Fakultät für Ingenieurwesen
Facoltà di Ingegneria
Faculty of Engineering

COURSE DESCRIPTION – ACADEMIC YEAR 2024/2025

Course title	**Fundamentals of Information Science and Microcontroller Programming**
Course code	42174
Scientific sector	ING-INF/04
Degree	Bachelor in Industrial and Mechanical Engineering (L-9)
Semester	1
Year	1
Credits	6
Modular	No

Total lecturing hours	36
Total lab hours	24
Attendance	Attendance at assigned laboratory sections is required; lecture attendance is very strongly recommended.
Prerequisites	
Course page	Microsoft Teams and https://ole.unibz.it/

Specific educational objectives	The course will introduce basic concepts in information and computer science (hardware and software), particularly those topics of fundamental importance to Engineering and confirm the theoretical learnings in lab projects.

Lecturer	Thomas Villgrattner (webpage)
Contact	Head of Adaptive Technology GKN Powder Metallurgy Email: Thomas.villgrattner@unibz.it
Scientific sector of lecturer	ING-INF/04
Teaching language	English
Office hours	By appointment to be arranged by email.
Lecturing Assistant (if any)	
Contact LA	
Office hours LA	
List of topics	• Basics of programming in the C language • Introductory electronics • Introductory motor control (servo and DC permanent magnet) • Introduction to computer architecture
Teaching format	Frontal lectures and lab exercises

Learning outcomes	**Intended Learning Outcomes (ILO)** Knowledge and understanding Through the application of the principles of Information Science and Microcontroller Programming, students should be able:

1. To know basic software design procedures.
2. To know how to develop simple microprocessor programs.
3. To know how to interface a microprocessor with simple sensors and actuators.
4. To know how to implement simple electromechanical systems.

Applying knowledge and understanding

5. To apply software design principles, programming, and hardware interfacing in theoretical examples and hands-on laboratory exercises that complement the lectures and sustain arguments.

Making judgments

6. To make autonomous judgments on the choice of the right tools such as data types, programming approaches, or electrical components. The labs will also require students to gather and interpret relevant data.

Communication skills

7. To correctly and properly present information, ideas, problems, and solutions during the labs.

Learning skills

8. To acquire extended skills in Information Science and Microcontroller Programming and be able to use this new knowledge as a solid foundation for further study in more advanced courses in Engineering.

Assessment

Examination of the course is conducted via a written exam and lab. The written exam consists of two parts: i) a part with short questions to assess the knowledge and understanding of the theoretical fundamentals of the course topics. ii) a part with exercises on Datatypes and Operations, exercises on the dimensioning of electrical circuits, as well as exercises on code writing.
The single experiments of the lab will be examined by i) the correct functionality of the student's own implementation as described in the relative task description ii) the ability of the single students in the lab groups to explain the selected approaches iii) the level of observation of physical processes iv) the overall implementation, documentation, and appearance of the electrical circuit and software code of the selected approach.

Formative assessment

Form	Length/duration	ILOs assessed
In class exercises	60 x 60 minutes	1-7

Summative assessment

Form	%	Length/duration	ILOs assessed
Written exam - Fundamentals	12%	4 questions (0.5 hours)	1 – 4
Written exam	48%	3 exercises (2.5 hours)	5, 6

	<table><tr><td>- Exercises</td><td></td><td></td><td></td></tr><tr><td>Lab</td><td>40%</td><td>6 lab experiments (24 hours)</td><td>5 – 7</td></tr></table>
Assessment language	English
Assessment Typology	Monocratic
Evaluation criteria and criteria for awarding marks	Written Final Exam: Completeness and correctness of answers. Labs: Completeness and correctness of the student's own implementation, the ability of the single students in the lab groups to explain the selected approaches, the level of observation of physical processes, and the overall implementation, documentation, as well as appearance of the electrical circuit and software code of the selected approach. Students are required to receive an overall grade of greater than 60/100 points in order to pass the course.

Required readings	Smith, A. G. Introduction to Arduino: A piece of cake, CreateSpace Independent Publishing Platform, 2011. ISBN: 978-1463698348 Hard copies available in library reserves, or can be downloaded here – http://www.introtoarduino.com/downloads/IntroArduinoBook.pdf Subject Librarian: David Gebhardi, David.Gebhardi@unibz.it and Ilaria Miceli, Ilaria.Miceli@unibz.it
Supplementary readings	Blum, J. Exploring Arduino: Tools and Techniques for Engineering Wizardry, John Wiley & Sons, 2013. ISBN: 978-1-118-54936-0
Software used	Arduino IDE freely available at: https://www.arduino.cc/en/software needs to be installed on the student's personal laptop. The Ubuntu operating system is recommended, but MacOS or Windows are also acceptable.