

## 30238 - Data Centers

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 30238 - Data Centers

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 439 - Bachelor's Degree in Informatics Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** First semester

**Subject Type:**

**Module:**

## 1. General information

### 1.1. Aims of the course

Achieving the learning outcomes.

In addition, these outcomes are related to a Sustainable Development Goal of the 2030 Agenda and two of its specific targets ([www.un.org/sustainabledevelopment/es/](http://www.un.org/sustainabledevelopment/es/)). Consequently, the student will have more criteria to assess their existence and impact. Specifically:

- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy.
  - Target 7.2. By 2030, increase substantially the share of renewable energy in the global energy mix.
  - Target 7.3. By 2030, double the global rate of improvement in energy efficiency.

### 1.2. Context and importance of this course in the degree

This course provides knowledge related to data centers in the general context of computer engineering, completing the training of the specialties "computer engineering" and "information technologies".

### 1.3. Recommendations to take this course

No particular one.

## 2. Learning goals

### 2.1. Competences

After passing the course, the student will be more competent to...

- Conceive, design and develop engineering projects.
- Plan, budget, organize, direct and control tasks, people and resources.
- Solve problems and make decisions with initiative, creativity and critical reasoning.
- Analyze and assess the social and environmental impact of technical solutions acting with ethics, professional responsibility and social commitment.
- Design and build digital systems, including computers, microprocessor-based systems and communications systems.
- Understand, apply and manage the assurance and security of computer systems.
- Analyze, evaluate, select and configure hardware platforms for the development and execution of computer applications and services.

### 2.2. Learning goals

Upon passing this course, the following learning outcomes will be experienced:

- Knowledge of the existence of standards in the design of data centers, in the areas of building, air conditioning, cabling, power supply, energy backup and service guarantee.
- Knowledge of the business models around a data center and the importance of guarantee and security. Knowledge of its technical requirements, its organization, the importance of providing quality services and the concept of business continuity.
- Understanding of the primary role of energy efficiency in the design and operation of a data center. Awareness of the impact on the environment.
- Understanding of the primary, secondary and tertiary storage components of a data center, their structure, scaling and management. Knowledge of secondary storage alternatives and their advantages and disadvantages (DAS, NAS, SAN, etc.). Knowledge of tertiary storage alternatives and the design of backup policies.
- Knowledge of the interconnection strategies between servers, racks and external internet connections, as well as their scaling.

### 2.3. Importance of learning goals

Data centers are infrastructures for computing, storage, connectivity, power supply and air conditioning. In their conception and daily work, they take advantage of the economy of scale to offer ICT services with an excellent quality/price ratio to their clients, and that is why they are proliferating in all types of countries, economies and situations.

This course introduces the student to the tasks of designing, building and operating a data center, both for corporate data processing and supercomputing. The learning outcomes of various disciplines (building, energy sources, air conditioning, servers, storage, connectivity, ICT load management, etc.) will allow the student to integrate into the multidisciplinary management team of a data center.

## 3. Assessment (1st and 2nd call)

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

The student will demonstrate that he/she has achieved the expected learning outcomes through the following assessment activities.

The evaluation will consist of two parts:

1. Exercises and assignments on theoretical and practical contents (50%).
2. Exam (50%)

The course is passed with an overall grade of 5 points out of 10, with a minimum of 4 points out of 10 in each of the two parts. In case of not reaching the minimum in any of the parts, the maximum overall grade will be 4.5 points out of 10.

## 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.
- Problem-solving classes.
- Assisted Labs.
- Homeworks.
- Autonomous work and study.

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

### 4.2. Learning tasks

The course includes the following learning tasks:

- Lectures.
- Problem-solving classes.
- Assisted Labs.
- Homeworks.
- Autonomous work and study.

### 4.3. Syllabus

The course will address the following topics:

- History of data centers. Technological evolution: present and future trends.
- Data center, energy efficiency and environmental impact, energy sources.
- Technical requirements of facilities: building, power supply, air conditioning, cabling, standards.
- Security and monitoring systems.
- Internal and external connectivity; scalability. Computing server types and scalability. Consolidation and energy efficiency.
- Availability and continuity of service: RAS, fault tolerance and redundancy. Mass storage subsystem. Secondary storage solutions.
- Introduction to the provision and support of ICT services: ITIL.

### 4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the [Escuela de Ingeniería y Arquitectura](#).

### 4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30238&Identificador=14703>