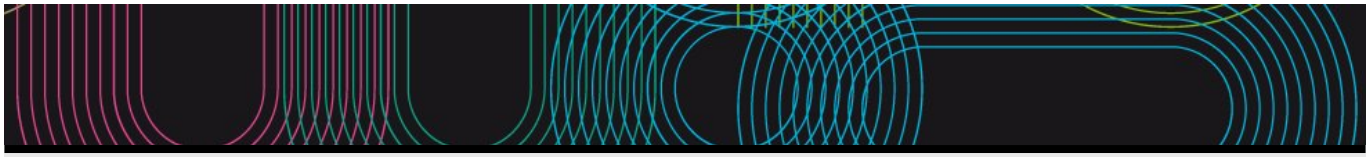

IDENTIFYING DATA				
Geomatics				
Subject	Geomatics			
Code	V09G290V01401			
Study programme	Degree in Energy Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	2nd
Teaching language	Spanish Galician English			
Department				
Coordinator	Martínez Sánchez, Joaquín			
Lecturers	Garrido González, Iván Liñares Méndez, Patricia Martínez Sánchez, Joaquín			
E-mail	joaquin.martinez@uvigo.es			
Web	http://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	
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	
Knowledge of advanced mathematical and numerical methods used in climate simulation models. Knowledge of the evolution of climate models both in space and time. Knowledge of the complexity of the simulation of the different climatic processes. Ability to validate a climate model and make the necessary changes when discrepancies are observed between model predictions and observations. Ability to analyze with the models, the observed changes and the future climate under different scenarios. Knowledge and analysis of climate models from a global and regional perspective.		
Understanding of the basic aspects needed to draw up plans at different scales.	C14	D1 D3 D7
Mastery of current techniques for data collection in the field using different sensor types which enable map and plan creation.	C14	D1 D5 D7

Knowledge of topographic techniques for data collection.	C14	D1 D3 D7
Ability to handle the main topographic instruments.	C14	D1 D3 D4 D7
Knowledge of photogrammetric techniques for collecting and processing data.	C14	D1 D3 D4 D5 D7
Acquisition of skills to use data from different sources to obtain point clouds which can later allow the creation of plans at different scales.	C14	D1 D3 D7

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 agreeement.
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 agreement.

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	C14	D1 D3 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	C14	D1 D5
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	C14	D1 D5
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	C14	D1 D3 D4 D5 D7

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

Renewable energy installations/V09G290V01604
Hydraulic resources, installations and hydro-power plants/V09G290V01601
Fluid dynamical alternative energies/V09G290V01704
Sustainable exploitation of mining energy resources/V09G290V01803
Construction works, on-site layout and processes/V09G290V01802
Projects/V09G290V01801
Final Year Dissertation/V09G290V01991

Subjects that are recommended to be taken simultaneously

Environmental technology/V09G290V01402

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.