INSTITUTO POLITÉCNICO DE BRAGANÇA

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| Course Unit | Internet of Things | | | Field of study | Computer Engineering | | |
| Bachelor in | Informatics Engineering | | | School | School of Technology and Management | | |
| Academic Year | 2021/2022 | Year of study | 3 | Level | 1-3 | ECTS credits | 6.0 |
| Type | Semestral | Semester | 2 | Code | 9119-706-3202-00-21 | | |

| Workload (hours) | 162 | Contact hours | T - | TP - | PL - | TC - | S - | E - | OT - | O - |
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T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s): Paulo Jorge Pinto Leitão, Andre Chaves Mendes, Lucas Hiroaki Sakurada, Luis Fernando Piardi

## Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Know the importance and role of Internet of Things tecnologies in the context of the digital transformation.
2. Know communication technologies for the IoT.
3. Use communication protocols for IoT.
4. Know and develop applications using IoT platforms (e. g. , Node-RED and ThingsBoard).
5. Know the problems associated to the security of IoT devices and platforms, and mechanisms to mitigate them.
6. Understand and implement simple IoT integration scenarios, using external services (e. g. , RESTful APIs).
7. Develop small IoT projects to solve real problems.

## Prerequisites

Before the course unit the learner is expected to be able to:
Have basic knowledge of informatics and programming.

## Course contents

Basic concepts and applications of the Internet of Things (IoT). Communication technologies and protocols for IoT. Platforms for the development of IoT applications. Security in IoT. Ecosystems and integration of devices in IoT. Development of simple IoT applications.

## Course contents (extended version)

1. Introduction to Internet of Things (IoT).
   - Concepts, definitions, history, applications and challenges in IoT.
   - Machine-to-Machine (M2M) communication.
2. Interface with the physical world.
3. Hardware and software architectures for IoT.
4. Computational platforms for IoT.
5. Wireless communication technologies for IoT (WiFi, WiMax, ZibBee, LoRa, BLE).
6. Communication protocols for IoT (CoAP, MQTT, RPL, 6LoWPAN, HTTP).
7. Data models. Data aggregation, processing and visualization.
8. Security in Internet of Things.
9. Ecosystems and device integration in IoT. REST interface.
10. Development of simple applications representative of the use of IoT.

## Recommended reading

1. Artigos técnicos diversos sobre Internet das Coisas.
2. Vídeos diversos sobre Internet das Coisas e suas aplicações.
3. "Designing the Internet of Things", Adrian McEwen and Hakim Cassimally, Wiley, 2014.
4. "The Internet of Things: Key Applications and Protocols, 2nd Edition", Olivier Hersent, David Boswarthick and Omar Elloumi, Wiley, 2012.
5. "Internet das Coisas - Introdução Prática", Pedro Coelho, FCA, 2017.

## Teaching and learning methods

Theoretical classes: Exposition of the proposed topics. Watching of videos, discussion and presentation by students of previously defined topics. Practical classes: resolution of exercises and practical works that help to consolidate the learning results. Non-face-to-face hours: study of presented topics, realization of application exercises and practical works.

## Assessment methods

- Alternative 1 - (Regular, Student Worker) (Final, Supplementary, Special)
   - Final Written Exam - 50% (The approval requires the achievement of a minimum score of 35%.)
   - Practical Work - 50% (Includes the participation in the classes and the discussion of developed works.)

## Language of instruction

Portuguese, with additional English support for foreign students.

## Electronic validation

| Paulo Jorge Pinto Leitão | José Luís Sousa de Magalhaes Lima | Luísa Maria Garcia Jorge | Paulo Alexandre Vara Alves |
|---|---|---|---|
| 19-02-2022 | 02-03-2022 | 06-03-2022 | 25-03-2022 |

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