Universidad Zaragoza

Academic Year/course: 2022/23

31010 - Aeronautical communications

Syllabus Information

Academic Year: 2022/23
Subject: 31010 - Aeronautical communications
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 4
Semester: First semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

The general objective of this subject is for the student to know the elements, models and methods of analysis and design of aeronautical communication systems, based on the knowledge acquired in the subjects of the degree, and with the aim of developing the fundamental abilities to deepen and extend these methods to the numerous applications that these techniques have in the field of Telecommunications Engineering in the aerospace sector.

In the context of aeronautical communication systems, communication systems embedded in air vehicles and airport systems stand out. Likewise, the most common radionavigation techniques in terrestrial systems will be presented. It is intended that the student knows the domains of application and the advantages and disadvantages of applying these techniques to specific problems.

Another of the aspects that the subject will deal with will be to initiate the student in the study of the systems associated with unmanned aerial vehicles.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/es/), in such a way that the acquisition of the results of Subject learning provides training and competence to contribute to some extent to its achievement:

Objective 8.2.: Achieve higher levels of economic productivity through diversification, technological upgrading and innovation, including by focusing on high value-added and labor-intensive sectors

Objective 7.3: By 2030, double the global rate of improvement in energy efficiency.

Objective 7.b: By 2030, expand infrastructure and improve technology to provide modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States and developing countries landlocked, in line with their respective support programs

Objective 9.5: Increase scientific research and improve the technological capacity of industrial sectors in all countries, in particular developing countries, including by fostering innovation and substantially increasing, by 2030, the number of people working in research and development per million inhabitants and public and private sector expenditures on research and development

Objective 9.c: Significantly increase access to information and communications technology and strive to provide universal and affordable Internet access in least developed countries by 2020.

Objective 9.1: Develop quality, reliable, sustainable and resilient infrastructure, including regional and cross-border infrastructure, to support economic development and human well-being, with a particular focus on affordable and equitable access for all

1.2. Context and importance of this course in the degree

The subject is highly relevant in what concerns the applications of Telecommunications Engineering in the Aerospace sector.

It complements part of the subjects called "Information Transmission Techniques" and "Telecommunication Techniques", which cover specific competencies of Telecommunication Systems.

The learning outcomes of this subject provide a pragmatic view of the technologies learned in basic subjects related to signal processing and information transmission.

1.3. Recommendations to take this course

The AERONAUTICAL COMMUNICATIONS subject will be taught by professors from the Signal Theory and Communications Area of the Department of Electronic Engineering and Communications.

To follow this subject normally, it is recommended that the student has previously studied the subjects of Theory of Communication, Digital Communications, Radiation and Propagation and Guided Transmission Media.

On the other hand, the student is recommended to actively attend class (both theory and problems). In the same way, the student is recommended to take advantage of and respect the teacher's tutorial schedules for the resolution of possible doubts about the subject and a correct follow-up of it.

2. Learning goals

2.1. Competences

1 Solve problems and make decisions with initiative, creativity and critical reasoning (C4).

2 Communicate and transmit knowledge, skills and abilities in Spanish (C5)

3 Use the engineering techniques, skills and tools necessary to practice it (C6)

4 Autonomously learn new knowledge and techniques suitable for the design, development or operation of telecommunication systems and services. (CRT1)

5 Use communication and computer applications (office automation, databases, advanced calculation, project management, visualization, etc.) to support the development and operation of telecommunications and electronic networks, services and applications. (CRT2)

6 Use computer tools to search for bibliographic resources or information related to telecommunications and electronics. (CRT3)

7 Analyze and specify the fundamental parameters of a communications system. (CRT4)

8 Ability to apply the techniques on which telecommunications networks, services and applications are based, both in fixed and mobile, personal, local or long-distance environments, with different bandwidths, including telephony, radio broadcasting, television and data, from the point view of transmission systems. (CST2)

9 Capacity for the selection of circuits, subsystems and systems of radio frequency, microwaves, broadcasting, radio links and radio determination. (CST4)

10 Capacity for the selection of antennas, equipment and transmission systems, propagation of guided and unguided waves, by electromagnetic, radiofrequency or optical means and the corresponding management of the radioelectric space and allocation of frequencies. (CST5)

2.2. Learning goals

RA1- Know the radiofrequency systems used in aeronautical communications

RA2- Understand the operation and properties of the different types of elements that can be used in aeronautical communications.

RA3- Calculate the coverage, capacity and quality of different links, fixed and mobile, used in aeronautical communications.

RA4- Describe the different standards and technologies used in the Aeronautical Communications Network both in ground-air and ground-ground communications

RA5- Know the parameters and basic characteristics of aeronautical communications equipment and air navigation radio aids that are installed at aerodromes.

RA6- Identify the phases and tools in the planning of communications, electronic and programming systems and subsystems design projects applied to UAVs

RA7- Identify the different aerial surveillance systems and Analyze the different subsystems of a Radar system.

2.3. Importance of learning goals

The understanding of aeronautical communications techniques is highly recommended for the exercise of the skills of a graduate, so the skills acquired in this subject will be very useful for their training, as it fosters attitudes to address complex problems both computational as experimentally.

Likewise, the training received in the tutored work carried out throughout the course acquires great importance, as it promotes the practical application of the theoretical content on which the subject is based and the critical analysis of the results obtained both in the field and in simulations.

3. Assessment (1st and 2nd call)

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

The student will have a global test in each of the calls established throughout the course. The dates and times of the tests will be determined by the School. The qualification of said test will be obtained in the following way:

- A final test (PF). This test will have a weight of 20% of the overall grade, scored from 0 to 10 points. This test evaluates all

the learning outcomes defined for the subject.

- A set of practices and supervised work whose weight on the global grade is 80% (30% laboratory practices (PL), 50% supervised work with group tutoring (TT)).

TT: supervised work (50%). Score from 0 to 10 points. The tutored works that must be carried out by each student during the course will be evaluated through the reports presented by the students and the follow-up sessions in which the student will present the work carried out orally and answer the questions that are raised by the teacher.

PL: Laboratory practices (30%). Score from 0 to 10 points. The laboratory practices, which must be carried out by each student during the course, will be evaluated through the reports presented by the students and/or orally.

Obtaining a grade equal to or greater than 4 points in both TT and PL will exempt the student from taking the final practical tests. Students who do not achieve this qualification must take the final test of supervised work and/or the final test of laboratory practices. To pass the subject, 5 points out of 10 are required in the final grade.

The TT and PL grades obtained throughout the evolution of the course will be kept for calculation in the next call of the same academic year. The notes of the final exam of the global test of the first call will not be saved for the second call.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

Methodology:

1. Lectures laying the theoretical foundations of the course. This task will be classroom-based and will rely on material previously delivered to the student (or available online).
2. Problems and case studies. Problems and cases appointed by the instructor, to be solved by the students or the teacher himself, based on the programmed lectures. This activity will be classroom-based.
3. Lab Sessions. Laboratory assignments of 2 hours each, to be performed in laboratories L.3.06 (Laboratorio de Alta Frecuencia) and/ or L.2.0.2 at the Ada Byron building whenever possible, under the actual circumstances. Small groups of students will carry out simulations and experimental measurements using test equipment related to radio and acoustic wave radiation and propagation, in order to support the knowledge acquired during the lectures. This activity will require presence at the laboratory.
4. Group assignment. A course project, under instructor supervision, will be assigned to each group. The course project should deal with the electromagnetic or acoustic modelling of some application focused on the Telecommunication field.
5. Personal attention through academic tutoring.

4.2. Learning tasks

Lectures and cases according to the detailed syllabus on section 4.3 will be preliminary focused on the aeronatical communications topics.

4.3. Syllabus

Unit 1. Introduction.

Unit 2. Radiolocation and radio-beacons.

Unit 3. Earth-Earth and Earth-Air Communications

Unit 4. UAVs

4.4. Course planning and calendar

Distribution of activities:

- Lectures and problems: three and a half hours a week during the semester
- 5 laboratory sessions of 2 hours each, in reduced groups

Lecture and laboratory session schedules together with evaluation dates will be provided by the university before the beginning of the semester.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=31010