UNIVERSIDAD DE GRANADA

ETSIIT
Escuela Técnica Superior de Ingenierías Informática y de Telecomunicación

BACHELOR'S DEGREE IN TELECOMMUNICATIONS ENGINEERING AT THE UNIVERSITY OF GRANADA

PRESENTATION

Academic years: 4
Total credits: 240
Optative credits: 30

The Bachelor's Degree in Telecommunications Engineering aims to provide graduates with a scientific, technological and socio-economic training that enables them to exercise the profession of Technical Telecommunications Engineer. The main objectives include the following:

- To develop the ability to understand the principles on which telecommunication technologies and services are based.
- To provide graduates with the ability to design, implement and operate a telecommunication service or system.
- To train professionals capable of writing, developing and signing projects, as well as carrying out measurements, calculations, valuations, appraisals, expert opinions, studies and reports in the field of Telecommunications.
- To promote knowledge of the basic elements in project management and to train professionals with knowledge, understanding and ability to apply the necessary legislation and regulations in the development of their profession.

Finally, the transversal objectives are to train students to learn new methods and technologies and to foster the ability to work in multidisciplinary groups and multilingual environments.

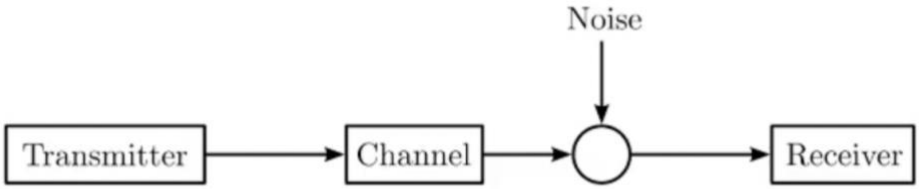
The Bachelor's Degree is located at the Escuela Técnica Superior de Ingenierías Informáticas y de Telecomunicación (ETSIIT), in the city of Granada. This School is adequately equipped with new technologies, which are very necessary to guarantee the adequate development of teaching. The ETSIIT classrooms have overhead projectors, slide projectors and computers with Internet access. Furthermore, the ETSIIT provides other facilities such as study rooms, computer rooms, audio-visual classrooms, practical laboratories, meeting rooms, reprographic services, coffee shop and university canteen.

SPECIALISATIONS

Available mentions of the degree at UGR:

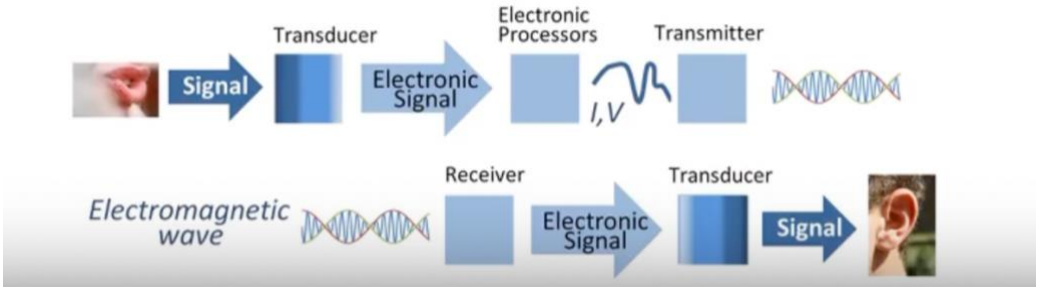
- **SPECIALISATION IN COMMUNICATION SYSTEMS**

  The aim of this specialization is to understand all aspects (design, development and maintenance) related to the transmission of information (voice, images, video, digital data, etc.) by different media (radio frequency, cable, fibre optics, etc.).



- **SPECIALISATION IN ELECTRONIC SYSTEMS**

  The objective is to provide the scientific and technological training necessary for the development, testing, use and maintenance of electronic and photonic devices, circuits, equipment and electronic systems particularly in the ICT field, but also in other areas of application.



- **SPECIALISATION IN TELEMATICS**

  Telematics involves cabling infrastructures, data processing centres, networks, services and applications.

TRADUCCIÓN DE LA BREVE DESCRIPCIÓN Y COMPETENCIAS DE LAS ASIGNATURAS DE PRIMER CURSO DEL GRADO EN INGENIERÍA DE TECNOLOGÍAS DE TELECOMUNICACIÓN

TRANSLATION OF THE BRIEF DESCRIPTION AND SKILLS OF THE SUBJECTS OF THE FIRST ACADEMIC YEAR – BACHELOR'S DEGREE IN TELECOMMUNICATIONS ENGINEERING

PRIMER CURSO – FIRST ACADEMIC YEAR
1º Semestre – 1º Semester

ÁLGEBRA LINEAL Y GEOMETRÍA – LINEAR ALGEBRA AND GEOMETRY

ACADEMIC YEAR	SEMESTER	CREDITS
1º	1º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Matrices and systems of linear equations. Vector spaces. Linear applications. Scalars products, orthogonal bases. Decomposition and diagonalization of matrices. Geometry in the plane and space. Transformations. Conics and quadrics. Introduction to differential geometry of curves and surfaces.

GENERAL AND SPECIFIC SKILLS
General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

- B1 - Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.

ANÁLISIS MATEMÁTICO – MATHEMATICAL ANALYSIS

ACADEMIC YEAR	SEMESTER	CREDITS
1º	1º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Differential and integral calculus for functions of one variable. Differential and integral calculus for functions of several variables.

GENERAL AND SPECIFIC SKILLS

General Skills

- B1 - Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.

- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

FUNDAMENTOS DE INFORMÁTICA – COMPUTER FUNDAMENTALS

ACADEMIC YEAR	SEMESTER	CREDITS
1º	1º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Functional structure of computers. Concept and use of Operating System. Concept and use of Database. Elements of programming. Computer tools with application in Engineering.

GENERAL AND SPECIFIC SKILLS

Basic Skills

- B2 - Basic knowledge about the use and programming of computers, operating systems, databases and computer programs with application in engineering.

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.

- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

INGENIERÍA, EMPRESA Y SOCIEDAD – ENGINEERING, COMPANY AND SOCIETY

ACADEMIC YEAR	SEMESTER	CREDITS
1º	1º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Global vision of Telecommunications Engineering. The Telecommunications sector market. Creation of spin-offs and management of companies in the sector. Social and environmental impact of technical solutions.

GENERAL AND SPECIFIC SKILLS

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.

- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.
- B5 - Adequate knowledge of the concept of company, and institutional and legal framework of the company. Company organisation and management.

ANÁLISIS DE CIRCUITOS – ANALYSIS OF CIRCUITS

ACADEMIC YEAR	SEMESTER	CREDITS
1º	1º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Theorems and methods of electrical network analysis. Passive circuit elements. Response transient and steady-state response of circuits. Circuit analysis based on the Laplace transform. Modelling of quadrupole circuits.

GENERAL AND SPECIFIC SKILLS

Transversal or General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.

- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

2º Semestre – 2º Semester

ECUACIONES DIFERENCIALES Y CÁLCULO NUMÉRICO – DIFFERENTIAL EQUATIONS AND CALCULUS

ACADEMIC YEAR	SEMESTER	CREDITS
1º	2º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Introduction to the numerical resolution of equations. Interpolation and approximation. Numerical integration and numerical derivation. Ordinary differential equations. Partial derivative equations. Numerical methods for solving PDEs.

GENERAL AND SPECIFIC SKILLS

Basic Skills

- B1 - Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry;

differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

ESTADÍSTICA Y OPTIMIZACIÓN – ESTATISTICS AND OPTIMIZATION

ACADEMIC YEAR	SEMESTER	CREDITS
1º	2º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

- One- and two-dimensional descriptive statistics.
- Probability. Calculation of probabilities. Random variable and distribution function.
- Basic models of one-dimensional, discrete and continuous distributions.
- Parameter estimation and hypothesis testing. Fitting of distributions.

- Optimization techniques in Operations Research.

GENERAL AND SPECIFIC SKILLS

Specific Skills

- B1 - Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

FUNDAMENTOS FÍSICOS DE LA INGENIERÍA – FUNDAMENTAL PHYSICS FOR ENGINEERING

ACADEMIC YEAR	SEMESTER	CREDITS
1º	2º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Fundamentals of mechanics. Fundamentals of thermodynamics. Electromagnetism.

GENERAL AND SPECIFIC SKILLS

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.
- B3 - Understanding and mastery of basic concepts about the general laws of mechanics, thermodynamics, fields and waves and electromagnetism and their application for the resolution of the typical problems of engineering.

SISTEMAS LINEALES – LINEAR SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
1º	2º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Spectral analysis. Characterization of linear systems: time and transformed domains. Systems described by state variables. Analogue filters. Introduction to feedback systems.

GENERAL AND SPECIFIC SKILLS

Specific Skills

- B4 - Understanding and mastery of the basic concepts of linear systems and functions and related transformations, theory of electrical circuits, electronic circuits, physical principle of semiconductors and logic families, electronic and photonic devices, materials technology and their application for the resolution of engineering problems.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

COMPONENTES Y CIRCUITOS ELECTRÓNICOS – ELECTRONIC COMPONENTS AND CIRCUITS

ACADEMIC YEAR	SEMESTER	CREDITS
1º	2º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Physical principles of semiconductors. Basic electronic and photonic devices. Modelling and simulation. Fundamentals of materials and electronic device technology. Basic electronic circuits of rectification and polarization. Fundamentals of logic families.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G8 - Ability for teamworking.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

TRADUCCIÓN DE LA BREVE DESCRIPCIÓN Y COMPETENCIAS DE LAS ASIGNATURAS DE SEGUNDO CURSO DEL GRADO EN INGENIERÍA DE TECNOLOGÍAS DE TELECOMUNICACIÓN

TRANSLATION OF THE BRIEF DESCRIPTION AND SKILLS OF THE SUBJECTS OF THE SECOND ACADEMIC YEAR – BACHELOR'S DEGREE IN TELECOMMUNICATIONS ENGINEERING

SEGUNDO CURSO – SECOND ACADEMIC YEAR
1º Semestre – 1º Semester

FUNDAMENTOS DE PROGRAMACIÓN – PROGRAMMING I

ACADEMIC YEAR	SEMESTER	CREDITS
2º	3º	9

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Functions. Recursion. Modularization. Dynamic. Memory management. Inputs and outputs. Error handling. Introduction to object-oriented programming.

GENERAL AND SPECIFIC SKILLS
Basic and General Skills
C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.
C7 - Knowledge and use of the fundamentals of programming in telecommunication networks, systems and services.
CB1 - Students should have demonstrated to possess and understand knowledge in a study area which comes from the basis of general secondary education, and is usually found at a level that, while it is supported by advanced textbooks, it also includes some aspects that involve knowledge that comes from the forefront of their study field.
CB2 - Students should know how to professionally apply their knowledge to their work or career and have the skills that are usually demonstrated through the elaboration and defense of arguments and problem solving within their study area.
CB3 - Students should have the ability to gather and interpret relevant datum (usually from their study area) to make judgments that include a reflection on relevant topics of an ethical, scientific or social nature.

CB4 - Students should be able to communicate information, ideas, problems and solutions to a specialized or general audience.
CB5 -Students should have developed the necessary learning skills to keep their future studies with a great degree of autonomy.

Transversal Skills

G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
G2 - Ability for organization and planning as well as information management ability.
G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
G4 - Ability to solve problems.
G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
G6 - Ability to use and apply ICT in the academic and professional field.
G7 - Ability to communicate in a foreign language, particularly in English.
G8 - Ability for teamworking.
G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
G12 - Ability to innovate and produce new ideas.
G13 - Awareness towards environmental issues.
G14 - Respect for fundamental rights and equality between men and women.
G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

SISTEMAS TELEMÁTICOS – TELEMATICS SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
2º	3º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Network architectures. OSI and TCP/IP models. Voice and data services. Networks protocols and services. Protocols and user services.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.

G2 - Ability for organization and planning as well as information management ability.

G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.

G4 - Ability to solve problems.

G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.

G6 - Ability to use and apply ICT in the academic and professional field.

G7 - Ability to communicate in a foreign language, particularly in English.

G8 - Ability for teamworking.

G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.

G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

G11 - Ability for self-adapting to technologies and future environments by updating professional skills.

G12 - Ability to innovate and produce new ideas.

G13 - Awareness towards environmental issues.

G14 - Respect for fundamental rights and equality between men and women.

G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.

C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.

C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

C6 - Ability to conceive, deploy, organize and manage of telecommunication networks, systems, services and infrastructures in residential contexts (home, city and digital communities), companies or institutions, taking responsibility for their implementation and continuous improvement, as well as how to know the economic and social impact.

C7 - Knowledge and use of the fundamentals of programming in telecommunication networks, systems and services.

C12 - Knowledge and use of the concepts of network architecture, protocols and communication interfaces.

C15 - Knowledge of the regulation and regulation of telecommunications at international, European and national levels.

TEORÍA DE LA COMUNICACIÓN – COMMUNICATION THEORY

ACADEMIC YEAR	SEMESTER	CREDITS
2º	3º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Random processes and noise, introduction to information theory, statistical modelling of communication channels. Fundamentals of statistical detection and estimation for communication.

GENERAL AND SPECIFIC SKILLS
Module Specific Transversal Skills
C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

Module Specific Non-Transversal Skills
C4 - Ability to analyse and specify the fundamental parameters of a communications system.
C5 - Ability to evaluate the advantages and disadvantages of different technological alternatives of display or implementation of communication systems, from the point of view of the gap of
the signal, the disturbances and the noise, and the analogue and digital modulation systems.

Transversal Skills
G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
G2 - Ability for organization and planning as well as information management ability.
G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
G4 - Ability to solve problems.

G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
G6 - Ability to use and apply ICT in the academic and professional field.
G7 - Ability to communicate in a foreign language, particularly in English.
G8 - Ability for teamworking.
G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
G12 - Ability to innovate and produce new ideas.
G13 - Awareness towards environmental issues.
G14 - Respect for fundamental rights and equality between men and women.
G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

TRANSMISIÓN DE ONDAS – WAVE TRANSMISSION

ACADEMIC YEAR	SEMESTER	CREDITS
2º	3º	9

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Maxwell's equations, electromagnetic wave propagation, introduction to radiation and antennas. Fundamentals of acoustics.

GENERAL AND SPECIFIC SKILLS
Transversal Specific Skills
C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

Module Specific Non-Transversal Skills
S8 - Ability to understand the mechanisms of propagation and transmission of electromagnetic and acoustic waves, and their corresponding emitting and receiving devices.

General Skills

G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.

G2 - Ability for organization and planning as well as information management ability.

G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.

G4 - Ability to solve problems.

G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.

G6 - Ability to use and apply ICT in the academic and professional field.

G7 - Ability to communicate in a foreign language, particularly in English.

G8 - Ability for teamworking.

G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.

G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

G11 - Ability for self-adapting to technologies and future environments by updating professional skills.

G12 - Ability to innovate and produce new ideas.

G13 - Awareness towards environmental issues.

G14 - Respect for fundamental rights and equality between men and women.

G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

2º Semestre – 2º Semester

COMUNICACIONES I – COMMUNICATIONS I

ACADEMIC YEAR	SEMESTER	CREDITS
2º	4º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Introduction to communication systems. Transmission channels. Analogue communication systems. Pulse modulation. Digital modulations.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.

G2 - Ability for organization and planning as well as information management ability.

G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.

G4 - Ability to solve problems.

G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.

G6 - Ability to use and apply ICT in the academic and professional field.

G7 - Ability to communicate in a foreign language, particularly in English.

G8 - Ability for teamworking.

G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.

G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

G11 - Ability for self-adapting to technologies and future environments by updating professional skills.

G12 - Ability to innovate and produce new ideas.

G13 - Awareness towards environmental issues.

G14 - Respect for fundamental rights and equality between men and women.

G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Transversal Skills

C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.

C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.

C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

INFRAESTRUCTURAS Y REDES DE COMUNICACIÓN – COMMUNICATION NETWORKS AND INFRASTRUCTURES

ACADEMIC YEAR	SEMESTER	CREDITS
2º	4º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Access and transport networks. Design, planning and deployment of fixed and mobile networks. Tariffs. Common telecommunication infrastructures (CTI).

GENERAL AND SPECIFIC SKILLS

Transversal Skills

G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.

G2 - Ability for organization and planning as well as information management ability.

G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.

G4 - Ability to solve problems.

G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.

G6 - Ability to use and apply ICT in the academic and professional field.

G7 - Ability to communicate in a foreign language, particularly in English.

G8 - Ability for teamworking.

G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.

G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

G11 - Ability for self-adapting to technologies and future environments by updating professional skills.

G12 - Ability to innovate and produce new ideas.

G13 - Awareness towards environmental issues.

G14 - Respect for fundamental rights and equality between men and women.

G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.

C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.

C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.
C6 - Ability to conceive, deploy, organize and manage of telecommunication networks, systems, services and infrastructures in residential contexts (home, city and digital communities), companies or institutions, taking responsibility for their implementation and continuous improvement, as well as how to know the economic and social impact.
C12 - Knowledge and use of the concepts of network architecture, protocols and communication interfaces.
C13 - Ability to differentiate the concepts of access networks and transport networks; circuit-switched networks and packet-based ones; fixed and mobile networks; as well as distributed network and application systems; voice, data, audio and video services; and interactive and multimedia services.
C14 - Knowledge of the methods of network interconnection and routing, as well as the basis of planning, dimensioning of networks according to traffic parameters.
C15 - Knowledge of the regulation and regulation of telecommunications at international, European and national levels.

SEÑALES DIGITALES – DIGITAL SIGNALS

ACADEMIC YEAR	SEMESTER	CREDITS
2º	4º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Discrete Fourier Transform. Characteristics and applications. Z-transform. Discrete-Time LTI systems. Design of digital filters and applications. Decimators and interpolators.

GENERAL AND SPECIFI SKILLS
Module Specific Transversal Skills
C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

Module Specific Non-Transversal Skills
C4 - Ability to analyse and specify the fundamental parameters of a communications system.

C5 - Ability to evaluate the advantages and disadvantages of different technological alternatives of display or implementation of communication systems, from the point of view of the gap of the signal, the disturbances and the noise, and the analogue and digital modulation systems.
C8 - Ability to understand the mechanisms of propagation and transmission of electromagnetic and acoustic waves, and their corresponding emitting and receiving devices.

All transversal (G) and basic skills (CB).

ELECTRÓNICA ANALÓGICA – ANALOG ELECTRONICS

ACADEMIC YEAR	SEMESTER	CREDITS
2º	4º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Analysis of basic electronics circuits for analogue processing. Amplifier stages and their frequency response. Current sources, active loads and output stages. The operational amplifier and its linear and non-linear applications.

GENERAL AND SPECIFIC SKILLS
General Skills
G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
G2 - Ability for organization and planning as well as information management ability.
G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
G4 - Ability to solve problems.
G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
G6 - Ability to use and apply ICT in the academic and professional field.
G7 - Ability to communicate in a foreign language, particularly in English.
G8 - Ability for teamworking.
G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
G12 - Ability to innovate and produce new ideas.

G13 - Awareness towards environmental issues.
G14 - Respect for fundamental rights and equality between men and women.
G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

ELECTRÓNICA DIGITAL – DIGITAL ELECTRONICS

ACADEMIC YEAR	SEMESTER	CREDITS
2º	4º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Analysis and design of digital electronic circuits: combinational, synchronous sequential, asynchronous sequential. Memories and integrated logic families. Fundamentals of digital design. Introduction to high-level hardware languages.

GENERAL AND SPECIFIC SKILLS
General Skills
G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
G2 - Ability for organization and planning as well as information management ability.
G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
G4 - Ability to solve problems.
G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
G6 - Ability to use and apply ICT in the academic and professional field.
G7 - Ability to communicate in a foreign language, particularly in English.
G8 - Ability for teamworking.
G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
G12 - Ability to innovate and produce new ideas.
G13 - Awareness towards environmental issues.
G14 - Respect for fundamental rights and equality between men and women.
G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.

C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.

C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

TRADUCCIÓN DE LA BREVE DESCRIPCIÓN Y COMPETENCIAS DE LAS ASIGNATURAS DE TERCER CURSO DEL GRADO EN INGENIERÍA DE TECNOLOGÍAS DE TELECOMUNICACIÓN

TRANSLATION OF THE BRIEF DESCRIPTION AND SKILLS OF THE SUBJECTS OF THE THIRD ACADEMIC YEAR – BACHELOR'S DEGREE IN TELECOMMUNICATIONS ENGINEERING

TERCER CURSO – THIRD ACADEMIC YEAR
1º Semestre – 1º Semester

COMUNICACIONES II – COMMUNICATIONS II

ACADEMIC YEAR	SEMESTER	CREDITS
3º	5º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Modulation and detection in Gaussian channels. Signal space. Optimal detection. Digital amplitude, phase and frequency modulations. Intersymbolic interference channels. Coding for error protection. Block codes. Synchronization.

GENERAL AND BASIC SKILLS
Module Specific Transversal Skills

- C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
- C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
- C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

Module Specific Non-Transversal Skills

- C4 - Ability to analyse and specify the fundamental parameters of a communications system.
- C5 - Ability to evaluate the advantages and disadvantages of different technological alternatives of display or implementation of communication systems, from the point of view of the gap of the signal, the disturbances and the noise, and the analogue and digital modulation systems.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

SISTEMAS DE CONMUTACIÓN – SWITCHING SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	5º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Introduction to teletraffic theory. Packet switching. Circuit switching. Switching node architectures. Signalling.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.

- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
- C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
- C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.
- C6 - Ability to conceive, deploy, organize and manage of telecommunication networks, systems, services and infrastructures in residential contexts (home, city and digital communities), companies or institutions, taking responsibility for their implementation and continuous improvement, as well as how to know the economic and social impact.
- C12 - Knowledge and use of the concepts of network architecture, protocols and communication interfaces.
- C13 - Ability to differentiate the concepts of access networks and transport networks; circuit-switched networks and packet-based ones; fixed and mobile networks; as well as distributed network and application systems; voice, data, audio and video services; and interactive and multimedia services.

- C14 - Knowledge of the methods of network interconnection and routing, as well as the basis of planning, dimensioning of networks according to traffic parameters.

SISTEMAS ELECTRÓNICOS DIGITALES – DIGITAL ELECTRONIC SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	5º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Introduction to programmable electronic systems. Microprocessors and microcontrollers. Memory and input/output interfaces. Reconfigurable hardware devices. HDL and fundamentals of automatic synthesis.

GENERAL AND SPECIFIC SKILLS
Subject Specific Skills

- C9 - Ability to analysis and design different circuits such as combinational and sequential, synchronous and asynchronous; and ability to use microchips and integrated circuits.
- C10 - Knowledge and application of the basics of hardware devices description languages.

Transversal Skills

- C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
- C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
- C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

TRANSMISIÓN DE DATOS Y REDES DE COMPUTADORES – DATA TRANSMISSION AND COMPUTER NETWORKS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	5º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Link control. Interconnection of networks and routing. Congestion control. Network quality of service. Network management fundamentals.

GENERAL AND SPECIFIC SKILLS

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
- C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to

support the development and exploitation of telecommunication and electronic networks, services and applications.

- C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.
- C6 - Ability to conceive, deploy, organize and manage of telecommunication networks, systems, services and infrastructures in residential contexts (home, city and digital communities), companies or institutions, taking responsibility for their implementation and continuous improvement, as well as how to know the economic and social impact.
- C12 - Knowledge and use of the concepts of network architecture, protocols and communication interfaces.
- C13 - Ability to differentiate the concepts of access networks and transport networks; circuit-switched networks and packet-based ones; fixed and mobile networks; as well as distributed network and application systems; voice, data, audio and video services; and interactive and multimedia services.
- C14 - Knowledge of the methods of network interconnection and routing, as well as the basis of planning, dimensioning of networks according to traffic parameters.

ELECTRÓNICA DE POTENCIA – POWER ELECTRONICS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	5º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Power electronics devices and circuits. Fundamentals of electrical engineering: single-phase and three-phase systems. Photovoltaic and thermal solar energy sources.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.

- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- C1 - Ability to learn independently new knowledge and appropriate techniques for the conception, development or exploitation of telecommunication systems and services.
- C2 - Ability to use communication and computer applications (office automation, database, advanced calculation, project management, visualization, etc.) to support the development and exploitation of telecommunication and electronic networks, services and applications.
- C3 - Ability to use computer tools to search bibliographic resources or information related to telecommunications and electronics.

2º Semestre – 2º Semester

SISTEMAS DE TELECOMUNICACIÓN – COMMUNICATION SYSTEMS

ANTENAS Y PROPAGACIÓN – ANTENNAS AND PROPAGATION

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Antenna fundamentals. Basic radiation parameters. Linear antennas, clusters and aperture antennas, horns and reflectors. Wave propagation in the natural environment.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.

Specific Skills

- S5 - Ability for the selection of aerials, equipment and transmission systems, guided and not-guided wave propagation, by electromagnetic, radiofrequency or optical means and the corresponding management of the radioelectric space and frequency assignment.

SISTEMAS DE CODIFICACIÓN Y ALMACENAMIENTO – STORAGE AND CODING SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Multirate systems. Analogue source compression techniques. Channel coding: non-binary and convolutional codes, and interleavers. Capture and storage systems.

GENERAL AND SPECIFIC SKILLS
Specific Skills

- S1 - Ability to build, operate and manage networks, services, processes and applications of, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of the transmission systems.
- S6 - Ability to analyse, codify, process and transmit multimedia information using techniques of analogue and digital signal processing.

General Skills
All skills in the verification report (G1 – G15).

SISTEMAS DE RADIOCOMUNICACIÓN – RADIO COMMUNICATION SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Transmitter and receiver systems for radio communications. Analysis, design and interconnection of sub-systems for radio communications. Quality and planning of radio links. Applications in terrestrial broadcasting, satellite radio communication and radio determination.

GENERAL AND SPECIFIC SKILLS
Module Specific Skills

- S2 - Ability to apply the techniques on which networks, services and telecommunications applications are based as in fixed environments as in mobile, personal, local or long-distance ones, with different bandwidths, including telephony, broadcasting, television and data, from the point of view of the transmission systems.
- S5 - Ability for the selection of aerials, equipment and transmission systems, guided and not-guided wave propagation, by electromagnetic, radiofrequency or optical means and the corresponding management of the radioelectric space and frequency assignment.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.

- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

TRATAMIENTO DIGITAL DE SEÑALES – DIGITAL SIGNAL PROCESSING

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
System modelling. Optimal and adaptive filters. Spectral estimation. Multidimensional and multichannel signal processing.

GENERAL AND SPECIFIC SKILLS
Specific Skills

- S1 - Ability to build, operate and manage networks, services, processes and applications of, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of the transmission systems.
- S6 - Ability to analyse, codify, process and transmit multimedia information using techniques of analogue and digital signal processing.

General Skills
All skills in the verification report (G1 – G15).

MEDIOS Y COMPONENTES ÓPTICOS PARA COMUNICACIONES – OPTICAL CHANNELS AND COMPONENTS FOR COMMUNICATIONS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
To be completed with the corresponding text.

GENERAL AND SPECIFIC SKILLS
General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.

Specific Skills

- S3 - Ability to analyse components and their specifications for guided and not-guided communication systems.
- S5 - Ability for the selection of aerials, equipment and transmission systems, guided and not-guided wave propagation, by electromagnetic, radiofrequency or

optical means and the corresponding management of the radioelectric space and frequency assignment.

SISTEMAS ELECTRÓNICOS – ELECTRONIC SYSTEMS

CIRCUITOS ELÉCTRONICOS PARA RADIOFRECUENCIA – RADIOFREQUENCY ELECTRONIC CIRCUITS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
To be completed with the corresponding text.

GENERAL AND SPECIFIC SKILLS
General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.

- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Electronic Systems Specific Skills

- E1 - Ability to build, operate and manage catchment systems, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.
- E2 - Ability to select circuits and specialised electronic devices for transmission, routing and terminals, both in fixed and mobile environments.
- E4 - Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information Technology and Communications.
- E5 - Ability to design analogue and digital electronic circuits, analogue-digital and digital-analogue conversion, radio frequency conversion, power and electric power conversion for telecommunication and computing applications.
- E8 - Ability to specify and use electronic instrumentation and measurement systems.
- E9 - Ability to analyse and solve interference and electromagnetics compatibility problems.

SISTEMAS DE ALIMENTACIÓN – POWER SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Linear and switching regulation. Linear and switching power supplies. Power supply in portable systems: batteries and chargers. Distributed power supply in communications. Electrical power conversion systems.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.

- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Electronic Systems Specific Skills

- E3 - Ability to perform the specification, implementation, documentation and set-up of equipment and systems, electronic, instrumentation and control, considering both the technical aspects as the corresponding regulatory regulations.
- E4 - Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information Technology and Communications.
- E5 - Ability to design analogue and digital electronic circuits, analogue-digital and digital-analogue conversion, radio frequency conversion, power and electric power conversion for telecommunication and computing applications.
- E6 - Ability to understand and use the theory of feedback and electronic systems of control.
- E9 - Ability to analyse and solve interference and electromagnetic compatibility problems.

ELECTRÓNICA DE MICROONDAS – MICROWAVE ELECTRONICS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Transmission lines and waveguides. Microwave devices. Analysis and characterization of passive and active microwave circuits.

GENERAL AND SPECIFIC SKILLS
All Degree General Skills.

Specific Skills

- E1 - Ability to build, operate and manage catchment systems, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.
- E2 - Ability to select circuits and specialized electronic devices for transmission, routing and terminals, both in fixed and mobile environments.
- E4 - Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information Technology and Communications.
- E5 - Ability to design analogue and digital electronic circuits, analogue-digital and digital-analogue conversion, radio frequency conversion, power and electric power conversion for telecommunication and computing applications.
- E8 - Ability to specify and use electronic instrumentation and measurement systems.
- E9 - Ability to analyse and solve interference and electromagnetic compatibility problems.

DISEÑO DE CIRCUITOS Y SISTEMAS ELECTRÓNICOS – DESIGN OF ELECTRONIC CIRCUITS AND SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Design methodologies. Electronic systems description and specification tools. Functional and temporal electrical simulation tools. Interface and terminal design.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

- E2 - Ability to select circuits and specialized electronic devices for transmission, routing and terminals, both in fixed and mobile environments.
- E3 - Ability to perform the specification, implementation, documentation and set-up of equipment and systems, electronic, instrumentation and control, considering both the technical aspects as the corresponding regulatory regulations.
- E5 - Ability to design analogue and digital electronic circuits, analogue-digital and digital-analogue conversion, radio frequency conversion, power and electric power conversion for telecommunication and computing applications.
- E7 - Ability to design interface devices, data capture and storage, and terminals for telecommunication services and systems.

INSTRUMENTACIÓN ELECTRÓNICA – ELECTRONIC INSTRUMENTATION

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Theory and measurement techniques. Signal conditioning circuits. A/D and D/A converters. Programmable and virtual instrumentation. Introduction to sensors and transducers.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

- E1 - Ability to build, operate and manage catchment systems, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.

- E3 - Ability to perform the specification, implementation, documentation and set-up of equipment and systems, electronic, instrumentation and control, considering both the technical aspects as the corresponding regulatory regulations.
- E4 - Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information Technology and Communications.
- E5 - Ability to design analogue and digital electronic circuits, analogue-digital and digital-analogue conversion, radio frequency conversion, power and electric power conversion for telecommunication and computing applications.
- E8 - Ability to specify and use electronic instrumentation and measurement systems.

TELEMÁTICA - TELEMATICS

COMPLEMENTOS DE PROGRAMACIÓN - PROGRAMMING

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Dynamic data structure. Exception handling. Multithreaded programming. Concurrency. Object-oriented programming.

GENERAL AND SPECIFIC SKILLS
Non-transversal Specific Skill

- T4 - Ability to describe, programme, validate and optimize communication protocols and interfaces in the different levels of a network architecture.
- T7 - Ability to programme telematics, networked and distributed services and applications.

Additionally Transversal Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability

and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

DESARROLLO DE APLICACIONES EN WEB – NETWORK APPLICATION DEVELOPMENT

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Fundamentals of network application development. Protocols. Support for web application development. Support for e-commerce applications development. Support for e-administration development.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.
- T4 - Ability to describe, programme, validate and optimize communication protocols and interfaces in the different levels of a network architecture.
- T7 - Ability to programme telematics, networked and distributed services and applications.

GESTIÓN DE REDES – NETWORK MANAGEMENT

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Functional aspects of network management. Fault management and performance studies. Network management models OSI and SNMP. Integrated network management architectures. Network management platforms.

GENERAL AND SPECIFIC SKILLS

Module Specific Transversal Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.

Module Specific Skills

- T3 - Ability to build, operate and manage telematic services using analytical tools of planning, dimensioning and analysis.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.

- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

REDES INALÁMBRICAS Y MOVILIDAD – WIRELESS NETWORKS AND MOBILITY

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Wireless network technologies. Media access technologies. WLAN and WWAN standards. Mobile IP. Security in mobile networks.

GENERAL AND SPECIFIC SKILLS
Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.

- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.
- T5 - Ability to follow the technological progress of transmission, switching and process to improve the networks and telematics services.
- T6 - Ability to design network architectures and telematic services.

SEGURIDAD EN REDES DE COMUNICACIÓN – COMMUNICATION NETWORKS SECURITY

ACADEMIC YEAR	SEMESTER	CREDITS
3º	6º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Security services. Security protocols. Secure communications. Cryptographic techniques. Vulnerabilities and attacks. Service access control. Audits and security policies. Content protection.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.
- T4 - Ability to describe, programme, validate and optimize communication protocols and interfaces in the different levels of a network architecture.
- T7 - Ability to programme telematics, networked and distributed services and applications.

TRADUCCIÓN DE LA BREVE DESCRIPCIÓN Y COMPETENCIAS DE LAS ASIGNATURAS DE CUARTO CURSO DEL GRADO EN INGENIERÍA DE TECNOLOGÍAS DE TELECOMUNICACIÓN

TRANSLATION OF THE BRIEF DESCRIPTION AND SKILLS OF THE SUBJECTS OF THE FOURTH ACADEMIC YEAR – BACHELOR'S DEGREE IN TELECOMMUNICATIONS ENGINEERING

CUARTO CURSO – FOURTH ACADEMIC YEAR
1º Semestre – 1º Semester

SISTEMAS DE TELECOMUNICACIÓN – COMMUNICATION SYSTEMS

COMUNICACIONES INALÁMBRICAS – WIRELESS COMMUNICATIONS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Introduction to wireless communication systems. Propagation effects in mobile channels. Modulation and multiple access techniques in mobile communications. Cellular architecture. Wireless systems and standards.

GENERAL AND SPECIFIC SKILLS
Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.

- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

- S1 - Ability to build, operate and manage networks, services, processes and applications of, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of the transmission systems.
- S2 - Ability to apply the techniques on which networks, services and telecommunications applications are based as in fixed environments as in mobile, personal, local or long-distance ones, with different bandwidths, including telephony, broadcasting, television and data, from the point of view of the transmission systems.
- S3 - Ability to analyse components and their specifications for guided and not-guided communication systems.
- S4 - Ability for the selection of circuits, subsystems and radiofrequency systems, microwaves, broadcasting, radio links and radiodetermination.
- S5 - Ability for the selection of aerials, equipment and transmission systems, guided and not-guided wave propagation, by electromagnetic, radiofrequency or optical means and the corresponding management of the radioelectric space and frequency assignment.

COMUNICACIONES ÓPTICAS – OPTICAL COMMUNICATIONS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Plane wave propagation in different media. Homogeneous plane waves in the frequency and time domain. Polarisation. Transmission lines and modes: TE, TM and TEM. Digital and analogue optical communications systems. Optical communications networks. Standards and regulations. WDM systems.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.

Specific Skills

- S3 - Ability to analyse components and their specifications for guided and not-guided communication systems.
- S5 - Ability for the selection of aerials, equipment and transmission systems, guided and not-guided wave propagation, by electromagnetic, radiofrequency or optical means and the corresponding management of the radioelectric space and frequency assignment.

TELEVISIÓN Y RADIO DIGITAL – DIGITAL TELEVISION AND RADIO

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

DVB and DAB transport stream. Digital terrestrial television. The DVB-T standard. Digital cable and satellite television. DVB-C and DVB-S standards. Digital Radio. DAB and DAB+ standards. Single frequency networks.

GENERAL AND SPECIFIC SKILLS

Module Specific Skills

- S1 - Ability to build, operate and manage networks, services, processes and applications of, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of the transmission systems.
- S2 - Ability to apply the techniques on which networks, services and telecommunications applications are based as in fixed environments as in mobile, personal, local or long-distance ones, with different bandwidths, including telephony, broadcasting, television and data, from the point of view of the transmission systems.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

SISTEMAS DE ELECTRÓNICOS – ELECTRONIC SYSTEMS

SISTEMAS DE CONTROL – CONTROL SYSTEMS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Feedback theory. Control theory: control loops, sequential control and PID. Simulation tools. Electronic control systems. Field buses. Regulatory standards.

GENERAL AND SPECIFIC SKILLS

Specific Skills: Electronic Systems

- E3 - Ability to perform the specification, implementation, documentation and set-up of equipment and systems, electronic, instrumentation and control, considering both the technical aspects as the corresponding regulatory regulations.
- E4 - Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information Technology and Communications.
- E6 - Ability to understand and use the theory of feedback and electronic systems of control.

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.

CIRCUITOS INTEGRADOS PARA COMUNICACIONES – INTEGRATED CIRCUITS FOR COMMUNICATIONS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Design of radio frequency electronic systems with CMOS integrated circuits: integrated circuits for radio frequency, electronic noise, low noise and broadband amplifiers; PLLS; power amplifiers.

GENERAL AND SPECIFIC SKILLS
General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.

- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

- E2 - Ability to select circuits and specialised electronic devices for transmission, routing and terminals, both in fixed and mobile environments.
- E5 - Ability to design analogue and digital electronic circuits, analogue-digital and digital-analogue conversion, radio frequency conversion, power and electric power conversion for telecommunication and computing applications.

EQUIPOS ELECTRÓNICOS – ELECTRONIC EQUIPMENT

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Noise and interference. Electromagnetic compatibility. Regulatory standards. Implementation, documentation and commissioning of electronic equipment. Electronic equipment for telecommunication services and systems.

GENERAL AND SPECIFIC SKILLS

General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Specific Skills

- E1 - Ability to build, operate and manage catchment systems, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of electronic systems.
- E2 - Ability to select circuits and specialised electronic devices for transmission, routing and terminals, both in fixed and mobile environments.
- E3 - Ability to perform the specification, implementation, documentation and set-up of equipment and systems, electronic, instrumentation and control, considering both the technical aspects as the corresponding regulatory regulations.
- E4 - Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information Technology and Communications.
- E7 - Ability to design interface devices, data capture and storage, and terminals for telecommunication services and systems.

TELEMÁTICA – TELEMATICS

DISEÑO Y DIMENSIONADO DE REDES – NETWORKS DESIGN AND PLANNING

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Network design and dimensioning: queuing theory. Traffic engineering. Load balancing and route selection. Network planning. Link dimensioning.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Transversal Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.

Module Specific Non-Transversal Skills

- T3 - Ability to build, operate and manage telematic services using analytical tools of planning, dimensioning and analysis.
- T6 - Ability to design network architectures and telematic services.

REDES DE ACCESO Y CORPORATIVAS – CORPORATE ACCESS NETWOTKS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Subscriber network architecture. Corporate networks. Local area networks. Access technologies. Performance analysis and dimensioning of user networks. Planning and configuration.

GENERAL AND SPECIFIC SKILLS
Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.

- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.
- T5 - Ability to follow the technological progress of transmission, switching and process to improve the networks and telematics services.

REDES MULTIMEDIA – MULTIMEDIA NETWORKS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Multimedia content distribution on networks. Real-time transmission. Multimedia transmission in RAL. QoS. Content protection.

GENERAL AND SPECIFIC SKILLS

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.

- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

Module Specific Skills

- T1 - Ability to build, operate and manage networks, services, processes and telecommunications applications, understanding them as systems of recruitment, transportation, representation, processing, storage, management and presentation of multimedia information, from the point of view of telematic services.
- T2 - Ability to apply the techniques on which networks, services and telecommunications applications are based, such as management systems, signaling and switching, routing, security (cryptographic protocols, tunnelling, firewalls, collection mechanisms, authentication and content protection), traffic engineering (graph theory, queuing theory and teletraffic) pricing and reliability and quality of service, in fixed, mobile, personal, local or long-distance, with different bandwidths, including telephony and data.
- T5 - Ability to follow the technological progress of transmission, switching and process to improve the networks and telematics services.
- T6 - Ability to design network architectures and telematic services.

SISTEMAS DE TELECOMUNICACIÓN – COMMUNICATION SYSTEMS

PROCESAMIENTO DE VÍDEO DIGITAL – DIGITAL VIDEO PROCESSING

ACADEMIC YEAR	SEMESTER	CREDITS
4º	8º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Video signal acquisition and representation. Digitization techniques. Camera, scene and object models. 2D and 3D motion estimation. Applications to video encoding and compression.

GENERAL AND SPECIFIC SKILLS
Subject Specific Skills

- O2 - Ability to understand the aspects related to the processing of the video signal. Ability to understand the problems related to the digitalization, coding and compression of video, the models and the 2D and 3D movement.

Transversal or General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.

- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

TECNOLOGÍAS DEL HABLA – SPEECH TECHNOLOGIES

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Speech analysis. Statistical approach: acoustic and speech modelling, automatic speech recognition systems. Speaker recognition and verification. Text-to-speech systems.

GENERAL AND SPECIFIC SKILLS

- O1 - Ability to understand the aspects related to speech technology. Ability to understand the problems related to the acoustic modelling of the voice signal, the modelling of the language current systems for automatic speech recognition and speech synthesis, as well as techniques used for the evaluation of systems. Introduce the basic concepts of this discipline as well as its advantages, limitations and main applications.

All general skills G1 – G15.

SISTEMAS DE ELECTRÓNICOS – ELECTRONIC SYSTEMS

ARQUITECTURAS ESPECIALIZADAS PARA TELECOMUNICACIONES – SPECIALIZED ARCHITECTURES FOR TELECOMMUNICATIONS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	8º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Digital Signal Processor (DSP). DSP-based Hw/Sw co-design. Optimized use of computing resources. Efficient DSP programming. Real-time interface programming. Device drivers. Embedded systems for communications. Architectures for communications.

GENERAL AND SPECIFIC SKILLS
Subject Specific Skills

- O5 - Know the Digital Signal Processors (DSPs), their main characteristics, internal elements and programming. Design applications based on DSPs using hardware resources and optimized software Analyse the elements that define a device driver oriented to communication interface, and programming such interface with real time restrictions. To know different alternatives of embedded systems and specialised architectures for interfaces.

Transversal or General Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G8 - Ability for teamworking.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.

TECNOLOGÍA DE CIRCUITOS IMPRESOS – PRINTED CIRCUIT BOARDS TECHNOLOGY

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

Design of printed circuit boards (PCB). CAD tools for the development of electronic circuits and electronic equipment. Technologies, manufacturing, processes, regulations and quality criteria in PCB design.

GENERAL AND SPECIFIC SKILLS

Training Skills Related to Telecommunications

- C3 - Ability to use computer tools to search for bibliographic resources or information related to telecommunications and electronics.

Module Specific Skills

- O6 - Ability to know and design printed circuit boards, tools, technologies and criteria of quality.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

TELEMÁTICA – TELEMATICS

PROGRAMACIÓN DE SISTEMAS EMPOTRADOS Y DE TIEMPO REAL – EMBEDDED AND REAL-TIME SYSTEMS PROGRAMMING

ACADEMIC YEAR	SEMESTER	CREDITS
4º	8º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

- Particular requirements of embedded and real-time systems.
- Execution environments: operating systems.
- Scheduling models and temporal analysis of tasks.
- Programming of embedded applications. Hardware interaction. Time control. Event management. Resource control.
- Design, configuration, deployment and debugging of embedded applications.

GENERAL AND SPECIFIC SKILLS

- T7 - Ability to programme telematics, networked and distributed services and applications.
- O4 - Ability to know operating systems and implementation details.
- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.

LABORATORIO DE TELEMÁTICA – TELEMATICS LAB

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

New generation networks, services and protocols. Advanced telematic services. Multiservice networks. Integration and commissioning of networks. Telematics engineering tools.

GENERAL AND SPECIFIC SKILLS

Specific Skills

- O3 - Ability to know new services and advanced protocols, as well as to use them for design, configuration and network management. Design advanced heterogeneous networks. The ability to: identify and evaluate the equipment, wiring and infrastructure necessary for the deployment of advanced networks and services.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.

- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

FORMACIÓN COMPLEMENTARIA – COMPLEMENTARY TRAINING

FUNDAMENTOS DE FOTÓNICA – PHOTONICS FUNDAMENTALS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	7º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)
Reflection, refraction, absorption, dispersion and scattering phenomena. Polarization, interference and diffraction phenomena. Fourier optics. Quantum optics. Electro-optics. Acousto-optics. Optical radiation resources, lasers and photodetectors.

GENERAL AND SPECIFIC SKILLS
Specific Skills
- O9 - To know the basics of photonics on application to communications.

Transversal Skills
- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.

- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.

FÍSICA APLICADA A LAS TELECOMUNICACIONES – APPLIED PHYSICS FOR TELECOMMUNICATIONS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	8º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

- Systems Mechanics.
- Oscillations and Waves.
- Acoustics.
- Electro-acoustics.

GENERAL AND SPECIFIC SKILLS

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.
- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.

- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.
- O7 - To know in the Physics field: Systems Mechanics; Oscillations and Waves; Acoustics; and Electro-acoustics.

COMPLEMENTOS DE ANÁLISIS MATEMÁTICO – ADVANCED CALCULUS

ACADEMIC YEAR	SEMESTER	CREDITS
4º	8º	6

BRIEF DESCRIPTION OF CONTENTS (ACCORDING TO THE DEGREE VERIFICATION REPORT)

The development of the subject is quite autonomous. The necessary basic knowledge is studied in the subjects of Mathematical Analysis and Linear Algebra and Geometry in the first academic year of the bachelor's degree.

GENERAL AND SPECIFIC SKILLS

Specific Skills

- B1 - Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculation; differential equations and partial derivatives; numerical methods; numerical algorithm; statistics and optimization.
- B8 – To know and use Fourier analysis and vector analysis.

Transversal Skills

- G1 - Analytical and synthesis ability: Find, analyse, criticise (critical thinking), relate, structure and synthesise information from several sources, as well as integrate ideas and knowledge.
- G2 - Ability for organization and planning as well as information management ability.
- G3 - Oral and written communication skills in the academic and professional field with special emphasis, in the writing of technical documentation.
- G4 - Ability to solve problems.
- G5 - Ability to make decisions based on objective criteria (available datum a such as experimental, scientific or of simulation one) as well as ability to argue and logically justify such decisions, knowing how to accept other points of view.
- G6 - Ability to use and apply ICT in the academic and professional field.
- G7 - Ability to communicate in a foreign language, particularly in English.
- G8 - Ability for teamworking.

- G9 - Ability for autonomous learning as well as initiative and entrepreneurial spirit.
- G10 - Motivation for quality and continuous improvement, acting with rigor, responsibility and professional ethics.
- G11 - Ability for self-adapting to technologies and future environments by updating professional skills.
- G12 - Ability to innovate and produce new ideas.
- G13 - Awareness towards environmental issues.
- G14 - Respect for fundamental rights and equality between men and women.
- G15 - Ability to project knowledge, skills and abilities acquired to promote a society based on the values of freedom, justice, equality and pluralism.