COURSE DATA

DATA SUBJECT

Code: 34799
Name: Telecommunication systems and services
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	Escola Tècnica Superior d'Enginyeria	3	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	Telecommunication signals, systems and services	COMPULSORY

COORDINATION

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SUMMARY

The subject Telecommunication Systems and Services is a compulsory quarterly basis that will be taught in the fifth semester of the Degree in Electronic Telecommunications Engineering, consisting of a total of 4 classroom credits (theory and problems) and 2 laboratory credits.

The subject of Telecommunication Systems and Services develops the necessary contents for the student to learn the fundamental parameters of a communications system. Examples of communication systems and services are also presented with their main characteristics and the comparison between them based on their fundamental parameters.

The purpose of this subject is to describe the basic concepts of telecommunication systems and services so that the student can be autonomous to choose the best option in terms of technologies, design, and functionality in their deployment. To strengthen this objective, it is intended that the student knows the operation of some of the current telecommunication systems and services.

The contents of the course are:

- Introduction to telecommunication systems and services

Concept. Telecommunication systems. Telecommunication services. Spanish and European regulatory framework. Standardization bodies. Information representation. Networks in a telecommunication system. Hierarchy of transport.

- Interconnection and management of telecommunication networks

Principles. Interconnection in Spain. Network management and administration. Current management and administration system.

- Wired access systems

Twisted pair cable in communications systems. Characterization of the subscriber loop. ADSL access systems. HDSL and VDSL access systems. XDSL systems and its developments.

- Optical access systems

Introduction. Optical fibre in communications systems. GPON and EPON systems. New XGPON systems and future systems. Figures of merit on the analysis and design of optical access network systems.

- Hybrid access systems

Coaxial cable in communications systems. Genesis of HFC networks. HFC network architecture. Deployment and regulatory framework. Data and grouped services technical requirements. HFC networks in Spain and Europe.

- DVB-S satellite systems

Introduction. Reference model. Network architecture. Technical regulations and deployment. Satellite and audiovisual sector in Spain. Trends in satellite communications networks.

- Mobile systems

Introduction. Architectures. Mobile phone generations. From 1G to 5G. Future of mobile communication systems.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

It is recommended to have studied the subjects of:

Mathematics
Physics
Electronic Circuits
Electronic and photonic devices
Fundamentals of communications

COMPETENCES / LEARNING OUTCOMES

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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.

R15 - Understand the standards and regulations of telecommunications in Spain, Europe and Internationally.

R1 - Ability for self-learning of new knowledge and techniques appropriate for the conception, development and exploitation of telecommunications systems and services.

R2 - Ability to use communication and computer applications (offimatics, databases, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunications and electronics networks, services and applications.

R3 - Ability to use computer tools to find bibliographic resources and information related to telecommunications and electronics.

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.

R8 - Ability to understand the mechanisms of propagation and transmission of electromagnetic and acoustic waves, and their corresponding transmitting and receiving devices.

DESCRIPTION OF CONTENTS

1. Introduction to telecommunication systems and services

1.1 Concept
1.2 Systems of telecommunication.
1.3 Services of telecommunication.
1.4 Spanish Regulatory Framework
1.5 Standardisation bodies.
1.6 Depiction of the information.
1.7 Networks in a telecommunications system.
1.8 Hierarchies transport

2. Wired access systems

2.1 Characterization of the subscriber loop.
2.2 ADSL access systems.
2.3 Deployment of services and technical requirements.
2.4 Access Systems HDSL and VDSL.
2.5 xDSL systems in Spain.
2.6 Bulletin of problems

3. Optical access systems

3.1 Introduction.
3.2 GPON and EPON systems.
3.3 New XGPON standards and future systems.
3.4 Bulletin of problems

4. Hybrid access systems

4.1 Genesis of the HFC networks.
4.2 HFC Network Architecture.
4.3 Services TV distribution.
4.4 Services Data
4.5 Telephony Services.
4.6 HFC networks in Spain.
4.7 Bulletin of problems.

5. DVB-S satellite systems

5.1 Introduction.
5.2 Reference model.
5.3 Network architecture.
5.4 Technical regulations and deployment.
5.5 Radio links and devices of DVB-S systems.
5.6 Trends in satellite communications networks.
5.7 Bulletin of problems

6. Mobile systems

6.1. Introduction.
6.2. Mobile communications architectures.
6.3. Mobile phone systems generations.
6.4. From 1G to LTE and 5G.
6.5. Future of mobile communication systems.
6.6. Bulletin of problems Bulletin of problems

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	15,00
Independent study and work	10,00
Preparation of lessons	45,00
Preparation for assessment activities	12,00
Resolution of case studies	8,00
Total hours	**90,00**

TEACHING METHODOLOGY

The development of the course is structured around four themes: the theory and problem solving sessions, tutorials, presentation of evidence of continuous assessment and presentation of technical documentation testing practices.

Group learning with the teacher (G3, G4, G5, G6, R4, R5, R15)

The sessions of theory and problems using the model of lecture. In the theoretical sessions the teacher will present the fundamental contents of this subject using the media at their disposal, (presentations, transparencies, blackboard). In the problem sessions, the professor will explain a number of problems-type, through which the student will learn to identify the essential elements of posing and solving problems. They also use the participatory approach to the problem sessions, which is to prioritize the communication between students and student / teacher. To this end, the teacher will advance which day will be devoted to solving problems and what problems could be solved, so that the student can attend these classes with the approach of the problems, but its resolution will be completed in class forming groups of four or five students who then have to go to the blackboard to explain the problem and resolve the doubts that have the other fellow.

Tutorials (G3, G4, G5, G6, R1, R4, R5, R15)

The students will have a schedule of tutoring whose purpose is to solve problems, questions, guidance on jobs, etc.. The schedule of these tutorials will be indicated at the beginning of the academic year. They will also have the opportunity to clarify some questions via email or discussion forums by using the tool "Virtual Classroom" which provides the University of Valencia.

Individual study (G4, G6, R1)

A voluntary student may submit the resolution of a series of quizzes in total have 7 continuous assessment tests (PEC, one per lesson). These tests are voluntary self-assessment and should be resolved exclusively by students without any help from the teacher.

Group work with colleagues (G3, G4, G5, R1, R5)

The practice groups will consist of a maximum of two people, which should be organized for the design, installation and experimental evidence. Each practice will consist of two distinct parts each with an estimated duration of 2 hours. The first part is theoretical and its resolution is required to perform the second part of a purely experimental.

Teaching materials available (G3, G4, G5, G6, R1, R4, R5, R15)

To make a success of the teaching methodology described the student has the Virtual Classroom, from the beginning of the academic year, the following documents:

¿ **Teaching Guide** provides the information elements sufficient to determine what it is intended that the student learns, how it will do, under what conditions and how it will be evaluated.

¿ **Guidelines for the Study** of the different lessons, structured in the following sections:

- Presentation.
- Objectives and skills acquired.
- Content and timing.
- Comments to the material.
- Fundamentals.
- Further Reading.
- Comments or additional.

¿ **Transparencies** of each course topic.

¿ **Newsletter problems** in each lesson.

¿ **Continuous Assessment Tests (PECs**) from each of the lessons.

¿ **The practice outlines** the following structure:

- Objectives.
- Material.
- Prior knowledge.
- Theoretical basis.
- Activities and experimental procedure.

EVALUATION

For the first round, it will be applied the continuous evaluation method. This means that, in addition to the final examination, class and laboratory work will also be evaluated according to the following rules:

1. Student work, up to 2 points, broken down as follows:
1.1. Participation in class, answers questions and solving exercises/tests in class (G3, G4, G5, G6, R4, R15)
1.2. Resolution of tasks/tests/dissertation/others deliverables that the professor calls for and others non-classroom-based volunteer work (G3, G4, G5, G6, R1, R5)

2. Continuous assessment of laboratory, up to 3 points. Obtained by:
2.1. The students will answer a test and/or tasks after each laboratory project, to determine the mark for each laboratory project.
2.2. The final mark will be the average of all the laboratory project marks. The unattendance to any of the laboratory sessions will provide a 0 mark for the corresponding laboratory project (G4, G5, R4)

3. Final exam, up to 5 points.
3.1 Exam regarding theoretical and practical issues of the subject (G3, G4, G5, G6, R4, R5)
It will be necessary to obtain at least a mark of 4 on 10 in laboratory and final exam sections to be evaluated this course in first round.

The final mark will be the sum of the three sections, it must obtain a minimum mark of 5 points on a total of 10 points to pass the course.

For the second round, a final examination will be held regarding the theoretical and practical content taught in the classroom and an additional exam regarding the work done in the laboratory.
It will be necessary to obtain at least a mark of 4 on 10 in laboratory and final exam sections to be evaluated this course in this second round.

The final grade will be given by the sum of the final exam (up to 6 points) and laboratory exam (up to 4 points) sections. It must obtain a minimum mark of 5 points on a total of 10 points to pass the course.

In case of not taking the final exam, the qualification in the corresponding call will be "not presented".

According to the Universitat de València's regulation, copying or performing any fraudulent action during the exams will turn out in a zero qualification and the beginning of the process according to the University regulation.

In any case, the system of evaluation will be ruled by the established in the Regulation of Evaluation and Qualification of the University of Valencia for Degrees and Masters. (http://www.uv.es/graus/normatives/2017_108_Reglament_avaluacio_qualificacio.pdf) and the good conduct and practice code at Universitat de Valencia https://www.uv.es/graus/normatives/Codi_convivencia_bones_practiques_UV.pdf .

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- Referencia b3: J. M. Huidobro. Redes y servicios de telecomunicaciones. Paraninfo.

- Referencia c1: F. Dungan. Sistemas electrónicos de telecomunicación II : sistemas telefónicos : fijos y móviles. Thomson Paraninfo.
- Referencia c2: L. Rubio, J. Reig y N. Cardona. Problemas de sistemas de telecomunicación.

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- Referencia c4: Tornatore, Massimo, Chang, Gee-Kung, Ellinas, Georgios, Fiber-Wireless Convergence in Next-Generation Communication Networks, Springer 2017

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