# Course Syllabus for
# Smart and Sustainable Industry PhD
# (2023-24)

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| **Course title** | ***Embedded system design for Industry 4.0*** |
| **Scientific Discipline Sector** | ING-INF/01 |
| **Hours of instruction** | 20 hours |
| **CFU** | 2 CFU |
| **Semester** | First semester |
| **Goal** | The course aims to provide both a theoretical and practical introduction to embedded systems for IoT and Industry 4.0. After a brief introduction to embedded systems and a rundown of the systems currently available on the market, the flow of HW, FW and SW design will be illustrated. The second part is a laboratory and aims to prepare students for the final project. It will be shown how to create a project, how to manage peripherals and how to interface the board with low-cost sensors and actuators. |
| **Syllabus** | Theoretical part<br>1) Introduction to embedded systems - definitions, general characteristics, fields of application<br>2) Overview of platforms and systems on the market<br>3) Hardware, firmware and software design flow<br>4) Deepening: ARM microcontroller architecture (STM32L5 and Nordic BLE nRF52832). Raspberry Pi – architecture and peripheral<br>Practical laboratory part<br>5) Peripheral and protocol management (BLE, GPIO, UART, IIC, SPI, PWM)<br>6) Examples for low-cost sensor and actuator management |
| **Bibliography** | Slides provided during the lessons |
| **Examination method** | Final project |