

Academic Year/course: 2022/23

30149 - Radar Systems

Syllabus Information

Academic Year: 2022/23

Subject: 30149 - Radar Systems

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

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

ECTS: 6.0

Year: 4

Semester: First semester

Subject Type: Optional

Module:

1. General information

1.1. Aims of the course

The subject Radar Systems makes students know and be able to analyse different aspects related to radio-detection systems. In order to achieve this, the main objectives can be summarized as follows:

- To describe the basic aspects of Radar systems.
- To characterize the different Radar techniques and their applications.
- To describe the properties of electromagnetic waves, their generation, propagation, detection and processing.
- To know the most significant Secondary Radars, their properties and applications.
- To describe the basic aspects of Electronic warfare.

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 9: Industry, innovation and infrastructure.

1.2. Context and importance of this course in the degree

The subject is part of the Radar and Missiles Systems speciality of Industrial Organization Engineering and it is essential for the students to become part of the Artillery Branch within the Spanish Army, thus integrating it in the training in the corresponding fundamental speciality.

1.3. Recommendations to take this course

The subject is mainly theoretical, thus making attendance to theoretical sessions with an active participation is highly recommended. Previous knowledge required to be able to properly follow the subject are basic concepts of electromagnetic waves and propagation, electronics and probability and statistics.

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 communicate knowledge and skills in Spanish.
- Ability to work in a multidisciplinary group and in a multilingual setting.
- Ability to continue learning and develop self-learning strategies.
- Familiarity with the fundamentals of Physics, Mathematics and Electronics required to understand and know how radar systems function.

2.2. Learning goals

In order to successfully pass the subject, the students will have to show that they are able to:

- Describe the working principles of RADAR Systems.
- Describe the propagation mechanism of electromagnetic waves.
- Identify the different RADAR Systems, specify their applications and limitations and explain their working principles.
- Describe the most common technique used in RADAR signal processing
- Know and describe the different technologies used in RADAR systems design: antennas, transmitters, duplexers, displays, etc.
- Describe the basic principles of Secondary Surveillance Radar (SSR), Identification Friend or Foe (IFF) and Combat Identification (CID) systems.
- Describe the concepts of Electronic Counter Measures (ECM), Electronic Counter Counter Measures (ECCM) and Electronic Protection Measures (EPM).

2.3. Importance of learning goals

The learning goals are essential to successfully pass the rest of subjects of the Artillery fundamental speciality, since they are key to understand the basic principles of any artillery weapon system. Furthermore, the most significant radio-detection techniques used in real systems are presented.

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 pass the total of the subject by the continuous assessment procedure. To do this, they must demonstrate that they have achieved the expected learning outcomes by passing the assessment instruments indicated below, which will be carried out throughout the semester:

- Midterm exam about multiple-choice theoretical and practical questions and problem-solving questions from lessons 1 and 2 of the subject. Its weight in the final grade is 25%.
- Midterm exam about multiple-choice theoretical and practical questions and problem-solving questions from lessons 3-6 of the subject. Its weight in the final grade is 35%.
- Continuous assessments during all the semester with autonomous and group work, and laboratory sessions. Its weight in the final grade is 40%.

In the final mark of the continuous assessment (100%) all the assessment instruments carried out throughout the course and its weight will be taken into account. To pass the subject, it is necessary to obtain, at least, a score of 4 (maximum is 10) in both Midterm exams and the student's final grade must be equal to or greater than 5.

Final Exam:

The students who do not pass the subject by continuous assessment or who would like to improve their grades, will have the right to take the Final Exam set in the academic calendar, prevailing, in any case, the best of both grades. This global assessment will consist of a single exam and will have the 100% weight in the final grade. To pass the subject, the student's final grade must be equal to or greater than 5.

SECOND CALL

Final Exam:

The students who do not pass the subject in the first call may take the Final Exam set in the academic calendar for the second call. This global assessment will consist of a single exam and will have the 100% weight in the final grade. To pass the subject, the student's final grade must be equal to or greater than 5.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The approach, methodology and assessment of this course is prepared to be equivalent in any teaching scenario. It will be adjusted to the socio-sanitary conditions of each moment, as well as to the indications given by the competent authorities.

The learning process that is designed for this subject is based on the following:

- The presentation of the theoretical contents in lectures.
- The resolution of problems.

- Personal study by students.
- Practical teaching in laboratories where students must apply their theoretical knowledge in practical situations.
- Development of individual or in-group works.

4.2. Learning tasks

The course includes the following learning tasks:

- The presentation of the theoretical contents in lectures and the resolution of theoretical problems and practical cases by the students.
- Laboratory sessions.
- Individual or in-group works.

4.3. Syllabus

The course will address the following topics:

1. Introduction to Radar Systems
2. Basic concepts and pulsed radars
3. Continuous-wave radars
4. Environment interferences
5. Special function radars: Tracking radars and Secondary surveillance radars
6. Introduction to Electronic Warfare

4.4. Course planning and calendar

The planning and scheduling of lectures and practical sessions will be announced by the teachers, both in class and at the Moodle platform.

4.5. Bibliography and recommended resources

<http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30149>