigo.es/			
General description	(*)Os obxectivos da materia son: 1) Dominar a terminoloxía do ámbito da tecnoloxía da auga. 2) Proporcionar as bases para a caracterización e explotación dos distintos tipos de recursos hidroxeológicos. 3) Coñecer os parámetros que definen a calidade e composición química da auga subterránea 4) Coñecer os principios de funcionamento das tecnoloxías para o tratamento de augas 5) Integrar os aspectos #ambiental de acordo coa lexislación actual, así como profundar nas novas tendencias da xestión dos recursos hídricos e a gobernanza da auga.			

Competencies	
Code	
A1	(*)Posuír e comprender coñecementos que acheguen unha base ou oportunidade de ser orixinais no desenvolvemento e/ou aplicación de ideas, adoito nun contexto de investigación.
A2	(*)Que os estudantes saiban aplicar os coñecementos adquiridos e a súa capacidade de resolución de problemas en contornos novos ou pouco coñecidos dentro de contextos máis amplos (ou multidisciplinares) relacionados coa súa área de estudo.
C1	(*)Competencia Específica CE1. Coñecemento adecuado de modelización, avaliación e xestión de recursos xeolóxicos, incluídas as augas subterráneas, minerais e termais.
C6	(*)Competencia Específica CE6. Capacidade para proxectar e executar tratamentos de augas e xestión de residuos (urbanos, industriais ou perigosos).
C7	(*)Competencia Específica CE7. Capacidade para avaliar e xestionar ambientalmente proxectos, plantas ou instalacións.
C15	(*)Competencia Específica CE15. Capacidade para planificar, realizar estudos e deseñar captacións de augas subterráneas, así como a súa xestión, exploración, investigación e explotación, incluíndo as augas minerais e termais.
D9	(*)Competencia Transversal CT9. 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.
D10	(*)Competencia Transversal CT10. Aplicar a lexislación vixente do sector, identificar os elementos crave da contorna social e empresarial do sector e relacionarse coa administración competente integrando este coñecemento na elaboración de proxectos de enxeñaría e no desenvolvemento de calquera dos aspectos do seu labor profesional.
D12	(*)Competencia Transversal CT12. Saber aplicar e integrar os seus coñecementos, a comprensión de aspectos teóricos e prácticos, a súa fundamentación científica e as súas capacidades de resolución de problemas en contornas novas e definidas de forma imprecisa, incluíndo contextos de carácter multidisciplinar tanto investigadores como profesionais altamente especializados.

Learning outcomes

Expected results from this subject	Training and Learning Results
New	C1 C6 D10
New	A1 C1 C7 C15 D10
New	A2 C1 C7 C15 D10 D12
New	A1 C6 C7 D10 D12
New	A1 A2 D9 D10 D12

Contents

Topic	
SUBJECT 1: HYDROLOGY	Cycle *hidrolóxico. PRECIPITATION. *Evapotranspiración. Infiltration. *Escorrentía. Balance *hídrico. *Modelización Of rivers and Discharges of avenue: HEC-HMS and HEC-FROGS
SUBJECT 2: HIDROXEOLO*GÍA	Aquifers. Hydraulic properties. Hydraulic underground. *Piezometría. Exploration and Exploitation of underground waters. Hydraulic of catchments. *Modelización Of aquifers: MODFLOW
SUBJECT 3: LEGISLATION	Law of Waters. Directive Mark European. Planning *Hidrolóxica. Hydraulic Public dominance. Grantings and Authorizations. Perimeters of Protection. Management of *Verteduras. Mineral waters and *Termais.
SUBJECT 4: RESOURCES *HÍDRICOS	Natural resources, potential and available. Sources of Information. Units of Management. Catchments. *Potabilización. *Depuración. Reuse. *Desalación. *Transvasamentos. Uses and Lawsuits. Economy of the water.
SUBJECT 5: CHEMICALHIDRO	Composition of the waters. Nets of measure. *Mostraxe And Analysis. Representation of data. State and Quality of the waters. Polluting processes. *Modelización *hidroquímica: WATEQ4*F

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	14	10	24
Problem solving	20	40	60
Case studies	10	10	20
Studies excursion	4	0	4
Essay questions exam	4	0	4
Case studies	0	22	22
Systematic observation	0	16	16

*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 contained envelope to subject object of study, theoretical bases and/or guidelines of one work, exercise or project to develop pole student.

Problem solving	Activity in the that formulate problem and/or exercises related with the subject. The student owes to develop the suitable or correct solutions by means of it *ejercitación 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 use how supplement of the lesson *maxistral.
Case studies	Analysis of a done, problem or real event with the aim to know it, interpreted, resolved, generate hypothesis, contrast data, *reflexionar, complete knowledges, diagnosed and trained in alternative procedures of solution
Studies excursion	Activities of application of *los *conocimientos the *situaciones concrete *y of acquisition of basic skills *y *procedimentales related with wool subject *objeto of studio. If *desarrollan in *espacios in the academic outsides. Between *ellas *pueden quote practices of field, visits to events, centres of investigation, companies, *instituciones... Of *interés academic-professional stop he student.

Personalized assistance

Methodologies	Description
Lecturing	Time devoted to attend the needs and queries of the students related with the study and/or subjects linked with the subject, providing him orientation, support and motivation in the process of learning. This activity can developed of form *presencial (directly in the classroom and us time of *titorías of dispatch) or of form no *presencial (through the email or of *Faitc) Stop all the modalities of *docencia, the sessions of *tutorización will be able to realized by telematic means (email, videoconference, forums of FAITI*C, ...) Low the modality of *concertación previous
Problem solving	Time devoted to attend the needs and queries of the students related with the study and/or subjects linked with the subject, providing him orientation, support and motivation in the process of learning. This activity can developed of form *presencial (directly in the classroom and us time of *titorías of dispatch) or of form no *presencial (through the email or of *Faitc)
Case studies	Time devoted to attend the needs and queries of the students related with the study and/or subjects linked with the subject, providing him orientation, support and motivation in the process of learning. This activity can developed of form *presencial (directly in the classroom and us time of *titorías of dispatch) or of form no *presencial (through the email or of *Faitc)
Studies excursion	Time devoted to attend the needs and queries of the students related with the study and/or subjects linked with the subject, providing him orientation, support and motivation in the process of learning. This activity can developed of form *presencial (directly in the classroom and us time of *titorías of dispatch) or of form no *presencial (through the email or of *Faitc)

Assessment

	Description	Qualification	Training and Learning Results		
Essay questions exam	Examination in the that the student owes to solve a series of questions, problems and/or exercises in a time/condition established/put them it professor. Of this way, the student owes to apply the knowledges that purchased. The results of the learning are: - Provide the bases stop the characterization and exploitation of the distinct types of resources *hidroxeológicos. -Know the parameters that define the quality and chemical composition of the underground water - Know the principles of operation of the technologies stop the treatment of waters -Integrate the environmental aspects in accordance with the current legislation, as well as deepen in the new trends of the management of the resources *hídricos and the *gobernanza of the water.	50	A1 A2	C1 C6 C7 C15	D9 D10 D12

Case studies	Exercises in the that exposes a situation or problematic already given or that can gave, splitting of the different factors *involucrados, the analysis of the antecedents, conditions, of the situation, etc. The results of the learning are: - Provide the bases stop the characterization and exploitation of the distinct types of resources *hidroxeológicos. -Know the parameters that define the quality and chemical composition of the underground water - Know the principles of operation of the technologies stop the treatment of waters -Integrate the environmental aspects in accordance with the current legislation, as well as deepen in the new trends of the management of the resources *hídricos and the *gobernanza of the water.	40	A1 A2	C1 C6 C7 C15	D9 D10 D12
Systematic observation	Techniques destined to recompile data envelope to participation of the student, based in a list of behaviours or operative criteria that facilitate the *obtención of data *cuantificables. The results of the learning are: - Dominate the terminology of the field of the technology of the water.	10		C1 C6	D10

Other comments on the Evaluation

Sources of information

Basic Bibliography

Custodio y Llamas, **Hidrología Subterranea**, Omega, 1996

Ministerio de Medio Ambiente, **Libro blanco del agua en España**, Ministerio de Medio Ambiente, 2000

Directiva 2000/60/CE, **Directiva Marco del Agua**, Comunidad Europea, 2000

RD 1/2001 de 20 de Julio, **Ley de Aguas**, BOE, 2001

Complementary Bibliography

Recommendations

Contingency plan

Description

In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID-19, the University establishes join extraordinary planning that will actuate in the moment in that the administrations and the @propio institution determine it attending to criteria of security, health and responsibility, and guaranteeing the *docencia in a @escenario no *presencial or no totally *presencial. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the *docencia of a way but *áxil and effective when being known beforehand (or with a wide advance) pole students and the teaching staff through the tool normalized and institutionalized of the teaching guides DOCNE*T.

1. Modality *semipresencial
In the case to actuate the education *semipresencial would suppose a reduction of the *aforos of the teaching spaces employees in the modality *presencial, pole that how first measure the centre would provide to the teaching staff of the subject to relative information to the new *aforos of the teaching spaces, to the object that it can proceed to reorganize the formative activities of the that subtracts of the *cuadrimestre. It fits to point out that the reorganisation will depend of the moment along the *cuadrimestre in that actuated dictate modality of teaching. In the reorganisation of the educations would follow the following *pautas:

Inform it all the students through the platform *FaiTIC of the conditions in that will develop the formative activities and the proofs of evaluation that subtract to finalize the *cuadrimestre.

The sessions of *titorización will be able to realized by telematic means (email, videoconference, forums of FAITI*C, ...) Low the modality of *concertación previous.

In the case that it splits of the students had realized practices of instrumental laboratory or of computing of form *presencial, realize *presencialmente, possibly, these activities or analogs stop the students that no realized them.

Of the activities that subtract to finish off the *cuadrimestre, identify those formative activities that can be realized by all the

students of form *presencial and the formative activities that will realize in remote way.

In relation the tools for it employ stop the formative activities that realize in way no *presencial, will explain with the use of *CampusRemoto and the platform *FaiTIC.

2. Modality in the *presencial

In the case in that actuate the modality of teaching no *presencial (suspension of all the formative activities and of evaluation *presenciais) will employ the available tools in the actuality in the University of Vigo: Remote Campus and *FaiTIC. The conditions of reorganisation will depend of the moment along the *cuadrimestre in that actuate dictate modality of teaching. In the reorganisation of the educations would follow the following *pautas:

2.1. Communication
Inform it all the students through the platform *FaiTIC of the conditions in the that will give back the formative activities and the proofs of evaluation that subtract to finalize the *cuadrimestre.

2,2. Adaptation and/ or modification of teaching methodologies
Since the teaching methodologies are conceived stop the modality of teaching *presencial indicate the continuation the teaching methodologies that would keep and which would modify or will substitute in the modality no *presencial.
The teaching methodologies that keep are the following, since they can employed in modality *presencial and no *presencial
Lesson *maxistral
The teaching methodologies that modify are the following
The exits of study to installations or companies *reemplazaranse by interactive or explanatory videos of the technological processes
To the practices in the room of computers *reemplazaranse by *teletraballo

2.3. Adaptation of attention of *titorías and attention customized
The sessions of *titorización will be able to realized by telematic means (email, videoconference, forums of FAITI*C, ...) Low the modality of *concertación previous..

2.4. Evaluation
No modifies

2.5. Bibliography or material additional to facilitate to car-learning
No modifies