Universidad Zaragoza

Academic Year/course: 2022/23

25265 -

Syllabus Information

Academic Year: 2022/23
Subject: 25265 -
Faculty / School: 201 - Escuela Politécnica Superior
Degree: 571 - Degree in Environmental Sciences
ECTS: 6.0
Year:
Semester: First Four-month period
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

This 6 ECTS course gives a solid theoretical and practical basis in environmental and planning remote sensing.

It is focused on the analysis of satellite images and other remote sensors data using SNAP and ARCGIS softwares.

It provides the students with the required knowledge to deal with and solve environmental problems in development planning, geohazards, pollution, wildfires, man-made disasters and other natural topics...

These approaches are aligned with some of the Sustainable Development Goals (SDGs) of the 2030 Agenda and certain specific targets, contributing to some extent to their achievement:

Sustainable Development Goals (SDGs)	Goal target/s
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	**4.3** By 2030, ensure equal access for all women and men to affordable and quali tertiary education, including university **4.4** By 2030, substantially increase the number of youth and adults who have rele and vocational skills, for employment, decent jobs and entrepreneurship **4.7** By 2030, ensure that all learners acquire the knowledge and skills needed to development, including, among others, through education for sustainable develop lifestyles, human rights, gender equality, promotion of a culture of peace and non and appreciation of cultural diversity and of culture?s contribution to sustainable d
Goal 13. Take urgent action to combat climate change and its impacts	**13.3** Improve education, awareness-raising and human and institutional capacity adaptation, impact reduction and early warning
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss	**15.1** By 2020, ensure the conservation, restoration and sustainable use of terrest ecosystems and their services, in particular forests, wetlands, mountains and dry under international agreements

1.2. Context and importance of this course in the degree

Within Module VI "Optional", this subject chronologically occupies the last place in the learning sequence defined in the curriculum of the degree.

This subject requires the prior acquisition of skills in thematic cartography, management of the information in digital support, the statistical treatment of the data, and the analysis of environmental variables in a GIS environment.

The knowledge acquired in the subject "Environmental remote sensing" can be used to complement some of the subjects related to the analysis and the interpretation of the territory, such as, ?Fundamentals of geology for the study of the environment?, ?Physical bases of the environment?, ?Air pollution?, ?Natural hazards?, ?Environmental impact assessment?, ?Territorial and urban planning?, ?Cartography and Geographic Information Systems?.

In short, remote sensing, together with Geographic Information Systems (GIS) are at this time essential tools to address the tasks of obtaining, processing, analyzing and mapping environmental and territorial information.

1.3. Recommendations to take this course

The subject "Environmental remote sensing" requires the learning outcomes that define the subjects previously studied within the degree. Especially basic knowledge of statistics, cartography and GIS are essential.

Given the introductory nature of this optional subject, it is essential that the student appropriately invest the time to their personal work to gradually strengthen the basic contents of the subject.

On the other hand, the high practical component of the subject gives great prominence to active participation in face-to-face sessions.

2. Learning goals

2.1. Competences

CB1. That students have shown that they possess and understand knowledge in the area of environmental sciences based on general secondary education, which tends be at a level that, even with the use of advanced textbooks, also includes certain aspects that involve avant-garde knowledge in their field of study.

CB2. That students know how to apply their knowledge to their work or vocation professionally and possess skills that tend to be shown by the elaboration and defence of arguments and problem-solving within their area of study.

CB3. That students have the capacity to bring together and interpret relevant data (normally within environmental sciences) in order to make decisions that include a reflection on socially, scientifically or ethically relevant subjects.

CB4. That students can transmit information, ideas, problems and solutions to both an expert and non-expert audience.

CB5. That students have developed the learning skills necessary to undertake subsequent studies with a high degree of autonomy.

CE3. Mastery of processes, languages, techniques necessary for the interpretation, analysis and evaluation of the environment. This entails the knowledge of math basics, statistic procedures and programs, mapping and geographic information systems, instrumental analysis systems in the environment or basics of environmental engineering.

CG1. Comprehension and mastery of fundamental knowledge in the area of study and the ability to apply this fundamental knowledge to specific tasks of an environmental professional

CG2. Communication and argumentation, oral and written, of stances and conclusions, to expert audiences or broadcasting and information to non-expert audiences

CG6. Capacity to apply theoretical knowledge to an analysis of situations.

CG7. Mastery of IT applications related to the field of study, as well as the use of the internet as medium and source of information.

CG8. Capacity to autonomously organize and plan work and manage information.

CG13. Capacity of autonomous learning and self-assessment

2.2. Learning goals

LG1. Define and explain the fundamentals of remote sensing.

LG2. Differentiate and manage basic procedures to improve and correct, visualize and classify images.

LG3. Acquire the basic knowledge to carry out a mapping of forms, vegetation and land uses by managing aerial photography, ortho-images and satellite images.

LG4. Acquire the necessary knowledge to perform, and process LiDAR data and be able to perform Digital Terrain Models.

	Sustainable Development Goals (SDGs)		
Learning goals	**Goal 4**. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	**Goal 13**. Take urgent action to combat climate change and its impacts	**Goal 15**. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
LG1	×		
LG2	×		×
LG3		×	×
LG4			×

2.3. Importance of learning goals

The learning outcomes of this subject are essential in the current context of Environmental Sciences for the explanatory analysis, modeling and resolution of territorial and environmental problems. Remote sensing, together with other geographic information technologies such as GIS, is an effective and avant-garde tool applicable in both research and professional practice. This subject trains the student - at the appropriate level for a university study in the first cycle - in the treatment of remote sensing data of different kinds from a solid theoretical, methodological and critical base.

Regarding the ODS, the students will develop the strategies to mitigate climate change and to establish sostenaible plans for the environment and the explotation of natural resources based on remotes sensing techniques.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

I Call

Global evaluation test about the theoretical content of the subject (test A) and the delivery of a portfolio (test B). The subject will be passed if the result of both tests - each with its corresponding weighting - is equal to or greater than 5 points out of 10.

Test A) an exam related to the syllabus of the subject, participating in 40% of the total. It will be passed if the result is equal to or greater than 5 points out of 10. The date and the place will be informed in the Official Exam Calendar defined by the Center.

This exam will include objective questions of test type, short questions and open questions.

The evaluation criteria, according to the question modality, are: the concepts handled, accuracy and precision, originality in the approach, ability to relate concepts, degree of structuring, relevance and coherence, correct use of the terminology, justified incorporation of concepts and theoretical contents.

Test B) portfolio that will be delivered on the day of the exam (test A). The portfolio will be composed of:

i) The work done during the practice sessions.

ii) Practical study cases (personal work).

The portfolio will represent 60% of the total. It will be passed if the result is equal to or greater than 5 points out of 10.

The evaluation criteria of the portfolio will be: domain of the specific tools for the adequate use of remote sensing data, accuracy and precision, originality in the approach, capacity of relationship, degree of structuring, relevance and coherence, correct use of the terminology, diagnostic capacity.

II Call

Students who have not done -or have not passed- the evaluation in the first call have the second official call, which is based on the same type of tests and with the same criteria as the global evaluation developed in the first call.

The average success rate of the subject in the last three years is 100%.

2018/19	2019/20	2020/21	AVERAGE
100%	100%	100%	100%

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, seminars and computer sessions with the SNAP and ArcGIS Softwares in order to interpret satellite images, aerial pictures and digital elevation models (DEMs).

4.2. Learning tasks

The learning process requires the overlap between the more strictly theoretical face-to-face activities and those of a more practical nature.

A) Theoretical-practical sessions guided by the teacher for the systematic development of the contents of the subject's syllabus (53 contact hours). These sessions include:

i) MD1-Lecture class mode (15 hours).

ii) MD9-Practical application of techniques for the visual and digital processing of satellite images, aerial and other environmental remote sensing data (38 hours), which includes the learning of skills in the management of specific remote sensing software.

B) MD10-Seminars of collaborative work with the students (3 hours) oriented to critical reflection and study cases related to the applications of environmental remote sensing.

C) MD12-Practical work (14 hours).

D) Autonomous study of the student (76 hours): assimilation of the concepts and content of the syllabus of the subject (preparation of the evaluation tests), handling of basic bibliography and other resources on the Internet (preparation of the evaluation tests), practice in the management of specific computer programs and tools for the visual analysis and digital processing of satellite images, aerial photographs and other remote sensing data.

E) MD15-Performance of written evaluation tests (4 hours).

4.3. Syllabus

1. Introduction to remote sensing: context, evolution and basic concepts.

2. Physical principles of remote sensing: fundamentals of remote observation, terms and units of measurement, electromagnetic radiation, the solar domain of the spectrum (characteristics and factors), typical spectral signatures.

3. Remote sensing systems and programs: types of sensors, orbital characteristics of satellites, resolution of a sensor system, search and download of images.

4. Treatment, interpretation and analysis of remote sensing data: visual interpretation of aerial and satellite images, treatment and digital analysis of images, environmental applications of remote sensing.

5. The use of aerial photography: photointerpretation of arid, humid and cold zones, serial sequences of aerial photos as markers of the evolution of the landscape and human activities.

6. Treatment and analysis techniques with LiDAR data.

4.4. Course planning and calendar

	1	2	3	4	5	6	7	8
	15-16 sep	19-23 sep (1)	26-30 sep (2)	3-7 oct (3)	10-14 oct	17-21 oct	24-28 oct	31 oct-4
Tipo actividad / Semana					Festivo 12 oct (mié)			Festivos oct (lune 1 nov (martes)
Actividad Presencial								
Teoría	2	2	2		2	2		2
Problemas		2		2	2	2		
Prácticas laboratorio			2	2			4	
Trabajos en grupo								
Salidas de prácticas								
Tutorías ECTS								
Evaluación								
Actividad No presencial								
Trabajo individual	4	4	4	3	4	2	3	4
Trabajo en grupo				1		2	1	2
TOTAL	6	8	8	8	8	8	8	8

Given that the subject is based on a continuous overlap between the theoretical and practical contents, the course planning and the key dates related to the different activities shown in this course planning, may undergo slight changes that will be indicated in the Digital Teacher Ring (ADDUnizar).

4.5. Bibliography and recommended resources

BB Chuvieco Salinero, Emilio. Teledetección ambiental : la observación de la tierra desde el espacio / Emilio Chuvieco. 1a. ed. Barcelona : Ariel, 2002

BB Geomorfología práctica : ejercicios de fotointerpretación y planificación geoambiental / Juan de Dios Centeno ... [et al.]. Madrid : Rueda, D.L. 1994

BB Gibson, Paul. Introductory remote sensing, principles and concepts / Paul J. Gibson ; with contributions to the text by Clare H. Power and Website development by John Keating. [London] : Routledge, 2000

BB Sistemas y análisis de la información geográfica : manual de autoaprendizaje con ArcGIS / Coordinador Antonio Moreno Jiménez; autores Rosa Cañada Torrecillas ... [et al.]. Madrid : Ra-Ma, 2006

BC Bhatta, Basudeb. Research Methods in Remote Sensing [electronic resource] / by Basudeb Bhatta. Dordrecht : Springer Netherlands : Imprint: Springer, 2013

BC Campbell, James B. Introduction to remote sensing / James B. Campbell. 3rd ed. London [etc.] : Taylor & Francis, 2002

BC Chuvieco Salinero, Emilio. Fundamentos de teledetección espacial / Emilio Chuvieco. 3a. ed. rev., reimp. corr. Madrid : Rialp, D.L. 2000

BC Earth Observation of Global Changes (EOGC) [electronic resource] / edited by Jukka M. Krisp, Liqiu Meng, Roland Pail, Uwe Stilla. Berlin, Heidelberg : Springer Berlin Heidelberg : Imprint: Springer, 2013

BC Fernández García, Felipe. Introducción a la fotointerpretación / Felipe Fernández García. 1a. ed. Barcelona : Ariel, 2000

BC Fernández-Prieto, Diego. Remote Sensing Advances for Earth System Science [electronic resource] : The ESA Changing Earth Science Network: Projects 2009-2011 / by Diego Fernández-Prieto, Roberto Sabia. Berlin, Heidelberg : Springer Berlin Heidelberg : Imprint: Springer, 2013

BC Gibson, Paul J. Introductory remote sensing : digital image processing and applications / Paul J. Gibson and Clare H. Power. London : Routledge, 2000

BC Jensen, J.R. (2004): Introductory digital image processing: a remote sensing perspective. Englewood Cliffs: Prentice Hall

BC Laser scanning for the environmental sciences / edited by George L. Heritage and Andrew R.G. Large. Chichester, UK ; Hoboken, NJ : Wiley-Blackwell, 2009

BC Lillesand, Thomas M. Remote sensing and image interpretation / Thomas M. Lillesand, Ralph W. Kiefer, Jonathan W. Chipman . 6th ed. Hoboken, NJ : John Wiley, cop. 2008

BC Mather, P.M., Coch, M. (2011). Computer processing of remotely sensed images. Chichester: John Wiley & Sons

BC Pinilla Ruiz, Carlos. Elementos de teledetección / Carlos Pinilla Ruiz. Madrid : RA-MA, D.L. 1995

BC Sabins, Floyd F. Remote sensing : principles and interpretation / Floyd F. Sabins. 3rd ed. New York : W.H. Freeman and Co, cop. 1997

BC Schowengerdt, R.A. (2007): Remote sensing, models, and methods for image processing. Burlington: Elsevier Academic Press, 2007

BC Sobrino, José A. Teledetección / José A. Sobrino (ed.). Valencia : AECI, D.L. 2000

LISTADO DE URLs:

Liang, S. (2004): Quantitave remote sensing for land surface characterization. Hoboken: John Wiley & Sons [http://dlspac.com/spatialacademysitefiles/Library/quantitative%20remote%20sensing%20of%20land%20surface.pdf]

Martínez Vega, J., Martín Isabel, M.P. (2010): Guía didáctica de teledetección y medio ambiente. Madrid: Red Nacional de Teledetección Ambiental
[http://www.aet.org.es/files/guia_teledeteccion_medio_ambiente.pdf]

Rees, W.C. (2012): Physical principles of remote sensing. Cambridge University Press
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http://waterhouse.ir/sites/default/files/Physical%20Principles%20of%20Remote%20Sensing%20-%20Third%20Edition_0.pd
]

The updated recommended bibliography can be consulted in:http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=25265