Smart Systems for Data Acquisition

Course Presentation

UniMORE - LM Digital Automation Engineering

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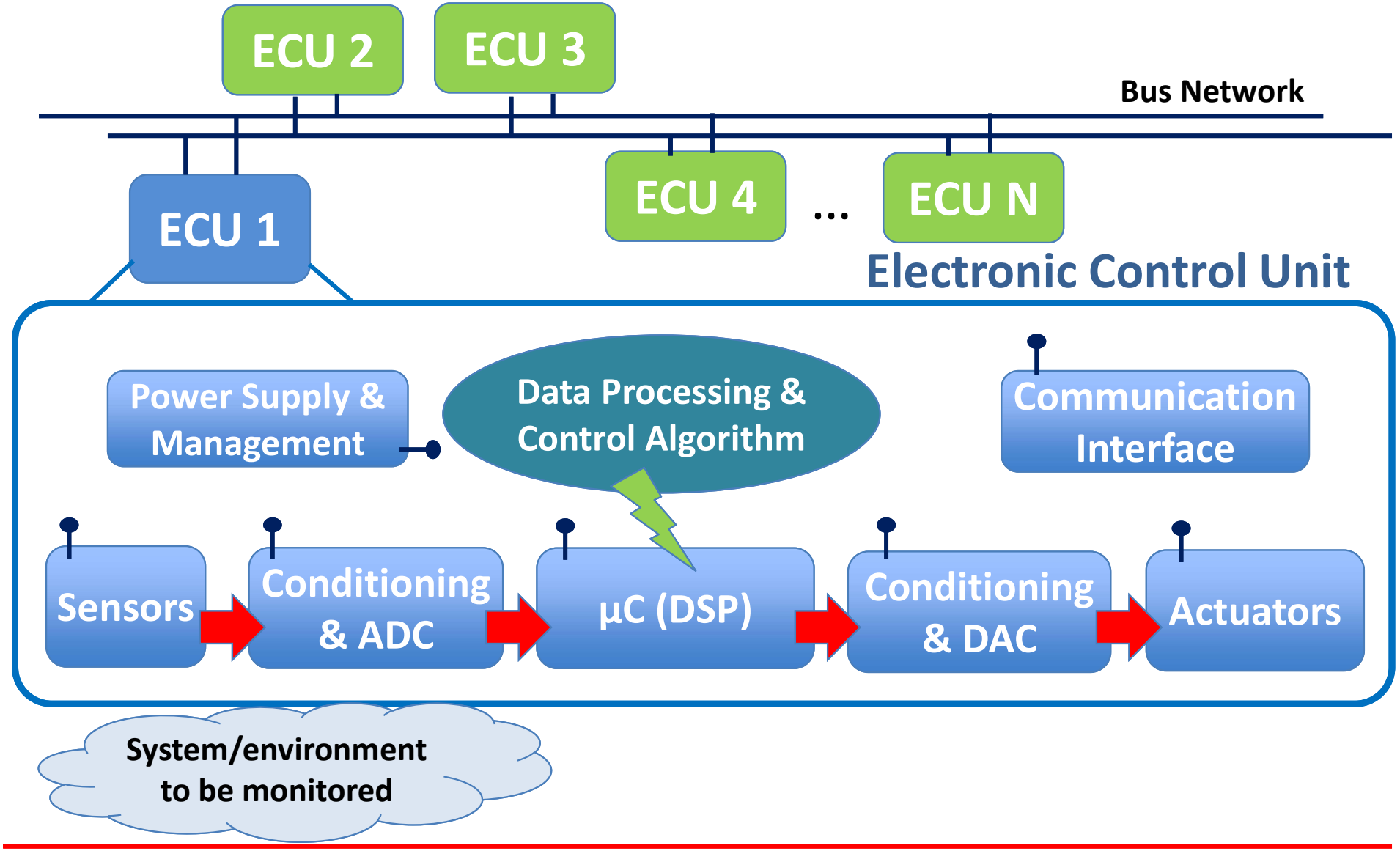
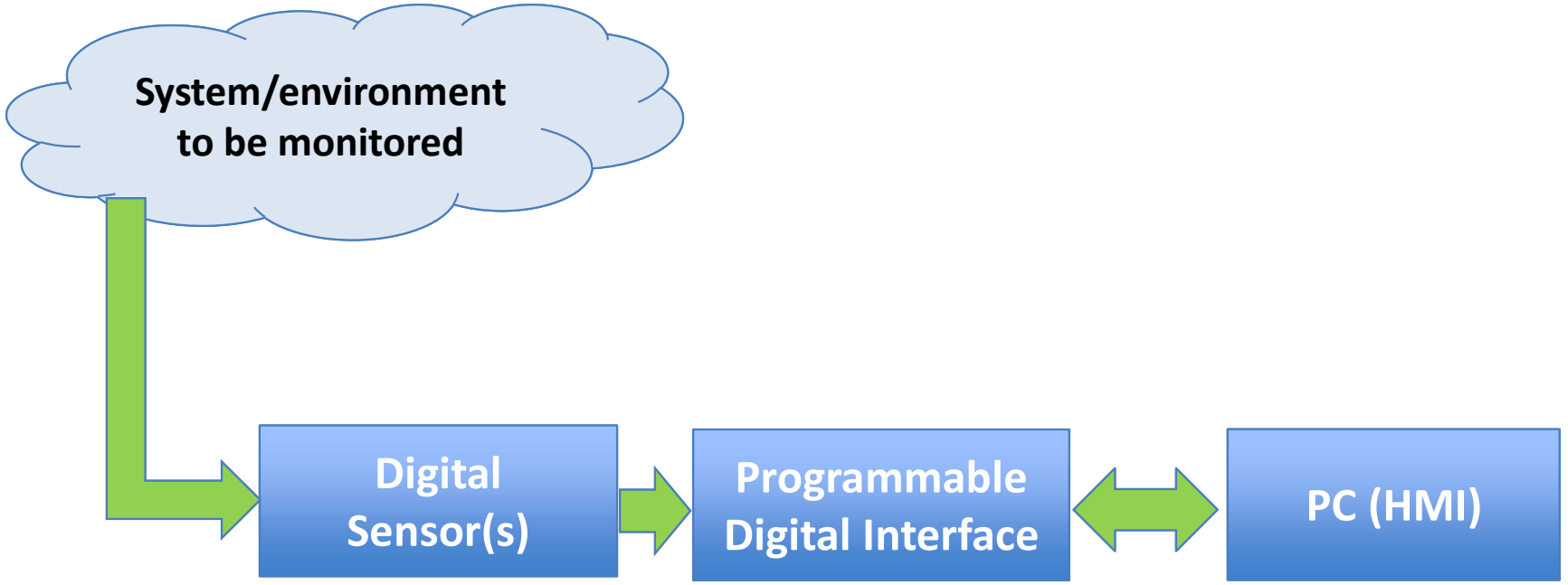
What is a Data Acquisition System?

GENERAL Scenario



What is a Data Acquisition System?

SIMPLIFIED Scenario



Goal & ToC

GOAL: ***developing specific skills in the electronic design of data acquisition systems for real industrial applications***

1. Sensors & Transducers: definitions, operation principles of the main sensors used in industrial applications, calibration
2. Analog-to-Digital converters (ADC): Fundamentals of A/D conversion, main topologies and operation principles
3. Sampling theorem and quantization On-Board and Board-to-Board communication protocols: UART, SPI, I2C, CAN
4. Discrete Fourier Transform
5. Finite impulse response (FIR) digital filters
6. Laboratory activities aiming to develop the exam project

Practical Information - 1

- **Prerequisites**
  - Circuit theory, Basic knowledge of programming
  - Attitude to develop multidisciplinary projects
- **Course teaching** consists of
  - lectures in the presence
  - laboratory activities
- **Teaching & Supporting Material**
  - slides, handouts, source codes, datasheets, etc… will be available on the Moodle's courses page
  - **Moodle is the only OFFICIAL REPOSITORY of the course**

Practical Information - 2

- Student Reception:
  - **by appointment** (via e-mail)
  - at the end of the lectures

- Each communication must be
  - **Sent ONLY by using your account @studenti.unimore.it**
  - **Addressed to both the teachers** with the only exception of technical requests on a specific topic of the program

The Exam

- **PART 1: Design and Implementation of a simple data acquisition system (0-30 points)**
  - Individual project proposed by the student inspired by a real application
  - The proposed system must use **at least one sensor with digital interface** (e.g. UART/USART, SPI, I2C)
  - The students must produce a **short report** containing the description of the system, the design choices taken and the description of the tests carried out to verify the proper operation of the prototype.
  - **Live Demo of the prototype on duty**
  - The project's grade will consider **completeness of the report, project files and live demo** to prove the proper operation of the prototype
- **PART2: Oral test (0-32 points)**
  - 4 questions about the course's contents
  - Each question will receive a score from 0 to 8 points
  - The typical duration is 30 minutes

Final Grade

- The overall grade is the **weighted average** of the grades obtained in the two PARTS
  - **PART 1- Project: 60%**
  - **PART 2- Oral exam: 40%**
- The final grade will be rounded to the nearest integer number
- **The exam is passed if overall grade ≥ 18/30**
- Honor if overall grade ≥ 30/30

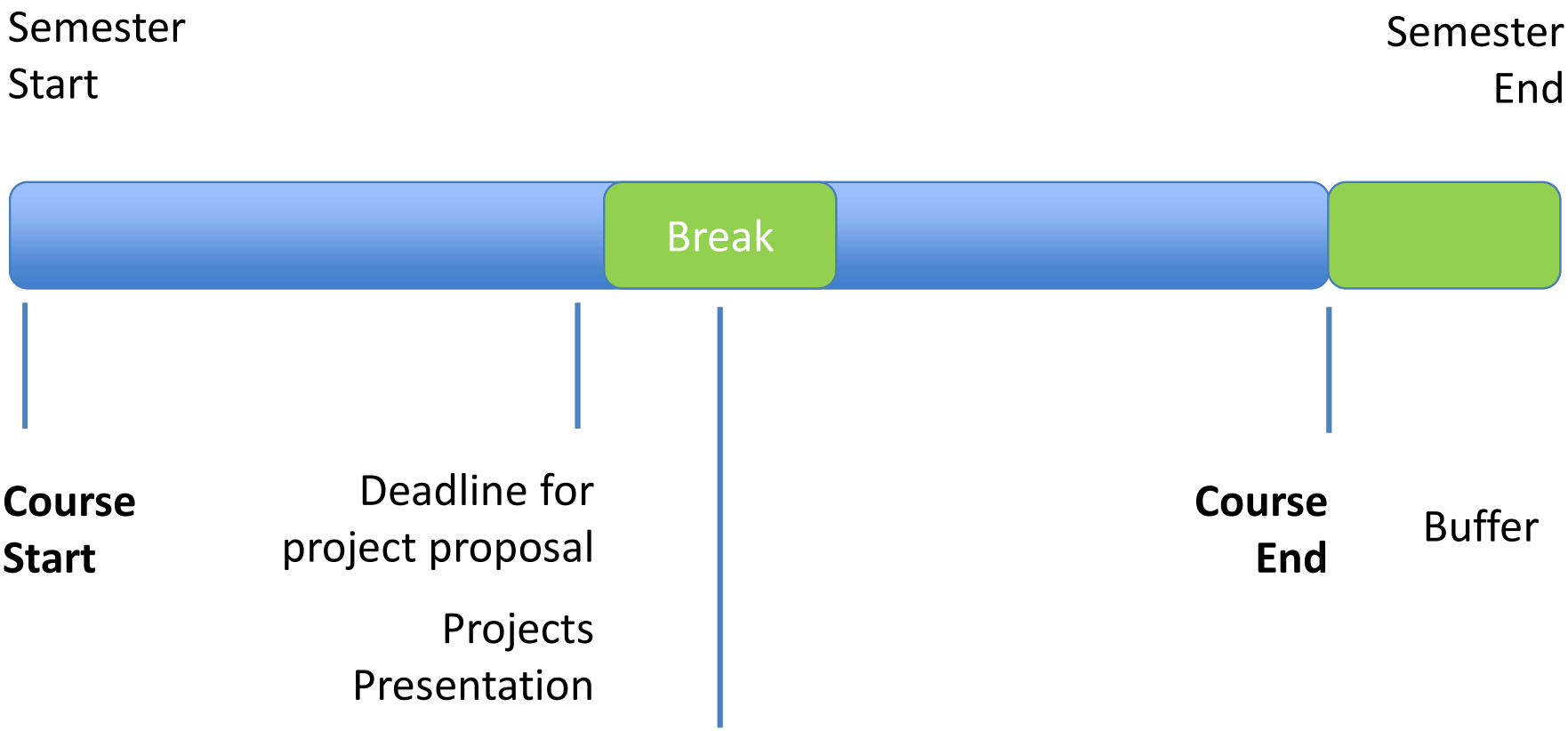
Practical Example

- Project: **27/30**
- Oral exam: **32/30**
- Final grade: **27*0.6 + 32*0.4 = 29.60 rounded to 30/30**

Exam Sessions

- Technical discussion, live demo and oral examination **will take place the same day**
- **Enrollment on www.esse3.unimore.it is MANDATORY and list closes ONE WEEK BEFORE the scheduled date**
- Report and all the project's files must be sent to both the lecturers **AT LEAST ONE WEEK BEFORE the chosen date**
- Exam sessions in the scheduled dates ONLY (communicated through the normal channels)
  - **WINTER (Jan – Feb): 3 dates** (scheduled as soon as possible)
  - **2nd SEMESTER BREAK: 1 date**
  - **SUMMER (Jun – Sept): 3 dates** (to be defined)
  - **1st SEMESTER BREAK 2024/25: 1 date** (to be defined)

Timeline


Semester
Start
Semester
End
Break
Course
Start
Deadline for
project proposal
Projects
Presentation
Course
End
Buffer
Suggestion:
Take the opportunity to start the
development of your projects!