



UNIVERSIDAD  
**COMPLUTENSE**  
MADRID

# IoT Node Architecture

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# Lecturers

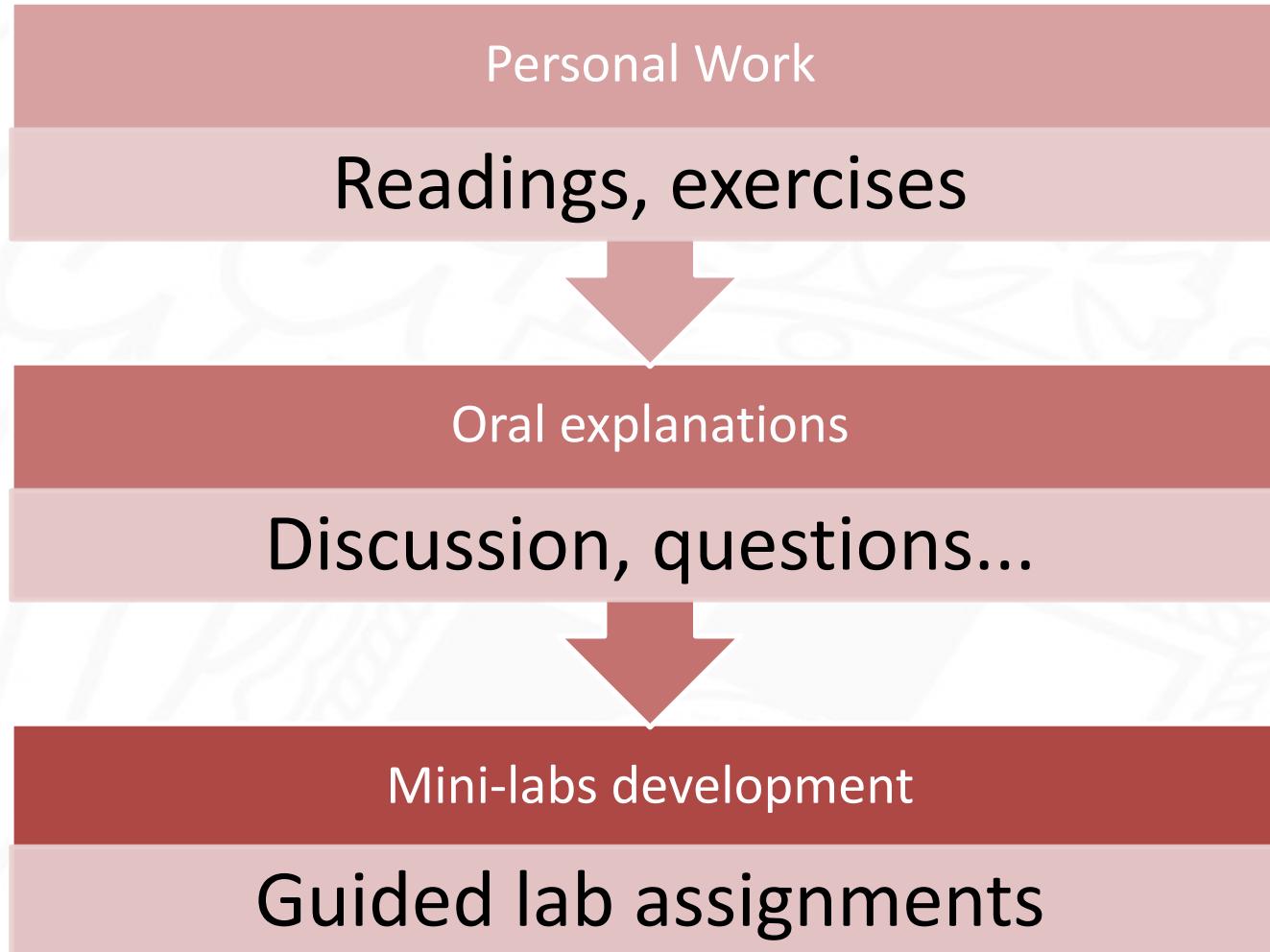
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- Contact us with any question

# Teaching goals

1. Get a global view of IoT applications lifecycle
2. Get to know the main components of an IoT device
3. Learn to use cross-development and debugging tools
4. Understand the specificities of Real Time Operating Systems (RTOS)
5. Use the most relevant serial communication interfaces
6. Use a variety of sensors
7. Understand the problems of data acquisition
8. Learn the main problems concerning energy consumption and supply
9. Firmware update basics

# Methodology

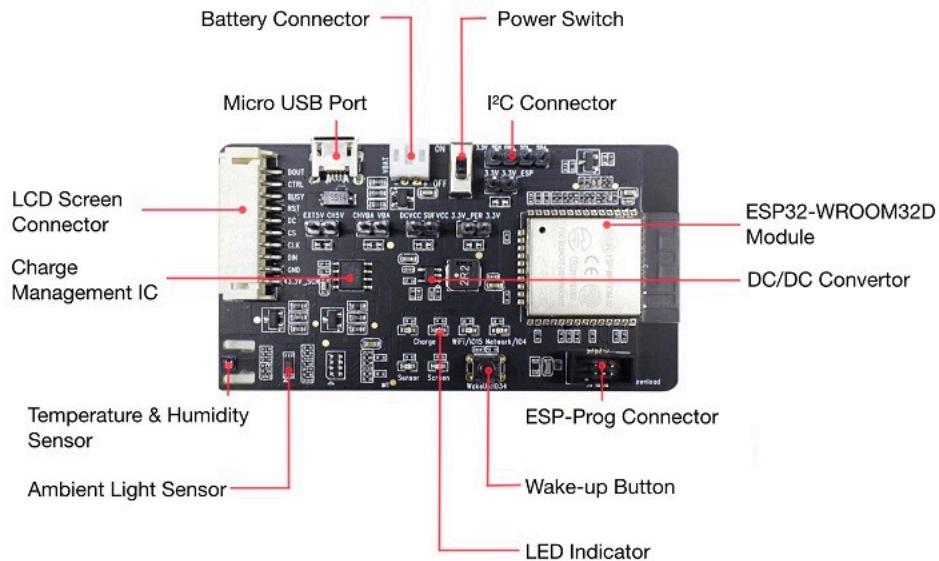
## □ Practice oriented



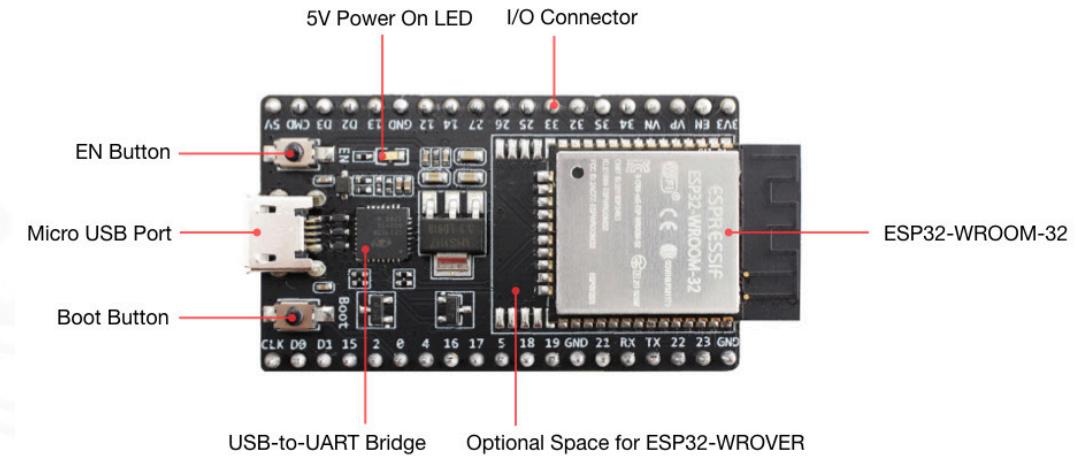
# Part 1. IoT Introduction

## CONTENTS

1. IoT ecosystem
2. IoT node lifecycle
3. Microcontrollers, System-on-chips (SoC), development boards



ESP32 – Meshkit Sense



ESP32 - DevKitC

# Part 2. Programming frameworks. RTOS

## CONTENTS

1. Cross-compilation and debugging frameworks
2. Operating Systems
  - FreeRTOS (ESP-IDF)
3. File systems. Logging



By HikingArtist.com

# Part 3. Sensorization

## CONTENTS

1. Sensors
2. Simple devices: timers, GPIO, interruptions
3. Serial bus connections: I2C, SPI, UART
4. ADC / DAC basics
5. Periodic sampling and application structure
6. Energy consumption and device powering



# Bibliography

- McEwen, A. and Cassimally, H. (2014) *Designing the Internet of Things*, John Wiley & Sons, Ltd, Chichester, 1.
- Qusay F. Hassan (2018) *Internet of Things A to Z. Technologies and Applications*, IEEE Press
  - Specially Chapter 6
- S. Cirani et al. (2019) *Internet of Things. Architectures, Protocols and Standards* . Wiley & Sons Ltd.

# Evaluation

## □ Lab assignments.

- Every student must finish the programming projects before the specified deadline
- This will account for 40% of overall grade

## □ Personal *paper project*

- IoT project proposal
- Paper project, no development involved
- 30% of overall grade

## □ Personal development project.

- Every student must develop a personal project
- You must use the provided hardware, but can include new devices if you want
- The project must
  - Periodically read several I2C sensors
  - Log into flash relevant events
  - Only allow signed binaries to run
- 30% of overall grade

# QUESTIONS?

- Please ask when you need it. I would like it to be an **interactive** class