Fakultät für Ingenieurwesen
Facoltà di Ingegneria
Faculty of Engineering

COURSE DESCRIPTION – ACADEMIC YEAR 2023/2024

Course title	**Systems and Control Lab**
Course code	42188
Scientific sector	ING-INF/04
Degree	Bachelor in Industrial and Mechanical Engineering
Semester	2
Year	3
Credits	6
Modular	YES

Total lecturing hours	0
Total lab hours	60
Attendance	Recommended
Prerequisites	Lectures and exercises of Mathematical Analysis I and II, Geometry, and Physics I
Course page	Microsoft Teams and https://ole.unibz.it/

Specific educational objectives	The student should understand the basic principles of the theory of modelling and control of linear systems and their practical implementation is simulation and with a real robot.

Lecturer	*Marco Frego, PhD,* *email : marco.frego@unibz.it* *page: https://www.unibz.it/it/faculties/engineering/academic-staff/person/44497-marco-frego*
Contact	*email : marco.frego@unibz.it*
Scientific sector of lecturer	ING-INF/04 – AUTOMATION
Teaching language	English
Office hours	*After agreement with the lecturer*
Lecturing Assistant (if any)	
Contact LA	
Office hours LA	
List of topics	• Introduction to Matlab • Basics of Simulink • Dynamic systems in the frequency domain • Application to robot control in the lab experiences
Teaching format	*The lessons are divided into theoretical online lessons, exercises on the blackboard and exercises with simulation software, hand-on experience in the lab with robots.*

Learning outcomes	The learning outcomes need to refer to the Dublin Descriptors: <u>Knowledge and understanding</u>

1. Matlab/Simulink computational tools and theory and practice of linear control systems.

Applying knowledge and understanding

2. Application of Matlab and Simulink to control problems, in simulation and with the robotic systems.

Making judgements

3. Ability to judge plausibility of results.

Communication skills

4. Maturing of technical-scientific terminology.

Ability to learn

Use the skills learnt in the course to autonomously extend the knowledge of programming and implementing control systems.

Assessment

Formative assessment

Form	Length /duration	ILOs assessed
In-class exercises	Continuously as part of course-accompanying exercises	1-5

Summative assessment

Form	%	Length /duration	ILOs assessed
Interactive	100	About 1h	1-5

Assessment language: English

Assessment Typology: Monocratic (Collegiale se esame modulare)

Evaluation criteria and criteria for awarding marks	*The exam includes exercises to be solved with Matlab and Simulink, invol mathematical methods for control problems. Judged will be the formal methodological correctness of the answers, the computations and their presentation analysis.*

Required readings	Lecture Material
Supplementary readings	There is a vast literature on Matlab/Simulink, Any book that covers the basics will work. Some suggestions: A MATLAB Primer for Technical Programming in Materials Science and Engineering - Leonid Burstein - Woodhead Publishing Elsevier - 2020 MATLAB A Practical Introduction to Programming and Problem Solving - Stormy Attaway - Second Edition - Butterworth-Heinemann Elsevier – 2012 Angermann, Rau, Beuschel, Wohlfarth - MATLAB, Simulink, Stateflow - De Gruyter (in German) 9th ed. 2017 Control Systems Engineering – Global Edition, Norman S. Nise, Wiley, 2017 (based on 7th edition from 2015).
Software used	*Matlab, Symbolic Math Toolbox, Control System Toolbox, Simulink*