COURSE DATA

Data Subject	
Code	34911
Name	Fundamentals of Telecommunication Systems
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1403 - Degree in Telematics Engineering	School of Engineering	2	Second term

Subject-matter

Degree	Subject-matter	Character
1403 - Degree in Telematics Engineering	8 - Signals and systems	Obligatory

Coordination

Name	Department
NAVARRO CAMBA, ENRIQUE	175 - Applied Physics and Electromagnetism
SORIANO ASENSI, ANTONIO	175 - Applied Physics and Electromagnetism

SUMMARY

This subject is an introduction to Telecommunication Systems. The course lays the foundations of communications and microwave radio frequency, digital transmission and multiplexing. This is a compulsory subject, common in the telecommunications branch. It takes 6 credits ECTS. It is taught in the 2nd semester of the 2nd year of the Degree in Telematics Engineering.

The course introduces students to the basics and fundamentals of telecommunications systems: hardware of communications, electromagnetic spectrum and the physical implementation of the radio channels. The representation of information in baseband and band-pass transformation using different types of modulations. Linear and nonlinear modulations. Digital transmission of radio and microwave frequencies, and different types of multiplexing.

We introduce the basics of radiated communications and radiant systems used. Technological innovation and implementation. Link balances and system gain. Effects of noise and other elements for degradation of the transmission quality. Elements of a common telecommunication infrastructure.

General objectives are:

- To introduce the spectrum and its use in radio and microwave communications.
- To understand the phenomena of radiation and propagation.
- To introduce the analogue modulations and digital transmission.

To introduce the multiplexing and management of users.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

To have studied the courses:
Mathematics I
Mathematics II
Mathematics III
Physics I
Physics II

OUTCOMES

1403 - Degree in Telematics Engineering

- R4 - Ability to analyze and specify the fundamental parameters of communication systems.
- R5 - Ability to assess the advantages and drawbacks of different technological alternatives for the deployment and implementation of communications systems, from the point of view of signal space, perturbations and noise and analogue and digital modulation systems.
- R1 - Ability for self-learning of new knowledge and techniques appropriate for the conception, development and exploitation of telecommunications systems and services.
- G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.
- G5 - Knowledge to carry out measurements, calculations, assessments, evaluations, loss adjustments, studies, reports, task planning, and other analogous work in the specific field of telecommunications.

- G6 - Ability in the handling of specifications, regulations and norms of compulsory compliance.
- R8 - Ability to understand the mechanisms of propagation and transmission of electromagnetic and acoustic waves, and their corresponding transmitting and receiving devices.
- R15 - Understand the standards and regulations of telecommunications in Spain, Europe and Internationally.

LEARNING OUTCOMES

1 Ability to independently learn new knowledge and techniques suitable for the design, development or utilization of telecommunication systems and services.

2 Capacity to analyze and provide fundamental specifications of a communication system.

3 Ability to evaluate the advantages and disadvantages of different technological alternatives of unfolding or implementation of communication systems, from the point of view of signal space, noise disturbances and the analogue and digital modulation.

4 Capability to understand the mechanisms of propagation and transmission of electromagnetic and acoustic waves, their transmitters receptors, and associated devices.

DESCRIPTION OF CONTENTS

1. Introduction to Communications Systems

Introduction to Communication Systems. Radiated and guided communications. Use of the spectrum and historical context. Functional blocks of the telecommunications systems.

Weeks/No of contact hours/No of non-contact hours
2/4/5

2. Radiating elements.

Radiating elements. Parameters and characteristics of directivity, efficiency, polarization and bandwidth of the various elements in wireless systems.

Weeks/No of contact hours/No of non-contact hours
2/4/6

3. Wireless channels

Canales inalámbricos. Modelado. Propagación en espacios abiertos y con bloqueo, propagación en entornos urbanos.

Weeks/No of contact hours/No of non-contact hours
2/4/6

4. Modulation.

Modulation. Base band information and pass-band transmission. Linear and Basic analogical modulations AM, FM, PM, BL, BLU. Basic structure of emitters and receivers

Weeks/No of contact hours/No of non-contact hours
2/6/8

5. Digital transmission

Digital transmission. Base band digital information. Transmission and pulse coding. Pass-band digital transmissions. QAM, PSK, FSK.

Weeks/No of contact hours/No of non-contact hours
2/8/10

6. Multiplexing.

Multiplexing. Multiple Access mechanisms: Shared access and multiplexing (FDMA, TDMA, CDMA). Cellular systems.

Weeks/No of contact hours/No of non-contact hours
2/8/10

7. Regulations.

Regulations. Government regulations and ordinances related to the elements of common telecommunication infrastructures (ICT).

Weeks/No of contact hours/No of non-contact hours
2/6/10

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Attendance at events and external activities	6,00	0
Development of group work	8,00	0
Development of individual work	10,00	0
Study and independent work	12,00	0
Readings supplementary material	4,00	0
Preparation of evaluation activities	12,00	0
Preparing lectures	8,00	0
Preparation of practical classes and problem	6,00	0
Resolution of case studies	6,00	0
Resolution of online questionnaires	3,00	0
TOTAL	**135,00**	

TEACHING METHODOLOGY

The methodology of teaching will combine learning activities with theoretical and practical tutoring activities and those which involve the study, assessment and the overall work, both individually and in teams of the students.

The performance of the activities is as follows:

1) Lectures: Teachers will explain the issues through lectures and ensuring the participation of students in the development of the class. Students must prepare lessons from the material which will be facilitated by teachers and as they will indicate in order to promote student-teacher dialogue.(R4, R5, R8, G3, G4)

2) Practical classes: Practical classes are based on the development of applications based on the theory and use of the computer and specific instrumentation as tools for achieving the objectives in each one of the practices. These are based on guides developed and designed to illustrate simple studies of case which can be found in reality. It will also enhance communication between teacher-student and among students. (R1, R4, R5, R15, G3, G4, G5)

3) Resolution of problems and works: We will develop problems to solve, small projects or practical work, which may be resolved or done individually or in groups, to apply the skills and investigate new concepts that may arise. (R1, R4, R5, R8)

4) Presentation of results: These activities are a complement to the course.

Individual or group tutorials, test and exams

EVALUATION

The evaluation mechanism is what could be called an adapted traditional one, which is not a complete continuous evaluation. The following items and assessments are taken into account: Assessment of attendance and participation 10% of the final grade (R-4, R-1, E-5). Attendance and laboratory practice 30% (R-4, G-4, G-4, G-6, E-1, R-1), and 60% of the results of evaluation tests.

In any case, the evaluation system will be governed by what is established in the Regulation of Evaluation and Qualification of the University of Valencia for Degrees and Masters: (https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639)

REFERENCES

Basic

- Referencia b1: -Sistemas de comunicaciones electrónicas, Wayne A. Tomasi, , Pearson Educación, 2001.

Additional

- Referencia c1: Mobile Communications Engineering, William C.Y. Lee, McGraw Hill, 1998.
  Referencia c2: Microwave Engineering, David M. Pozar, Addison Wesley, 2003.
  Referencia c3: Antenas, Ángel Cardama et al., Servei de Publicacion de la UPC, 2002.
  Referencia c4: Artículos seleccionados del IEEE e IET (www.ieeexplore.ieee.org).

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

Contents

The contents initially included in the teaching guide are maintained.

Workload and temporary teaching planning

The different activities described in the teaching guide are maintained with the planned dedication.

The material for the follow-up of the classes of theory/practices allows to continue with the professor of temporary planning so much in days as in schedule, so much if the teaching is face-to-face in the classroom or if it is not.

Teaching methodology

In classroom theory and practices, students will tend to have the maximum physical attendance possible, always respecting the sanitary restrictions that limit the capacity of the classrooms as indicated by the competent public health authorities to the estimated percentage of their usual occupation.

Depending on the capacity of the classroom and the number of students enrolled, it may be necessary to distribute the students into two groups. If this situation arises, each group will attend classroom theory and practical sessions with physical presence in the classroom by rotating shifts, thus ensuring compliance with the criteria for occupying spaces.

The rotation system will be established once the actual enrollment data is known, guaranteeing, in any case, that the attendance percentage of all the students enrolled in the subject is the same.

With respect to laboratory practices, attendance at sessions scheduled in the schedule will be totally face-to-face.

Once the actual enrollment data is available and the availability of spaces is known, the Academic Committee of the Degree will approve the Teaching Model of the Degree and its adaptation to each subject, establishing in said model the specific conditions in which it will be developed teaching the subject.

If there is a closure of the facilities for sanitary reasons that totally or partially affects the classes of the subject, these will be replaced by non-contact sessions following the established schedules.

Evaluation

The evaluation system described in the teaching guide of the subject in which the different evaluable activities have been specified as well as their contribution to the final grade of the subject is maintained.

If there is a closure of the facilities for health reasons that affect the development of any face-to-face evaluable activity of the subject, it will be replaced by a test of a similar nature that will be carried out in virtual mode using the computer tools licensed by the Universitat de València.

The contribution of each evaluable activity to the final grade for the course will remain unchanged, as established in this guide.

Bibliography

The bibliography recommended in the teaching guide.