

## Course guide

# 300035 - IOT-S - Telecommunications Infrastructure and Operation

Last modified: 06/06/2024

**Unit in charge:** Castelldefels School of Telecommunications and Aerospace Engineering  
**Teaching unit:** 739 - TSC - Department of Signal Theory and Communications.  
732 - OE - Department of Management.

**Degree:** BACHELOR'S DEGREE IN TELECOMMUNICATIONS SYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).

**Academic year:** 2024    **ECTS Credits:** 6.0    **Languages:** Catalan

### LECTURER

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**Coordinating lecturer:** Definit a la infoweb de l'assignatura.

**Others:** Definit a la infoweb de l'assignatura.

### REQUIREMENTS

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Have studied the subjects of:

- Optical Communications
- Engineering of RF

Been studying or have studied

- Audiovisual Communications

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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#### Specific:

1. CE 11 TELECOM. Capacidad de concebir, desplegar, organizar y gestionar redes, sistemas, servicios e infraestructuras de telecomunicación, en contextos residenciales (hogar, ciudad y comunidades digitales), empresariales o institucionales responsabilizándose de su puesta en marcha y mejora continua, así como conocer su impacto económico y social. (CIN/352/2009, BOE 20.2.2009.)
2. CE 20 TELECOM. Conocimiento de la normativa y la regulación de las telecomunicaciones en los ámbitos nacional, europeo e internacional.(CIN/352/2009, BOE 20.2.2009.)
3. CE 8 TELECOM. Capacidad para utilizar herramientas informáticas de búsqueda de recursos bibliográficos o de información relacionada con las telecomunicaciones y la electrónica.(CIN/352/2009, BOE 20.2.2009.)

#### Generical:

7. PROJECT MANAGEMENT - Level 1: To know project management tools carrying out the different phases of the project established by the professor
8. PROJECT MANAGEMENT - Level 2: Define the objectives of a well-defined, narrow scope, and plan development, identifying resources, tasks, shared responsibilities and integration. Use appropriate tools to support project management.
9. PROJECT MANAGEMENT - Level 3: Define the objectives of an extensive project and open, multidisciplinary. Schedule tasks and resources, track and integration of the parties. To evaluate the intermediate and final results, restating the objectives if necessary.

**Transversal:**

4. ENTREPRENEURSHIP AND INNOVATION - Level 1. Showing enterprise, acquiring basic knowledge about organizations and becoming familiar with the tools and techniques for generating ideas and managing organizations that make it possible to solve known problems and create opportunities.
5. ENTREPRENEURSHIP AND INNOVATION - Level 2. Taking initiatives that give rise to opportunities and to new products and solutions, doing so with a vision of process implementation and market understanding, and involving others in projects that have to be carried out.
6. ENTREPRENEURSHIP AND INNOVATION - Level 3. Using knowledge and strategic skills to set up and manage projects. Applying systemic solutions to complex problems. Devising and managing innovation in organizations.
10. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 3. Taking social, economic and environmental factors into account in the application of solutions. Undertaking projects that tie in with human development and sustainability.
11. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.
12. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.
13. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

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**TEACHING METHODOLOGY**

This subject aims that the student realise an important part of his learning process by means of an autonomous and collaborative approach, and making use of the project based learning methodology.

In the first five weeks of the course, in the sessions of theory will go presenting the basic concepts of technical rules, regulations and economic management of projects and processes, which will work in the problem sessions. At the end of these sessions, the students in groups of two, will have to present one work of regulations and one of economic management of projects.

From the sixth week, the teachers of the subject will assign to each group of four or five students, a project of infrastructure and/or operation of services of telecommunication, which will have to develop and deliver at the end of the semester. In the problem sessions, each member of the group will have to expose to all the class group the results of the work that has realised, and the rest of students will ask him questions; the teacher will moderate the session and will go clearing the doubts and/or the errors that commit .

In these weeks will realise laboratory practices in concrete aspects of the common Infrastructures of Telecommunication (ICT) in houses.

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**LEARNING OBJECTIVES OF THE SUBJECT**

In finishing the subject of Infrastructures and Operation of Telecommunications, the student has the following capabilities:

- Knows and uses applications to develop the management of network, services and infrastructures of telecommunications.
- Is able to deploy, organise and manage networks, systems, services and infrastructures of telecommunications.
- Knows and applies the valid and normative regulation, state and autonomic, European and international.
- Manages Projects and realises management of operations and analyses of processes.
- Uses knowledge or strategic skills for the creation and management of innovative products and of companies: marketing, finances, accountancy, human resources, etc.
- Considers the social dimensions, economic and environmental in applying solutions carrying out projects of engineering on the ICT areas, coherent with the human development and the sustainability.
- Defines the aims of an extensive and open project, of multidisciplinary character.
- Schedules tasks and necessary resources, realises the follow-up and the integration of the parts. Analyzes the intermediate and finals results, modifying the aims if it was necessary.

## STUDY LOAD

Type	Hours	Percentage
Self study	84,0	56.00
Hours small group	19,5	13.00
Hours large group	26,0	17.33
Guided activities	1,0	0.67
Hours medium group	19,5	13.00

**Total learning time:** 150 h

## CONTENTS

### 1. Technnical regulations and telecommunications policies

#### Description:

Competent and regulatory public bodies in matter of telecommunications: international, European, state, autonomic and local. Organization, structure and functions.

Legislation and current technical regulation applicable in matter of infrastructures and services of telecommunication.

#### Specific objectives:

At the end of this part, the student has to be capable of:

- Locate, identify, analyse and apply the valid legal disposals and the applicable technical rules to the field of the telecommunications.
- Know the functions and identify the regulatory and competent organisms in matter of telecommunications of international, European, state, autonomic and local levels.

#### Related activities:

Activity 1: Workshop of activities of search of technical and legislative rules.

**Full-or-part-time:** 26h 06m

Theory classes: 7h 30m

Practical classes: 4h

Self study : 14h 36m

## 2. Design and economic project management

### Description:

- Project management: PERT and CPM.
- Project management tools.
- Process analysis. Process based management.
- Business plan.
- Cost calculations and management. Cost systems.
- Budget control and planning.
- Quality assurance.
- Professional skills and task assignment.

### Specific objectives:

At the end of this matter, the student has to be capable of:

- Realise the design and the planning of projects of infrastructure and/or operation of systems of telecommunication.
- Apply systems and procedures of quality control

### Related activities:

Activity 2: Preparation of a PERT or CPM of a project of infrastructure of telecommunication.

**Full-or-part-time:** 26h 06m

Theory classes: 7h 30m

Practical classes: 4h

Self study : 14h 36m

## 3. The project of telecommunication: Technological aspects

### Description:

Projects of infrastructure: common Infrastructures of telecommunication at the house buildings (ICT); Radio relays; broadcast radio stations; mobile telephony Base stations; Projects of infrastructure in urban surroundings and at industrial areas, etc.

### Specific objectives:

At the end of this matter, the student has to be capable of:

- Know the specific technical rules, and the obliged technical requirements for the design, installation and set up of infrastructures and services of telecommunication.

### Related activities:

Activity 3: Presentation and defence of the project: technical part

Activity 4: Laboratory activity

**Full-or-part-time:** 45h 30m

Theory classes: 12h

Laboratory classes: 8h

Self study : 25h 30m

#### 4. The telecommunication project: Economical aspects

**Description:**

- Cost calculation of infrastructure, deployment, installation, and execution of the infrastructure of telecommunication projects.
- Business plan preparation, and forecast of the account of derivative results of the exploitation of infrastructures and services of telecommunication.

**Specific objectives:**

In finishing this topic, the student has to be able of:

- Elaborate the business plan, and do the calculations of the costs and revenue of exploitation of the infrastructures and services of telecommunication.

**Related activities:**

Activity 5: Presentation and defence of the project: economic and business part

**Full-or-part-time:** 45h 30m

Theory classes: 12h

Practical classes: 8h

Self study : 25h 30m

## ACTIVITIES

#### ACTIVITY 1: WORKSHOP OF ACTIVITIES OF SEARCH OF TECHNICAL AND LEGISLATIVE RULES.

**Description:**

This directed activity will be done by means of the research of technical and legislative documents in the available databases existing on the network of the Library, and that it will realise in groups of four or five students. The work will consist in the selection of the technical and legislative documentation which applies to the infrastructures of telecommunication.

**Specific objectives:**

Learn to use the following databases: WestLaw, UIT, ETSI, ERO, CMT, BOE, DOGC, etc.

**Material:**

The support that need the student will be given him by the teacher along the session.

**Delivery:**

Exercise of selection of technical and legislative rule of interest for the realisation of projects of infrastructures of telecommunication.

**Full-or-part-time:** 6h

Practical classes: 2h

Self study: 4h

## ACTIVITY 2: PREPARATION OF A PERT OR CPM OF A PROJECT OF INFRASTRUCTURE OF TELECOMMUNICATION.

**Description:**

This activity will consist in the preparation of a PERT of a project of infrastructure of telecommunication, that will realise in groups of 4 or 5 students.

**Specific objectives:**

Learn to schedule the execution of projects

**Material:**

The support that need the student will be given him by the teacher along the session.

**Delivery:**

Exercise of preparation of a PERT or corresponding CPM to a project of infrastructure and/or service of telecommunication.

**Full-or-part-time:** 6h

Practical classes: 2h

Self study: 4h

## ACTIVITY 3: PRESENTATION AND DEFENCE OF THE PROJECT: TECHNICAL PART

**Description:**

This directed activity will carry out in groups of 4 or 5 students and will consist in the presentation of a project of infrastructure and/or service of telecommunication that will propose the teacher, which will have the technical slope that will be able to complement with the activities of laboratory (activity 4), and that will have to go accompanied of the economic part and of management of project (Activity 5). Of the project elaborated will do a presentation and public defence, separately of the economic part and of the technical part.

**Specific objectives:**

Learn to elaborate projects of infrastructure and operation of services of telecommunication.

**Material:**

Computer programmes, simulation software, etc.

**Delivery:**

Memory on the project realised.

**Full-or-part-time:** 2h 30m

Theory classes: 1h 30m

Practical classes: 1h

#### ACTIVITY 4: LABORATORY ACTIVITY

**Description:**

Organised in 4 sessions of 2 hours. They will form groups of 2 to realise the practical.

The activities of laboratory will be related with the common infrastructures of telecommunication in buildings, antenna pointing, installations of optical fibre, etc.

**Specific objectives:**

In finishing the practical the student will have to be able of:

- Comprise the operation of the field measurement instrument, do measures and antenna pointing, etc.

**Material:**

Lab practices materials

**Delivery:**

The assistance in all lab activities is compulsory. They will evaluate the competence skills of laboratory of the student in function of:

- Assistance and realisation of the practical activities
- Previous studies to realise of individual way
- Memory or article of practical to realise in pairs

**Full-or-part-time:** 16h

Laboratory classes: 8h

Self study: 8h

#### ACTIVITY 5: PRESENTATION AND DEFENCE OF THE PROJECT: ECONOMIC AND BUSINESS PART

**Description:**

This activity directed will carry out in groups of 4 or 5 students and will consist in the presentation of a project of infrastructure and/or service of telecommunication that will propose the teacher, which will have the technical slope (Activity 3), that will be able to complement with the activities of laboratory (activity 4), and that will have to go accompanied of the economic part and of management of project. Of the project elaborated will do a presentation and public defence, separately of the economic part and of the technical part

**Specific objectives:**

Learn to elaborate projects of infrastructure and operation of services of telecommunication.

**Material:**

Simulation programmes and software, technical documents, etc.

**Delivery:**

Memory on the project realised.

**Full-or-part-time:** 2h 30m

Theory classes: 1h 30m

Practical classes: 1h

### GRADING SYSTEM

- 50 % Examinations. An examination of middle semester (25%) and an examination of final of semester (25%).
- 10 % Laboratory practices and other deliverable
- 40 % Project



## EXAMINATION RULES.

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In the examination of middle semester, the students will have to answer individually questions related with the theoretical concepts and or practical exposed to class on economic aspects, technical and normative.

The assistance to all the classes, and in special to the ones of laboratory and of project, is compulsory.

In the examination of final of semester, each student will have to answer individually questions related with the project that has realised in group

## BIBLIOGRAPHY

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### Basic:

- "LEY 32/2003, de 3 de noviembre, General de Telecomunicaciones.". BOE.
- " Reial Decret 346/2011, d'11 de març pel que s'aprova el Reglament Infraestructures comunes de telecomunicació (ICT)". BOE.
- " DECRET LEGISLATIU 1/2005, de 26 de juliol, pel qual s'aprova el Text refós de la Llei d'urbanisme.". DOGC.
- "Ley Economía Sostenible". BOE.
- "Llei d'Obra Pública (Llei 3/2007, del 4 de juliol, DOGC 4920, 06/07/2007)". DOGC.
- Stallings, William. Comunicaciones y redes de computadores [on line]. 7ª ed. Madrid [etc.]: Pearson Educación, 2004 [Consultation: 26/07/2022]. Available on : [https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\\_BooksVis?cod\\_primaria=1000187&codigo\\_libro=1245](https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1245). ISBN 8420541109.
- Freeman, Roger L. Reference manual for telecommunications engineering. 2nd ed. New York, NY [etc.]: John Wiley and Sons, cop. 1994. ISBN 0471579602.

### Complementary:

- "¿Orden ITC/1644/2011, de 10 de junio, por la que se desarrolla el Reglamento ICT". BOE.
- "Orden ITC/99/2011, de 28 de enero, por la que se determina la fecha de ejecución de la reordenación de canales de televisión". BOE.
- "Norma UNE 133100-1:2002: Part 1: Canalitzacions subterrànies". AENOR.
- "Norma UNE 133100-2:2002: Part 2: Arquetes i càmeres de registre". AENOR.
- "Norma UNE 133100-3:2002: Part 3: Trams interurbans". AENOR.
- " Norma UNE 133100-4:2002: Part 4: Líneas aèries". AENOR.
- "Norma UNE 133100-5:2002: Part 5: Instal·lació en façanes". AENOR.

## RESOURCES

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### Other resources:

- International Telecommunicatios Union (ITU): [www.itu.ch](http://www.itu.ch)
- International Electrotechnical Comission (IEC): <http://www.iec.ch/>
- Institute of Electrical and Electronic Engineers (IEEE): [www.ieee.org](http://www.ieee.org)
- European Broadcast Union (EBU): [www.ebu.ch](http://www.ebu.ch)
- European Conference of Postal and Telecommunications Administrations (CEPT): <http://www.cept.org/>
- European Radiocommunications Office (ERO): <http://www.ero.dk/>
- International Radiation Protection Association (IRPA): <http://www.irpa.net/>
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) (CISPR): <http://www.icnirp.de/>
- Europe's Information Society (Comissió Europea): [http://ec.europa.eu/information\\_society/index\\_en.htm](http://ec.europa.eu/information_society/index_en.htm)
- European Telecommunications Standards Institute (ETSI): [www.etsi.org](http://www.etsi.org)
- Comité Européen de Normalisation Electrotechnique (CENELEC): [www.cenelec.org](http://www.cenelec.org)
- ISO: [www.iso.ch](http://www.iso.ch)
- American National Standards Institute: [www.ansi.org](http://www.ansi.org)
- Asociación Española de Normalización y Certificación (AENOR). [www.aenor.es](http://www.aenor.es)