

Course guide

230925 - IOT - Internet of Things

Last modified: 24/05/2024

Unit in charge: Barcelona School of Telecommunications Engineering
Teaching unit: 744 - ENTEL - Department of Network Engineering.

Degree: BACHELOR'S DEGREE IN DATA SCIENCE AND ENGINEERING (Syllabus 2017). (Optional subject).
BACHELOR'S DEGREE IN ELECTRONIC ENGINEERING AND TELECOMMUNICATION (Syllabus 2018). (Compulsory subject).

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

LECTURER

Coordinating lecturer: ISABEL VICTORIA MARTIN FAUS

Others: Segon quadrimestre:
ISABEL VICTORIA MARTIN FAUS - 11, 12, 13

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CE12. (ENG) GREELEC: Coneixement i utilització dels fonaments de propagació i transmissió d'ones electromagnètiques i acústiques, i els seus corresponents dispositius emissors i receptors. (Mòdul comú a la branca de telecomunicació).

CE17. (ENG) GREELEC: Coneixement i utilització dels conceptes d'arquitectura de xarxa, protocols i interfícies de comunicacions. (Mòdul comú a la branca de telecomunicació).

CE18. (ENG) GREELEC: Capacitat de diferenciar els conceptes de xarxes d'accés i transport, xarxes de commutació de circuits i de paquets, xarxes fixes i mòbils, així com els sistemes i aplicacions de xarxa distribuïts, serveis de veu, àudio i serveis intercatius i multimèdia. (Mòdul comú a la branca de telecomunicació).

CE19. (ENG) GREELEC: Coneixement dels mètodes d'interconnexió de xarxes i encaminament, així com els fonaments de la planificació, dimensionat de xarxes en funció de paràmetres de trànsit. (Mòdul comú a la branca de telecomunicació).

Generical:

CG1. (ENG) Capacitat per redactar, desenvolupar i signar projectes en l'àmbit de l'enginyeria de telecomunicació que tinguin per objecte la concepció i el desenvolupament o l'explotació de xarxes, serveis i aplicacions de telecomunicació i electrònica.

Transversal:

CT7. (ENG) GREELEC: TERCERA LLENGUA: Conèixer una tercera llengua, preferentment l'anglès, amb un nivell adequat oral i escrit i en consonància amb les necessitats que obtindran els titulats i titulades.

TEACHING METHODOLOGY

Lectures
Application classes
Laboratory classes
Laboratory sessions
Individual work (not presential)
Group work (not presential)
Short-answer tests (Control)
Short-answer tests (Test)
Extended-response tests (Final Exam)

LEARNING OBJECTIVES OF THE SUBJECT

The objective of this subject is that students of electronic engineering acquire the basic concepts that allow to connect electronic devices, in a efficient and secure way, through different communication networks, especially under the paradigm of Internet of Things (IoT). For this, during the first part of the course, the fundamental concepts of transmission systems, local area networks and IP networks are introduced, combining theoretical classes with exercises and laboratory practices. In the second part of the course, more specific IoT technologies and the most commonly used application protocols are addressed. In this way, students will be able to write applications to control devices remotely, and will understand the communications infrastructures they use.

STUDY LOAD

Type	Hours	Percentage
Hours large group	39,0	26.00
Hours small group	26,0	17.33
Self study	85,0	56.67

Total learning time: 150 h

CONTENTS

Lesson 1. Introduction to telematic networks

Description:

Deterministic and statistic multiplexing.
Network classification by topology, coverage and switching technology.
Protocol architectures.

Full-or-part-time: 6h

Theory classes: 4h
Self study : 2h

Tema 2. Data link.

Description:

Data link control: Framing, flow and error control.
Medium access control: Contention and contentionless

Full-or-part-time: 28h

Theory classes: 8h
Laboratory classes: 4h
Self study : 16h

Lesson 3. Local area networks.

Description:

Wired networks: Ethernet (IEEE 802.3).
Wireless networks: WiFi (IEEE 802.11).

Full-or-part-time: 25h

Theory classes: 7h
Laboratory classes: 6h
Self study : 12h

Lesson 4. TCP / IP protocol architecture

Description:

Basic network protocols (IP, ARP, ICMP).

Transport protocols (UDP, TCP).

Examples of application protocols.

Intranets and NAT.

Full-or-part-time: 39h

Theory classes: 8h

Laboratory classes: 6h

Self study : 25h

Lesson 5. IoT technologies and protocols.

Description:

Low-rate wireless personal area networks (IEEE 802.15.4).

Low-power wide-area networks (LoRa, Sigfox, NB-IoT).

Application protocols (CoAP, MQTT).

Full-or-part-time: 52h

Theory classes: 12h

Laboratory classes: 10h

Self study : 30h

GRADING SYSTEM

This course is continuously evaluated as follows:

- Theory (60% score of the course): two mid-term controls, each one has a weight of 50% of the theory.
- Laboratory (40% score of the course): short term tests (85% laboratory) and practical reports (15% laboratory).
- 100% attendance at the laboratory class must be in order to pass the course, except cases justified in writing.

In case of not passing the course in the ordinary call, you can go to the re-evaluation exam.

In the revaluation exam, the theory part (60%) of the entire subject program is assessed.

The laboratory (40%) is not reassessed and, therefore, the mark obtained in the ordinary call is kept.

BIBLIOGRAPHY

Basic:

- Forouzan, B. A. Data communications and networking with TCP/IP protocol suite. 6th ed. New York: McGraw-Hill, 2022. ISBN 9781260597820.

Complementary:

- LoRa Alliance Technical Committee. LoRaWAN Specification [on line]. 1.0.3. 2018 [Consultation: 10/07/2019]. Available on: <https://lora-alliance.org/resource-hub/lorawanr-specification-v103>.