Universidad Zaragoza

Academic Year/course: 2021/22

30137 - Digital and Remote Sensing Geographical Information

Syllabus Information

Academic Year: 2021/22
Subject: 30137 - Digital and Remote Sensing Geographical Information
Faculty / School: 179 - Centro Universitario de la Defensa - Zaragoza
Degree: 563 - Bachelor's Degree in Industrial Organisational Engineering
ECTS: 6.0
Year: 4
Semester: Second semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The main objective of the course is the acquisition by the students of knowledge and skills in the use and application of Geographical Information systems, Global Navigation Satellite Systems, Image Interpretation and Remote Sensing to Industrial and Military Organisational Engineering.

These approaches and objectives are in line with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/), in such a way that the acquisition of the course learning outcomes provides training and competence to contribute to their achievement to some degree:

- Goal 4: Quality education.
- Goal 9: Industry, innovation and infrastructure.
- Goal 13: Climate action.
- Goal 16: Peace, justice and strong institutions.

1.2. Context and importance of this course in the degree

This subject contributes to the training of Army Officers, developing knowledge about Geographic Information Systems, Global Navigation Satellite Systems and Remote Sensing and the skills for their application in the performance of their mission within the Army.

1.3. Recommendations to take this course

Basic knowledge of computer science and statistics. The subject has a theoretical-practical nature, so attendance at the computer lab sessions and lectures, active participation in them, as well as the completion of the different assignments on the scheduled date is highly recommended.

2. Learning goals

2.1. Competences

- Ability to plan, budget, organise, manage and monitor tasks, people and resources.
- Ability to solve problems and take decisions with initiative, creativity and critical reasoning.
- Ability to apply Information and Communication Technologies (ICTs) within the field of engineering.
- Ability to communicate knowledge and skills in Spanish.
- Ability to use techniques, skills and tools necessary to practise engineering.
- Ability to manage information; skills to handle and apply technical specifications and the necessary legislation to practise engineering.
- Ability to continue learning and develop self-learning strategies.

- Capacity for spatial vision and knowledge of graphic representation techniques whether through traditional methods of metric geometry and descriptive geometry or through computer-assisted design applications.
- Knowledge and skills to set up and manage information systems in organisations.
- Knowledge of geographical information systems, remote sensing, and aerial photography. Capability of managing navigation systems.

2.2. Learning goals

- Understands the fundamental concepts that define Geographic Information Systems and assess their usefulness to industrial and military oriented applications.
- Describes the geographical space through the concepts and terms used to build models in Geographical Information Systems.
- Uses correctly various techniques and instruments for measurement, location and spatial orientation on the map and in the field.
- Knows the aerial photograph series of our country and know how to interpret some basic variables of environmental and socioeconomic nature.
- Knows and is able to use GIS and the geoprocesses and functions applicable with them.
- Knows and applies some of the basic techniques of thematic cartography design.
- Describes the concepts, physical foundations and components of spatial Remote Sensing and uses precisely the vocabulary, terminology and nomenclature of the discipline.
- Knows the main spatial Remote Sensing systems and programs (sensors, platforms, etc.) and assesses their spatial analysis potential.
- Knows and handles the basic procedures to improve, correct and interpret images correctly.
- Describes the factors responsible for the spectral behavior of the main land covers.
- Manages a GIS software to perform spatial analysis and digital processing of satellite images, with an average degree of difficulty.
- Generates documents of medium complexity, composed of texts, maps, graphs and tables to clearly report the data model design of a GIS application.

2.3. Importance of learning goals

Learning goals of this course are of vital importance in the context of the Bachelor's Degree in Industrial Organisational Engineering, since they train the student for the implementation and management of GIS and their use for Industrial and Military Organisational Engineering. Likewise, it focuses into some of GIS sources of information, such as Global Navigation Satellite Systems, Aerial Images and Remote Sensing, in a way that enables the student to use tools traditionally applied in the Ministry of Defense with the following objectives:

1. Analogue and digital cartographic production, under the responsibility of the military cartographic centers.
2. Property and infrastructure management. Arrangement of plans of Military Centers and Bases, for their maintenance, environmental management and quality.
3. Support for military operations and training exercises.
4. Support to the Military Emergency Unit (UME) in the management of catastrophes.
5. Support to the police and civil guard in border control.

3. Assessment (1st and 2nd call)

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

FIRST CALL

Continuous assessment:

The students will be able to overcome the subject by a continuous evaluation procedure. For this purpose, they must demonstrate to have achieved the expected learning outcomes by passing throughout the semester the evaluation instruments indicated below:

1. Portfolio. Autonomous preparation of practical exercises related to concepts seen in computer lab sessions. In order to overcome the assessment, a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 30%.
2. First exam. Assessment of the learning goals acquisition by the students in the lectures and computer lab sessions. In order to overcome the assessment and to calculate the final mark of the subject, a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 35%.
3. Second exam. Assessment of the learning goals acquisition by the students in the lectures and computer lab

sessions. In order to overcome the assessment and to calculate the final mark of the subject a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 35%.

In the final mark of the continuous assessment (100%) all the evaluation instruments carried out throughout the course and its weight will be taken into account. To overcome the subject, the student's final grade must be equal to or greater than 5.

ASSESSMENT CRITERIA

Correctness of the contents, adequacy and correctness of the techniques and methods used, correct design of the graphic representations, adequate and careful presentation.

Global assessment:

The students who fail the continuous assessment or would like to improve their grade, will have the right to take the global assessment in the date set in the academic calendar, prevailing, in any case, the best of both grades. This global assessment will be equivalent to the continuous assessment described above and will have the 100% weight in the final grade. This assessment will consist of the two evaluation instruments indicated below:

1. Portfolio. Autonomous preparation of practical exercises related to concepts seen in computer lab sessions. In order to overcome the assessment a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 30%.
2. Exam. Assessment of the learning goals acquisition by the students in the lectures and computer lab sessions. This exam is divided into two parts, in accordance with the first and second exams of the continuous assessment. In order to overcome the assessment and to calculate the final mark of the subject, a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 70%.

To overcome the subject, the student's final grade must be equal to or greater than 5.

ASSESSMENT CRITERIA

Correctness of the contents, adequacy and correctness of the techniques and methods used, correct design of the graphic representations, adequate and careful presentation.

SECOND CALL

Global assessment:

The students who fail to pass the subject in the first call may take the global assessment in the date set in the academic calendar for the second call. This global assessment will be equivalent to the continuous and global assessment described above and will have the 100% weight in the final grade. This assessment will consist of the two evaluation instruments indicated below:

1. Portfolio. Autonomous preparation of practical exercises related to concepts seen in computer lab sessions. In order to overcome the assessment a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 30%.
2. Exam. Assessment of the learning goals acquisition by the students in the lectures and computer lab sessions. This exam is divided into two parts, in accordance with the first and second exams of the continuous assessment. In order to overcome the assessment and to calculate the final mark of the subject, a minimum mark of 4 out of 10 points is required. Its weight in the final grade is 70%.

To overcome the subject, the student's final grade must be equal to or greater than 5.

ASSESSMENT CRITERIA

Correctness of the contents, adequacy and correctness of the techniques and methods used, correct design of the graphic representations, adequate and careful presentation.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

If this teaching could not be done in person for health reasons, it would be done telematically.

The methodology followed in this course is oriented towards the achievement of the learning objectives. It favors the acquisition of the knowledge and appropriate skills in the application of Geographical Information Systems, Global Navigation Satellite Systems, image interpretation and Remote Sensing to industrial and military-oriented applications.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials, including a discussion forum.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes the following learning tasks:

- Lectures. Lecture notes and a set of problems will be available for the students.
- Computer lab sessions. Students will work doing tasks related to the application of Geographical Information

Systems, Global Navigation Satellite Systems, image interpretation, and Remote Sensing techniques.

- Assignments. Students will complete assignments, problems, and exercises related to concepts seen in Computer lab sessions and lectures.
- Autonomous work. Time to study theory, solve tasks related to the application of Geographical Information Systems, Global Navigation Satellite Systems, image interpretation, and Remote Sensing techniques, prepare assignments, and take exams.
- Tutorials. Teacher?s office hours allow students to solve questions and discuss unclear course contents. It is advisable to come with clear and specific questions.

4.3. Syllabus

The course will address the following topics:

- Section 1. Geographical Information Systems (GIS).
  - Topic 1. Introduction to GIS.
  - Topic 2. Geographical information characteristics (data modeling in GIS).
  - Topic 3. Sources of information in GIS.
  - Topic 4. Spatial analysis functions.
  - Topic 5. Visualization and cartographic design.
- Section 2. Global Navigation Satellite Systems (GNSS) as a GIS source of data.
  - Topic 1. What is a GNSS?.
  - Topic 2. Operation of GNSS systems.
  - Topic 3. Types of GNSS receivers.
  - Topic 4. Error sources of GNSS and technology to reduce them.
  - Topic 5. Key parameters in the use of GNSS receivers.
- Section 3. Remote Sensing.
  - Topic 1. Introduction to Remote Sensing.
  - Topic 2. Remote Sensing data characteristics.
  - Topic 3. The concepts of ?resolution? and Remote Sensing systems and programs.
  - Topic 4. Remote Sensing images visualization and treatment.

4.4. Course planning and calendar

The beginning of the classes is in February, second semester. The lecture and the practice sessions will be in groups and will be held at the place and time-resolved by the ?Centro Universitario de la Defensa?.

The key dates of the subject, related to the different activities that are developed throughout the course, as well as the assignments or work that students must present, will be indicated in the ?Anillo Digital Docente? (ADD) (https://moodle2.unizar.es). In addition, students will find there a detailed program on the subject and the computer software and materials needed to complete it.

4.5. Bibliography and recommended resources

Bibliography available at:

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30137

Recommended resources:

available in Moodle subject website