

Degree programme	Type	Course
Electronic Engineering for Telecommunications	OB	2
Telecommunication Systems Engineering	OB	2

Contact lecturer

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Prerequisites

Students must have an adequate level of calculus, statistics, and programming.

Group languages

You can consult this information at the [end](#) of the document.

Objectives

- Know the architecture and operation of different telecommunication networks.
- Know the architecture and operation of different telecommunication protocols.
- Know the operation of interconnection mechanisms of telecommunication networks.
- Know the design and operation of distributed telecommunication applications and services.
- Know the architecture of Internet
- Introduce the concept of Quality of Service in telecommunication networks
- Briefly introduce Security in services related to telecommunication networks
- Know some of the classic, new generation and security services related to telecommunication networks

Learning outcomes

Electronic Engineering for Telecommunications

- CU100 (Evaluate the design and performance of telecommunications networks, systems, protocols, services, and infrastructure in residential, business, or institutional contexts, including the Internet, considering their impact on accessibility and gender equity.) Evaluate the design and performance of telecommunications networks, systems, protocols, services, and infrastructure in residential, business, or institutional contexts, including the Internet, considering their impact on accessibility and gender equity.
- CU101 (Assess the economic and social impact of telecommunication networks, systems, services and infrastructures in residential, business or institutional contexts, and the Internet.) Assess the economic and social impact of telecommunication networks, systems, services and infrastructures in residential, business or institutional contexts, and the Internet.
- KU113 (Describe the concepts of network architecture, protocols and communication interfaces.) Describe the concepts of network architecture, protocols and communication interfaces.
- KU114 (Differentiate between the concepts of access and transport networks, circuit and packet switching networks, fixed and mobile networks, as well as distributed network systems and applications, data, audio, video and interactive and multimedia services.) Differentiate between the concepts of access and transport networks, circuit and packet switching networks, fixed and mobile networks, as

well as distributed network systems and applications, data, audio, video and interactive and multimedia services.

- KU115 (Describe the methods of interconnecting networks and routing between them.) Describe the methods of interconnecting networks and routing between them.
- KU116 (Describe the fundamentals of planning and sizing networks based on traffic parameters.) Describe the fundamentals of planning and sizing networks based on traffic parameters.
- SU118 (Apply the concepts of network architecture, protocols and communication interfaces to the design of a communications network.) Apply the concepts of network architecture, protocols and communication interfaces to the design of a communications network.
- SU119 (Configure the devices that make up a communication network and program the applications and services.) Configure the devices that make up a communication network and program the applications and services.

Telecommunication Systems Engineering

- CU100 (Evaluate the design and performance of telecommunications networks, systems, protocols, services, and infrastructure in residential, business, or institutional contexts, including the Internet, considering their impact on accessibility and gender equity.) Evaluate the design and performance of telecommunications networks, systems, protocols, services, and infrastructure in residential, business, or institutional contexts, including the Internet, considering their impact on accessibility and gender equity.
- CU101 (Assess the economic and social impact of telecommunication networks, systems, services and infrastructures in residential, business or institutional contexts, and the Internet.) Assess the economic and social impact of telecommunication networks, systems, services and infrastructures in residential, business or institutional contexts, and the Internet.
- KU113 (Describe the concepts of network architecture, protocols and communication interfaces.) Describe the concepts of network architecture, protocols and communication interfaces.
- KU114 (Differentiate between the concepts of access and transport networks, circuit and packet switching networks, fixed and mobile networks, as well as distributed network systems and applications, data, audio, video and interactive and multimedia services.) Differentiate between the concepts of access and transport networks, circuit and packet switching networks, fixed and mobile networks, as well as distributed network systems and applications, data, audio, video and interactive and multimedia services.
- KU115 (Describe the methods of interconnecting networks and routing between them.) Describe the methods of interconnecting networks and routing between them.
- KU116 (Describe the fundamentals of planning and sizing networks based on traffic parameters.) Describe the fundamentals of planning and sizing networks based on traffic parameters.
- SU118 (Apply the concepts of network architecture, protocols and communication interfaces to the design of a communications network.) Apply the concepts of network architecture, protocols and communication interfaces to the design of a communications network.
- SU119 (Configure the devices that make up a communication network and program the applications and services.) Configure the devices that make up a communication network and program the applications and services.

Contents

The course is divided into 12 subjects, which revolve around architecture, protocols, systems and services of the telecommunication networks:

0. Introduction

1. Network architecture, layers, protocols, and communication interfaces

2. Classification of networks

3. Application layer: Distributed applications and services

4. Transport and Network layers: TCP/IP protocols
5. Network layer: Creation of networks and subnets
6. Network layer: Basic routing
7. Link and Physical layers: Network technologies
8. Network services
9. Internet Architecture
10. Quality of Service
11. Security
12. Services
 1. Introduction
 2. Classic services
 3. Multimedia services
 4. New generation services
 5. Security services

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Laboratory preparation and autonomous work	26	1.04	CU100, SU118, SU119
Laboratory sessions	12	0.48	CU100, SU118, SU119
Follow-up of portfolio, class activities and practical sessions	6	0.24	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Preparation of the virtual portfolio of the course	26	1.04	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Theory classes	36	1.44	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Study and preparation of the assesment tests	26	1.04	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Problems and activities classes	12	0.48	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119

During the course, we will carry out the following activities:

- Theory sessions, where the teacher will provide information on the knowledge of the subject and on strategies to acquire, expand and organise this knowledge.
- Problems and activities sessions, where the students will have to actively take part to consolidate the knowledge acquired by solving, presenting and debating related problems.
- Laboratory practical sessions, where small projects will be proposed to be analysed and developed by the students in a group. The sessions will be previously prepared, documented and programmed by the teacher, and the students will have to prepare them before attending, reviewing the related theoretical knowledge and the basic technical aspects of the development. The laboratory sessions should serve

students to achieve the skills of the subject and contribute to achieve some skills such as autonomous work.

- Preparation of the Portfolio of the subject, in a virtual way. Students will have to work autonomously in teams in the research and the preparation of the corresponding material of the evidences of his theory and problems learning, and in the study of this material. The preparation of the Portfolio should serve students to develop a constant work that will take them to reach the proposed knowledge, and the skills and competences associated with the theory and problems parts.

Annotation: within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Assessment of the development of the virtual portfolio	30% The minimum grade required for this part is 5 out of 10	1	0.04	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Class activities assessment	15% No minimum grade is required for this part	2	0.08	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Knowledge validation tests	30% The minimum grade required for this part is 5 out of 10	2	0.08	CU100, CU101, KU113, KU114, KU115, KU116, SU118, SU119
Assessment of the laboratory sessions	25% The minimum grade required for this part is 5 out of 10	1	0.04	CU100, SU118, SU119

Scheduled assessment process and activities

The final grade of the subject, which includes assessment on the acquisition of knowledge, skills and competences, will be calculated by weighting:

- In 30% the qualification of the work done in the Portfolio. The minimum grade required for this part is 5 out of 10.
- In 30% the validation qualification of knowledge. The minimum grade required for this part is 5 out of 10. To carry out the validation of knowledge, two partial tests will be done during the course (a partial test to assess part I of the subject and another partial test to assess part II of the subject) and a final exam (which will assess both parts). If the student takes more than a 4 in one of the two parts in the partial tests, it should not be assessed again of this part in the final exam (the note for this part will be that of the partial). The validation note will finally be the average of the marks obtained in the two parts. In order to make the average, the student must have obtained more than 4 in the theoretical exam of each part (either partial or in the corresponding part of the end). In case a student gets more than 4 in the two partial tests, but the average is less than 5, the final exam of the part with a grade lower than 5 must be presented (in case both parts are less than 5, the student can decide if to take the final exam of the two parts or only of 1 of them).
- In 15% the qualification of the work done to the activities in class. No minimum grade is required for this part.
- In 25% the qualification of the laboratory sessions. The minimum grade required for this part is 5 out of 10. In order to make the average, the student must have obtained more than 4 in each one of the practices, and pass their validation tests.

A minimum final grade of 5 is required to pass the course.

In the event of failing the subject because any of the assessment activities does not reach the minimum mark required, the final grade will be the lower value between 4.5 and the weighted average of the marks, with the exception that students who do not participate in any of the evaluation activities will be given the grade of 'not evaluable'.

The assessment mechanisms used in the subject are described in more detail below.

Schedule of assessment activities

The dates of continuous assessment and delivery of works will be published the first day of the course on the Virtual Campus and may be subject to possible changes due to adaptation to possible incidents. These changes will always be reported on the Virtual Campus since it is understood that this is the usual platform for the exchange of information between teachers and students.

The following assessment activities are planned:

- Portfolio: weekly
- Classroom activities: weekly
- Laboratory: 6 sessions during the course, day, and time depending on the group of practices
- Validation test of practices: once the practices are finished, in the assessment weeks
- Theory partial exams of parts I and II of the subject: in the assessment weeks
- Theory and practices retake exams

Single assessment

This course does not consider the single assessment system.

Retaking process

Students may take the retaking process if they have taken a set of activities that represent at least two-thirds of the total grade of the course.

Retaking mechanisms will focus on activities 1) Portfolio, 2) Validation of Knowledge, 3) Laboratory sessions. In the event that a student has not passed any, or all of these parts, before the date of the final exam, this part can be retaken by means of a written test (cases 2 and 3), making a second delivery of the laboratory report (case 3) or finishing the Portfolio before that date (case 1). In case 1, if the student retakes the Portfolio part, a pass, or fail will be obtained. If the student passes, a maximum mark of 5 will be obtained. If the student fails, the mark previously obtained in this part will be obtained.

Review of the exam procedure

For each assessment activity, a place, date, and time of revision will be indicated in which the student will be able to review the activity with the teacher. In this context, claims may be made about the activity mark, which will be assessed by the teacher responsible for the subject. Unless otherwise noted, if the student does not attend this revision, this activity will not be reviewed later.

Special grades

When a student has not done any work in laboratory, has not taken any of the partial or final theory written tests, and has a mark lower than 5 in the Portfolio, it will be considered that there are not enough assessment evidences, and the final mark will be "not assessable." The rest of students who have not passed the course

will get a "Suspens" (fail) grade, with the mark obtained in the subject. Those students qualified with "Suspens" due to not having reached the minimum mark in any of the assessment tests, will have the mark got in the assessment exam that has not reached the minimum required (always taking the minimum mark in the case that the minimum in several tests is not obtained).

Honour grade (Matrícula d'Honor, MH): Granting an honour grade qualification is a decision of the faculty responsible for the subject. The regulations of the UAB indicate that MH can only be awarded to students who have obtained a final grade of 9.00 or more. It can be granted up to 5% of MH of the total number of students enrolled.

Use of AI

In this subject, the use of Artificial Intelligence (AI) technologies is allowed exclusively in support tasks, such as bibliographic or information search. The student will have to clearly identify which parts have been generated or improved with this technology, specify the tools used and finally include a critical reflection on how these have influenced the process and the final result of the activity. Non-transparency of the use of AI will be considered academic dishonesty and may lead to a partial or total penalty in the grade of the activity, or higher penalties in serious cases.

Student irregularities, copy, and plagiarism

Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, any irregularities committed by the student that could lead to a variation of the grade of an assessment act will be graded with a zero. Therefore, copying or allowing to copy a laboratory work/report or any other assessment activity will involve failing with a zero, and if it is necessary to pass it to pass the course, the whole course will be failed. The assessment activities qualified in this way and by this procedure will not be retaken, and therefore the course will be failed directly without the opportunity to retake it in the same academic year.

Assessment of repeater students

The repeater students will be able to validate the theory part of the subject. The way to calculate the final mark will be the same as mentioned above, taking the mark from the Portfolio, classroom activities and partial exam(s) of the part(s) of the theory to validate.

Repeater students will also be able to validate the practices separately. The way to calculate the final mark will be the same as mentioned above, taking the mark from the practice(s) to validate.

Bibliography

Basic bibliography

- W. Stallings (2007). Comunicacions informàtiques i de dades, 8a Edició. Pearson Prentice Hall. Fundació privada Torrens-Ibern, 2010.
- W. Stallings (2004). Comunicaciones y redes de computadores, 7a Edición. Pearson Prentice Hall.
- Kurose & Ross. (2021). Computer Networking: A top-down Approach, 8th Edition. Pearson.

Supplementary Bibliography

- Business Data Communications, 7e, William Stallings and Tom Case, Prentice Hall September 2012 ©.

Web links

- <http://williamstallings.com>

Software

For the realization of the laboratory sessions will be used:

- C compiler (an Integrated Development Environment, IDE, may be used).
- eve-ng network emulator
- OpenSSL
- GnuPG

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this [link](#). To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	31	Catalan	first semester	morning-mixed
(PAUL) Classroom practices	311	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	311	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	312	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	312	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	313	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	314	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	315	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	316	Catalan/Spanish	first semester	morning-mixed