Fakultät für Ingenieurwesen
Facoltà di Ingegneria
Faculty of Engineering

COURSE DESCRIPTION − ACADEMIC YEAR 2025/2026

Course title	**Embedded and software systems**
Course code	42806
Scientific sector	IINF-05/A
Degree	Master in Smart Technologies for Sports and Health (LM-32)
Semester	1
Year	2
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	24
Attendance	Preferrable. Non-attending students should contact the lecturer at the start of the course to agree on the modalities of the independent study
Prerequisites	
Course page	Teams, OLE

Specific educational objectives	The course belongs to the type "caratterizanti". Basic knowledge of the principles of real-time and embedded systems, as well as of mobile systems and their technical design processes and embedded system architectures, operating systems and scheduling techniques.

Lecturer	Prof. Fronza Illenia
Contact	Ilenia.Fronza@unibz.it
Scientific sector of lecturer	IINF-05/A Information Processing Systems
Teaching language	English
Office hours	After consultation and agreement with lecturers
Lecturing assistant (if any)	-
Contact LA	-
Office hours LA	-
List of topics	• Real-time and embedded system principles - hardware, system software, application software; • Embedded system design process - systems engineering processes; • Embedded systems architecture; • Hardware software co-design; • Embedded processors and micro-controllers; • Real-time operating systems and scheduling.
Teaching format	Frontal lectures, exercises; team and/or individual projects.

Learning outcomes	**Knowledge and understanding** • Knowledge and understanding of the fundamentals, development methods and most important programming techniques for embedded systems and robotic systems. **Applying knowledge and understanding**

- Analyzing the complexity of a software development problem and being able to implement it in an embedded software system;

Making judgments
- Ability to independently select documentation from various sources, including technical literature, digital library, technical and scientific journals, web portals, hardware or open-source software tools;
- Ability to plan and re-plan the work of a technical project and to complete it within specified deadlines and objectives;
- Ability to set work objectives that are realistic and compatible with available resources;
- Ability to pursue project objectives, resolve conflicts and make compromises without losing sight of costs, resources, time, knowledge or risks;
- Ability to work independently and autonomously in small and large projects and with structural responsibilities.

Communication skills
- Ability to present the contents of a scientific and technical report within a given timeframe, even to a non-expert audience;
- Ability to organize and write scientific and technical documentation for project descriptions;
- Ability to coordinate the work of a project team and to identify the activities required to achieve the project objectives;
- Ability to develop and present technical content in English;
- Ability to interact and collaborate with peers or professionals in the context of a project or research activity;
- Ability to communicate in interdisciplinary teams by classifying technical terms from other disciplines and presenting complex technical concepts in an understandable manner;
- Ability to carry out research activities and projects in a team;
- Ability to synthesize knowledge acquired through reading and studying scientific and technical documentation; preparation of reports and presentations.

Learning skills:
- Ability to independently expand on knowledge acquired during study by reading and understanding scientific and technical documentation in English;
- Ability to independently and continuously update oneself on developments in the most important areas of smart systems for sport and health;
- Ability to expand knowledge, including incomplete knowledge, in the area of problem solving, taking into account the primary objective of the project;
- Ability to formulate and test theories and to define new methods through empirical induction and the tools of next-generation scientific research.

Assessment	Written exam and project work. The mark for each part of the exam is 18-30, or insufficient. The written exam counts for 50% of the total mark. The project work consists of an embedded systems project and verifies whether the student is able to apply the concepts taught or presented in the course to solve concrete problems. It is assessed through a final presentation and a project report and can be carried out either individually or in a group of 2 students. It counts for 50% of the total mark.
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	The final mark is computed as the weighted average of the written exam and the project. The exam is considered passed when both marks are valid, i.e., in the range 18-30. Otherwise, the individual valid marks (if any) are kept for all 3 regular exam sessions, until also all other parts are completed with a valid mark. After the 3 regular exam sessions, all marks become invalid. Relevant for the written exam: clarity of answers; ability to recall principles and methods, and deep understanding about the course topics presented in the lectures; skills in applying knowledge to solve exercises about the course topics; skills in critical thinking. Relevant for the project: skill in applying knowledge in a practical setting; ability to summarize in own words; ability to develop correct solutions for complex problems; ability to write a quality report; ability in presentation; ability to work in teams. Non-attending students have the same evaluation criteria and requirements for passing the exam as attending students.

Required readings	All the required reading material will be provided during the course and will be available in electronic format. Copy of the slides will be available as well.
Supplementary readings	
Software used	