Course guide
270536 - IT - Internet of Things

Last modified: 03/02/2025

Unit in charge:	Barcelona School of Informatics
Teaching unit:	701 - DAC - Department of Computer Architecture.

Degree: MASTER'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2012). (Optional subject).

Academic year: 2024   **ECTS Credits:** 3.0   **Languages:** Spanish

LECTURER

Coordinating lecturer: JORGE GARCÍA VIDAL

Others: Segon quadrimestre:
JORGE GARCÍA VIDAL - 10

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .

Generical:
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.

Transversal:
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

TEACHING METHODOLOGY

Theory classes.

LEARNING OBJECTIVES OF THE SUBJECT

1.To understand the Internet of Things from a technological point of view, identifying its limitations and opportunities
2.To learn about the applications of the Internet of Things in the field of Smartcities and precision agriculture in order to solve social problems such as sustainability, energy consumption, greenhouse gas emissions, population ageing, etc.

STUDY LOAD

Type	Hours	Percentage
Self study	48,0	64.00
Hours large group	27,0	36.00

Total learning time: 75 h

CONTENTS

Introduction

Description:
IoT concept, main technologies and applications. Wireless communications

Low Power communication technologies

Description:
802.15, BlueTooth, RFID, NFC, LoraWAN

Standards and communication protocols

Description:
6loWPAN, RPL, CoAP, Routing en WSN

Data Analysis. Security and Privacy.

Description:
Middleware, edge and cloud systems. Algorithms. Privacy i security

Sensors and devices

Description:
Sensors, Low power devices. Operating systems

Digital Twins

Description:
Application examples in Digital Twins for industry, health, environment, home, etc

ACTIVITIES

T1: Introduction

Description:
Course overview. Main concepts related with IoT

Specific objectives:
1

Related competencies :
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 3h
Theory classes: 3h

T2: Low power communication technologies

Description:
Low power communication systems. Standards: 802.15.4, Bluetooth, RFID, NFC, LoraWAN.

Specific objectives:
1

Related competencies :
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 3h
Theory classes: 3h

T3: Standards and communication protocols

Description:
Main standards and communication protocols: 6LoWPAN, RPL, CoAP. MQTT, Routing in WSN.

Specific objectives:
1

Related competencies :
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 9h
Self study: 6h
Theory classes: 3h

T4: Sensors and devices

Description:
Sensors. Low power devices

Specific objectives:
1, 2

Related competencies :
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 9h
Self study: 6h
Theory classes: 3h

T5: Data analysis and management. Security and privacy.

Description:
Middleware. Cloud platforms. Inertial sensors data processing. Regression techniques. Security and privacy.

Specific objectives:
1, 2

Related competencies :
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 12h
Self study: 6h
Theory classes: 6h

T6: Digital Twins

Description:
Applicacions to Digital Twins in industry, health, environment, precission agriculture, etc

Specific objectives:
2

Related competencies :
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 12h
Self study: 6h
Theory classes: 6h

Project presentation

Description:
Students will develop a research project in a system related with IoT

Specific objectives:
1, 2

Related competencies :
CTE2. Capability to understand and know how to apply the operation and organization of Internet, technologies and protocols for next generation networks, component models, middleware and services.
CTE8. Capability to design and develop systems, applications and services in embedded and ubiquitous systems .
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CG8. Capability to apply the acquired knowledge and to solve problems in new or unfamiliar environments inside broad and multidisciplinary contexts, being able to integrate this knowledge.
CTR2. SUSTAINABILITY AND SOCIAL COMMITMENT : Capability to know and understand the complexity of the typical economic and social phenomena of the welfare society. Capacity for being able to analyze and assess the social and environmental impact.

Full-or-part-time: 14h
Self study: 12h
Theory classes: 2h

Exam

Full-or-part-time: 13h
Self study: 12h
Guided activities: 1h

GRADING SYSTEM

Ef: Final exam
P: Project

Nota= 0,75*Ef+0,25*P

BIBLIOGRAPHY

Basic:
- Dunkels, A.; Vasseur, J.P. IP for Smart Objects. IPSO Alliance, 2008.
- Vasseur, Jp [et al.]. A survey of several low power Link layers for IP Smart Objects. IPSO alliance, 2010.
- Palattella, Maria Rita ... [et al.]. "Standardized Protocol Stack for the Internet of (Important) Things". IEEE COMMUNICATIONS SURVEYS & TUTORIALS, [on line]. Volume: 15, Issue: 3, Third Quarter 2013, pg. 1389 - 1406 [Consultation: 08/05/2023]. Available on: https://ieeexplore-ieee-org.recursos.biblioteca.upc.edu/abstract/document/6380493.