



IDENTIFYING DATA

Monitoring and processing of geospatial information in the field of water

Subject	Monitoring and processing of geospatial information in the field of water			
Code	V09M195V01213			
Study programme	Máster Universitario en Gestión sostenible del agua			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Mandatory	1st	2nd
Teaching language	Spanish Galician			
Department				
Coordinator	Solla Carracelas, María Mercedes			
Lecturers	Soilán Rodríguez, Mario Solla Carracelas, María Mercedes			
E-mail	merchisolla@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	This course aims to train students to manage multi-band and multi-scale geospatial data for monitoring water resources. The theoretical and methodological knowledge necessary for the processing, management and analysis of geospatial data of various formats will be addressed, and practical examples of GIS application in the field of water will be included.			

Training and Learning Results

Code	
B7	Demonstrate through specific cases that geographic information systems (GIS) are a basic tool in water management, applied to the management of water resources. Explain the basic and advanced functionalities of GIS for the preparation, analysis and interpretation of geospatial information of hydrological interest.
C5	Use geographic information systems (GIS) for the treatment and elaboration of geospatial data. Handle GIS tools, statistical tools and tools based on artificial intelligence for the analysis of data related to water management.
D6	Integrate different sources of data in decision frameworks that allow better management of water resources.

Expected results from this subject

Expected results from this subject	Training and Learning Results
Demonstrate through specific cases that geographic information systems (GIS) are a basic tool in water management, applied to the management of water resources. Explain the basic and advanced functionalities of GIS for the preparation, analysis and interpretation of geospatial information of hydrological interest.	B7
Use geographic information systems (GIS) for the treatment and elaboration of geospatial data. Handle GIS tools, statistical tools and tools based on artificial intelligence for the analysis of data related to water management.	C5
Integrate different sources of data in decision frameworks that allow better management of water resources.	D6

Contents

Topic	
1. Multiband and multiscale sensors for the monitoring of water resources.	1.1. Radar. 1.2. RGB images. 1.3. Multispectral and thermal images. 1.4. Hyperspectral images.

2. Space platforms, aerial, terrestrial and aquatic.	2.1. Satellite platforms with RGB and multispectral sensors of low resolution. 2.2. Satellite platforms with RGB and multispectral sensors of medium resolution. 2.3. Aerial platforms (UAV) with RGB, multispectral and thermal sensors of high resolution. 2.4. Terrestrial platforms with hyperspectral sensors of high resolution. 2.5. Aquatic and terrestrial platforms to collect georadar data in groundwaters and reservoirs.
3. Processing and analysis of geospatial data.	3.1. Atmospheric corrections of satellite images. 3.2. Linear corrections to the value of the pixels to obtain information of reflectance from the digital levels of the original image. 3.3. Processing of RGB data. Digital models of the terrain (DMT) from photogrammetric data (RGB sensors mounted on UAV). 3.4. Processing and analysis of multispectral data. 3.5. Processing and analysis of hyperspectral data. 3.6. Processing and analysis of georadar data. 3.7. Calculation of coverage and geospatial distribution. 3.8. Monitoring and control of water pollution (periods and plume).
4. Image classifications (UAV, satellite, ...).	4.1. OBIA classification. 4.2. Random forest. 4.2. Confusion matrix.
5. Variables and indexes of hydrographic interest.	5.1. Remote Sensing indexes for the analysis of ground and aquatic vegetation (NDVI, GNDVI, SR, ...). 5.2. Remote Sensing indexes for the analysis of water condition (NDWI, RI, SEI).
6. Generation of raster/vectorial models (geoprocessing).	6.1. Generation of raster and/or vectorial models from satellite, RGB and multispectral, radar images. 6.2. Visualisation of raster/vectorial models in different sources (repositories of free access, WMS, WFS and WCS servers). 6.3. Geoprocessing for data analysis.
7. Examples of application.	7.1. Applications within the field of water.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	10	15	25
Practices through ICT	20	9	29
Case studies	0	8	8
Essay	0	12	12
Objective questions exam	0	1	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	Presentations by the lecturer of theoretical and practical content in in-person sessions in classroom.
Practices through ICT	Activities to apply knowledge to specific situations and to acquire basic and procedural skills related to the subject.

Personalized assistance

Methodologies	Description
Lecturing	Guidance, support and motivation for the learning process will be provided in person, in the classroom and during the office tutorial hours. Likewise, tutorial sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...), in a synchronously way (under the modality of previous appointment) or asynchronously.
Practices through ICT	Guidance, support and motivation for the learning process will be provided in person, in the classroom and during the office tutorial hours. Likewise, tutorial sessions may be carried out by telematic means (email, videoconference, Moovi forums, ...), in a synchronously way (under the modality of previous appointment) or asynchronously.

Assessment

Description	Qualification Training and Learning Results

Case studies	Small works in which a work scenario is presented, real or fictitious, having a specific problematic. The students must apply the theoretical and practical knowledge of the subject to find a solution to the question or questions raised.	30	B7 C5
Essay	The students present the result obtained in the elaboration of a document (individual project) on the thematic of the subject. Students are required to apply both technical and management skills. In addition to the technical report, the students have to present (oral presentation) the results in the classroom.	40	B7 C5
Objective questions exam	Test of objective theoretical questions (multiple choice or short answer) in which students have to demonstrate their knowledge on the theoretical content of the subject.	30	D6

Other comments on the Evaluation

The first call for continuous assessment carries out during the second semester of teaching. For the delivery of the activities planned (case studies, essay, and objective questions exam), the virtual platform (Moovi), will be enabled, establishing a schedule for an asynchronous delivery of tasks.

For the second call in continuous evaluation, the same activities must be delivered as for the first call. The access to the platform (Moovi) will be enabled again (from the day after the record grades in the first call and until the official day of qualification). The qualification obtained in the activities presented in the first call will be saved, unless the student wants to raise the grade (the final grade will always be the most favorable of both opportunities).

In both announcements, the evaluation criteria will be the same.

The students has the right to request the overall assessment (on explicit request within the official dates). In both calls, this evaluation will consist of the delivery of a case study (30%), an essay (40%), and an objective questions exam (30%), all of them on the official day of qualification of the subject.

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

Chuvieco Salinero, Emilio, **Teledetección ambiental**, 3ª ed., Ariel, 2010

Chuvieco Salinero, Emilio, **Fundamentos de Teledetección Espacial**, 3ª ed., Rialp, 2000

Buzai, Gustavo D., **Sistemas de Información Geográfica (SIG) y Cartografía Temática. Métodos y técnicas para el trabajo en el aula**, 1ª ed., Lugar Editorial, 2008

Lillesand, Thomas and Kiefer, Ralph W. and Chipman, Jonathan, **Remote Sensing and Image Interpretation**, 7ª ed., John Wiley & Sons, 2000

Complementary Bibliography

Henderson, Floyd M. and Lewis Anthony J., **Principles & Applications of Imaging Radar**, 3ª ed., John Wiley & Sons, 1998

Scanvic, Jean-Yves, **Teledetección Aplicada**, 1ª ed., 1989

Recommendations

Subjects that continue the syllabus

Integrated data analysis. Multi-criteria decision systems/V09M195V01217