

## **Syllabus Information**

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**Academic Year:** 2022/23

**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 Defense 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

- The student understands the operation of simple telecommunication systems and the main modes of radio propagation.
- The student recognises and identifies the most common civil telecommunication systems.
- The student recognises and identifies the most common military telecommunication systems.
- The student acquires the scientific fundamentals of NBC weapons.
- The student describes the organisation of NBC defence in small units, as well as the NBC equipment in a Company-type unit.
- The student makes predictions of areas contaminated by nuclear attack or chemical-biological agents, and applies the principles of prevention, protection and control to these attacks.
- The student has a general knowledge of the use of NBC weapons in land battle.
- The student acts as the officer in charge of the NBC control core of a company-type unit.
- The student applies safety rules in the use of weapon systems.

## 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 can be evaluated by a continuous evaluation procedure over the course or by a global evaluation test.

### Continuous evaluation procedure:

Students could satisfactorily pass the subject through the continuous evaluation process. For this purpose, they must demonstrate they have achieved the expected learning outcomes by passing the evaluation instruments that will be carried out throughout the four-month period.

The next tests will be carried out:

1. Telecommunications exam (ExTel). Weight 55%. It will consist of a written exam in which students will have to demonstrate their knowledge about theoretical contents of this part as well as their capability to its application.
2. NBC Defense exam (ExNBC). Weight 45%. It will consist of two exams: 1) Theoretical exam (75%), in which students will have to demonstrate their knowledge about theoretical contents of this part as well as their capability to its application; 2) Problem-based exam (25%), in which students will have to solve several practical exercises concerning NBC messaging and zoning for nuclear, chemical and biological agents. Marks obtained in both exams must be greater than or equal to 4,5 to be averaged to obtain the final mark of this part.

Thus, the mark for the subject will be calculated as follows:

$$\text{Continuous Evaluation mark} = \text{ExTel} \cdot 0,55 + \text{ExNBC} \cdot 0,45$$

To pass the subject by means of continuous assessment, this mark must be greater than or equal to 5.

**IMPORTANT:** marks obtained in Telecommunications exam (ExTel) and NBC Defense exam (ExNBC) must be greater than or equal to 5 to be averaged in the final mark.

### Global evaluation test:

Students who do not successfully pass the subject by continuous evaluation or who, even if they have passed it, wish to obtain a better mark, will have the right to sit the Global exam on dates set in the calendar for the first or second sitting. The best of the marks obtained between the continuous evaluation or the global evaluation test will prevail.

This global exam will consist of two parts:

1. Telecommunications exam (ExTel). Weight 55%. It will consist of a written exam in which students will have to demonstrate their knowledge about theoretical contents of this part as well as their capability to its application.
2. NBC Defense exam (ExNBC). Weight 45%. It will consist of two exams: 1) Theoretical exam (75%), in which students will

have to demonstrate their knowledge about theoretical contents of this part as well as their capability to its application; 2) Problem-based exam (25%), in which students will have to solve several practical exercises concerning NBC messaging and zoning for nuclear, chemical and biological agents. Marks obtained in both exams must be greater than or equal to 4,5 to be averaged to obtain the final mark of this part.

The final mark for this overall test will be calculated as follows:

$$\text{Global test mark} = \text{ExTel} \cdot 0,55 + \text{ExNBC} \cdot 0,45$$

To pass the course by means of Global evaluation test this mark must be greater than or equal to 5.

**IMPORTANT:** marks obtained in Telecommunications exam (ExTel) and NBC Defense exam (ExNBC) must be greater than or equal to 5 to be averaged in the final mark.

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

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>.

The approach, methodology and assessment in this guide are designed to be the same in any teaching setting. They will be adjusted to the socio-health conditions of the moment, as well as to the indications given by the competent authorities.

### 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>