

## **Syllabus Information**

---

**Academic Year:** 2021/22

**Subject:** 30172 -

**Faculty / School:** 179 - Centro Universitario de la Defensa - Zaragoza

**Degree:** 563 - Bachelor's Degree in Industrial Organisational Engineering

**ECTS:** 4.5

**Year:** 3

**Semester:** First semester

**Subject Type:** Compulsory

**Module:**

## **1. General information**

### **1.1. Aims of the course**

The student must acquire knowledge about:

- Basic notions and general aspects of telecommunications.
- Structure of telecommunication networks.
- Working principles of telecommunication networks.
- Scientific and technological aspects of Nuclear-Biological-Chemical (NBC) risk and protection.

These objectives are in line with some of the 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. The SDGs in which this course influences are the following:

- SDGs 3 Good health and well-being.
- SDGs 16 Peace, justice and strong institutions.

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

This course contributes to the training of future Army Officers about telecommunication systems and NBC defense.

Telecommunication systems are essential for the proper functioning of any organization. This is much more relevant in the context of Defence since the success of a military operation cannot be guaranteed if there are no good telecommunication systems.

The attacks in Japan with sarin gas (Matsumoto 1994, Tokio 1995) and the armed conflict in Syria (2012-2013) are recent examples of the current threat that nuclear, biological or chemical weapons suppose. In this sense, it is key to have scientific-technological knowledge of agents and conditions that play a role in the NBC (Nuclear-Biological-Chemical) risk and protection in order to design and apply programmes and procedures of NBC defense.

Such knowledge can help future Army Officers to carry out their mission and thereby contribute to the development of Peace and Security.

### **1.3. Recommendations to take this course**

The common recommendations to access any engineering degree, but, basically, the scientific-technological sixth-form. This subject uses the competences acquired in the Industrial Organization Engineering degree.

In order to follow in a proper way this subject, it is necessary to be willing to perform a continuous effort from the starting day of lessons. A daily routine of work is required to make the most of the lessons. It is recommended that the students clear up their doubts as soon as they have them, both during lessons and tutorials using the means provided by the teachers.

## **2. Learning goals**

### **2.1. Competences**

- 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 analyse and evaluate the social and ecological impact of technical solutions, behaving ethically, with professional responsibility and social commitment, always striving for quality and continuous improvement.
- Ability to work in a multidisciplinary group and in a multilingual setting.
- 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.

## 2.2. Learning goals

- Understand the way of working of simple telecommunication systems, as well as the main radio-electrical propagation methods.
- Recognize and identify any telecommunication system, either civil or military.
- Know the scientific basis of NBC risk and protection.
- Delimit polluted areas due to radioactive, chemical or biological contaminants.
- Know the basic measurements of prevention, protection and control under NBC risk.
- Use the equipment to detect NBC pollution.

## 2.3. Importance of learning goals

The learning goals are of utmost importance for obtaining professional competences, which can have an impact on the work developed by the student apart from representing improving opportunities.

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

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

This subject will be evaluated by means of theoretical-practical exams of telecommunications systems and NBC defense. The exam (or exams) of the telecommunications systems part will represent 55% of the global mark, and the exam (or exams) of the NBC defense part will represent 45% of the global qualification. Since these two parts are completely independent, to pass the subject it will be necessary to pass both parts independently.

During the course, a partial exam will be carried out which, if approved, will release content from the official exam. These previous exam will account for at least 45% of the global qualification of the subject.

# 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 learning process designed for the subject combines the following elements:

- **Theoretical-practical classes** that allow transmitting knowledge to the student, encouraging their participation. In these classes practical cases will be solved and theory will be taught without an explicit separation between both.
- **Personalized attention** either in small groups or individualized in the tutorials.
- **Continuous personal work by the student** since the beginning of the course.

All information and material related to the assignment is available on <http://moodle.unizar.es>.

## 4.2. Learning tasks

The program will be published on the Moodle platform. The credits of the subject are divided into:

- Lectures (40 hours).
- Evaluation and intermediate assessments (5 hours).

## 4.3. Syllabus

The course will address the following topics:

TELECOMMUNICATIONS PART

- Topic 1. Introduction to telecommunications systems.
- Topic 2. Signals in a telecommunication system.
- Topic 3. Modulation and multiplexing.
- Topic 4. Wired transmission media.
- Topic 5. Propagation of electromagnetic waves.
- Topic 6. Telecommunications networks.

#### NBQ PART

- Topic 1. Nuclear and radiological risk.
- Topic 2. Chemical risk.
- Topic 3. Biological risk.
- Topic 4. Detection and identification.
- Topic 5. Protection, decontamination and zoning.

#### **4.4. Course planning and calendar**

The session planning and exam dates can be consulted on the following web addresses: <http://tud.unizar.es> y <http://moodle.unizar.es>.

#### **4.5. Bibliography and recommended resources**

The recommended bibliography for this subject is available at this web address:

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30172>