Course guide
2500212 - GEA0212 - Geographic Information Systems

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Unit in charge: Barcelona School of Civil Engineering
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.

Degree: BACHELOR'S DEGREE IN ENVIRONMENTAL ENGINEERING (Syllabus 2020). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: MARIA DE LAS NIEVES LANTADA ZARZOSA

Others: MARIA DE LAS NIEVES LANTADA ZARZOSA, ROGELIO LOPEZ BRAVO, FRANCISCO JAVIER MUÑOZ CAPILLA, CAROLINA PUIG POLO

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
14445. Recognize the biological bases and foundations of the plant and animal field in engineering: notions of genetics, biochemistry and metabolism, physiology, organisms and environment, population dynamics, flows of matter and energy and changes in ecosystems, biodiversity, principles of the kinetics of microbial growth and reactor theory.
14447. Obtain basic knowledge about the use and programming of computers, operating systems, databases and basic numerical calculation and applied to engineering.
14451. Apply the fundamental concepts of statistics and randomness of physical, social and economic phenomena, as well as uncertainty and decision-making techniques.
14452. Enhance the capacity of spatial vision and identify the techniques of graphic representation, topography, photogrammetry, cartography, remote sensing and Geographic Information systems.
14453. Describe and apply the techniques of analysis of physical, chemical and biological parameters; Integrate the experimental evidence found in field and / or laboratory data with the theoretical knowledge and interpret its results.
14454. Formulate the principles of fluid mechanics and the fundamentals of continuous medium mechanics.
14455. Identify the concepts and technical aspects linked to the conduit systems, both in pressure and in free sheet and apply them to the water supply transport networks; pumping systems; unit networks; separative networks; Avenues prevention systems in urban areas and analysis of tools for the recovery of altered river and coastal spaces.
14456. Describe the processes linked to the water cycle: atmospheric circulation and rain formation; rain transformation into runoff; and apply them to surface and underground hydrology associated with avenues risk, surface water pollution, aquifer management and groundwater pollution.

Generical:
14440. Identify, formulate and solve problems related to environmental engineering.
14441. Apply the functions of consulting, analysis, design, calculation, project, construction, maintenance, conservation and exploitation of any action in the territory in the field of environmental engineering.
14442. To use in any action in the territory proven methods and accredited technologies, in order to achieve the greatest efficiency respect for the environment and the protection of the safety and health of workers and users.

TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 1.2 hours weekly with half the students (medium size group).

The 2.3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.
The 1.2 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.
The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

The PREDOMINANT LANGUAGE OF THE COURSE will be Spanish in the classroom (with material in Catalan). However, the language in which classes are taught will depend on the teacher. Specifically, the theory classes on the topics Spatial Reference Systems and LIDAR will be taught in Catalan.

Although most of the sessions will be given in the language indicated, sessions supported by other occasional guest experts may be held in other languages.

LEARNING OBJECTIVES OF THE SUBJECT

Geographic Information Systems as a tool for processing environmental geographic information from different sources. Acquisition, control, visualization, management of the I.G. Spatial analysis of the I.G. for modeling and decision making in environmental management. Formats and Software. Applications of GIS in Environmental Engineering.

1. Apply the basic concepts of Geographic Information Systems, studying the main formats and software.
2. Perform spatial data analysis and its application using GIS tools to Environmental Engineering.

Geographic information systems. Introduction to Geographic Information Systems, studying the main formats and software. Spatial analysis of TD information and GIS applications to Environmental Engineering.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours small group	15,0	10.00
Hours medium group	15,0	10.00
Hours large group	30,0	20.00

Total learning time: 150 h

CONTENTS

0. Introduction to SIG

Description:
general concepts, applications ...
LAB1. SIG.CRS

Full-or-part-time: 9h 36m
Theory classes: 2h
Laboratory classes: 2h
Self study : 5h 36m

I. Coordinate Reference Systems (CRS)

Description:
Spatial Reference Systems
Cartographic projections
LAB_SIG2. Spatial Reference System

Full-or-part-time: 14h 23m
Theory classes: 4h
Laboratory classes: 2h
Self study : 8h 23m

II. Geoinformation Capture Techniques

Description:
GNSS
FIELD1. GNSS. RTK
FIELD2.GNSS. DGPS (GPS for GIS)
LAB1. GNSS data processing
LIDAR (ALS and TLS)
FIELD3. Acquisition of Terrestrial LIDAR data
LAB2. LIDAR data processing
Photogrammetry applied to massive data capture
LAB8. Photogrammetric processing
Exercises

Full-or-part-time: 62h 24m
Theory classes: 8h
Practical classes: 2h
Laboratory classes: 16h
Self study : 36h 24m

III. Geographic Information Systems

Description:
Geoinformation and databases management
LAB4. Geoinformation. Formats and edition
LAB_SIG2. Databases
Geoprocessing
Exercises
LAB_SIG3&4.Geoprocessing
GIS project

Full-or-part-time: 57h 35m
Theory classes: 8h
Practical classes: 2h
Laboratory classes: 14h
Self study : 33h 35m

GRADING SYSTEM

This course is assessed by Continuing Learning and Assessment (AAC in Catalan). The following summarizes the rating method. Additional details of the method will be given the day of the first lecture.

The evaluation consists of two sections: the theoretical part (theory and exercises) and the practical part (field, laboratories and / or practices at computers' classroom). The practices of the subject are a key element in the evaluation and therefore it is compulsory the assistance (minimum of 80%) and the proper presentation of the reports. The reports must follow the quality standards indicated by the teacher to be evaluated. Without this requirement it is not possible to pass the subject.

# 1) Exam Mark, Me:
Mpac1 =Mark of the 1st partial continuous assessment test, towards the middle of the semester (a first part of the syllabus is evaluated) Mpac2 = Mark of the 2nd partial test continuous assessment, at the end of the course (the rest of the syllabus is assessed, not assessed in the PAC1). Me (Exam Grade): Me = 0.5 * Mpac1 + 0.5 * Mpac2
Me can be increased by a maximum of one point by completing questionnaires or kahoots done in class, these activities are additive in nature. However, students with a Ne below 5 have the option of re-evaluating as long as they have the internship part of the subject passed and have submitted and passed a minimum of the practices' reports.

2) Mark of practical activities, Mp: problems, questionnaires, deliveries and works of practices so much in group as individual, of additive and formative character, realized during the course, normally out of the classroom. The Np grade integrates the exercises done in the classroom or at home, the practice reports, the questionnaires done by Athena, the work developed during the field and laboratory practices (including attendance), and the final deliveries. There is no possibility of taking a re-assessment exam of the practical part of the subject.

#3) Final mark / grade, MF: The Me is the result of an individual assessment of the student, while the Mp is largely the result of group work and outside the classroom. Therefore, if Me > = 5, then MF = 0.5 * Me + 0.5 *Mp. However, if Me

EXAMINATION RULES.

The practices are activities that are carried out continuously and under supervision during the course. They are delivered in a specific period of time, and are corrected shortly after. Therefore, there will be no possibility of re-evaluation of these activities.
Criteria of qualification and of admission to the re-evaluation: The students suspended to the ordinary evaluation that have presented regularly, and passed the practices of the subject, will have option to realize a proof of re-evaluation in the period fixed in the academic calendar. Students who have already passed the subject, or students who have qualified as not presented, and students who don't have passed the practical part of the subject, will not be able to take the re-assessment test for a subject. The maximum grade in the case of taking the re-assessment exam will be five (5.0). The non-attendance of a student to the re-evaluation test, held in the set period may not lead to the performance of another test with a later date. Extraordinary assessments will be carried out for those students who, due to major force, have not been able to take any of the continuous assessment tests. These tests must be authorized by the corresponding head of studies, at the request of the teacher responsible for the subject, and will be carried out within the corresponding teaching period.

BIBLIOGRAPHY

Basic:
- Bosque Sendra, J. Sistemas de información geográfica. 2a ed. corr. Madrid: Rialp, 1997. ISBN 8432131547.
- Nuñez-García, A.; Valbuena; J.L.; Velasco, J. G.P.S.: la nueva era de la topografía. Madrid: Ediciones de las ciencias sociales, 1992. ISBN 8487510310.
- Heritage, G.L; Large, A.R.G. Laser scanning for the environmental sciences. Chichester, UK ; Hoboken, NJ: Wiley-Blackwell, 2009. ISBN 9781405157179.