

Master of Science in Mechanical Engineering

Mechatronics and Robotics

FA4



Contacts



**Prof. Francesco
Braghin**

francesco.braghin@polimi.it



Track description

Creating mechatronic systems requires skills from a broad range of disciplines. Consider modern passenger cars and intelligent robots for households and industry. These complex and highly interactive systems pose fundamental questions about their modelling, optimization and control. The Mechatronics and Robotics track offers students the integrated and multidisciplinary engineering expertise needed to design, develop and manage innovative and intelligent high-tech products and systems that meet today's challenges in the most diverse fields of application, ranging from energy to mobility, from health to the environment. The track also offers course packages focused on three specific subtopics, i.e. robots, mechatronics and vehicles.



Skills

Students will learn how to:

- model, optimize and control multiphysics/multidomain innovative systems
- exploit the potentialities of smart materials/metamaterials for innovative (smart) systems
- design, develop and manage complex mechatronic systems
- design, develop and manage (co)robotic systems (from traditional anthropomorphic robots to humanoid and bioinspired robots)
- develop high-performance control logic (for vehicles, drones, machines, ...)



FA4: Core Courses

Course Title	YEAR	SEM	ECTS	ECTS GROUP
Data Analysis and Experimental Characterization for Mechatronic and Robotic Systems	1	2	10	10
Actuating Devices for Mechanical Systems	1	1	5	5
Advanced Dynamics of Mechanical Systems	1	2	10	10
Advanced Machine Design	1	1	10	10
Advanced Manufacturing Processes B	1	1	5	5
Smart Materials	1	2	5	5

FA4: Track Specific Courses

Course Title	YEAR	SEM	ECTS	ECTS GROUP
Methods and Technologies for Feedback Control Systems	1	1	10	10
Mechatronic Systems A	2	1	10	10
Nonlinear Dynamics and Chaos	1	2	5	5
Topology Optimisation	1	1	5	
Nonlinear Optimization	1	2	5	
Numerical Analysis For Partial Differential Equations B	1	2	5	
Model Order Reduction Techniques	1	1	5	20
Elective courses (Machine Learning and Model Identification for Mechanical Systems, Nonlinear Control, Robust Control, Algorithmic Game Theory, Bio-inspired Robotics, Collaborative Robotics, Micro and Nano Robotics, Design of Robotic Systems, Soft Robotics, Swarm Robotics, Mechanics and Design of Micro Electro Mechanical Systems - Sensors, Connected and Autonomous Vehicles, Hybrid And Electric Vehicles, Smart Farming, Unmanned Vehicles, Wind Turbine and Wind Farm Modelling and Control B, Metamaterials and Metastructures, Smart Structures and Devices, ...)	2	1-2	5	
Lab course (Noise, Vibration and Harshness Testing, Bioinspired Robotics, Innovative Applications of Industrial Robotics, Mechatronics, Mechanical Engineering Applications of Deep Learning, Metamaterials and Metastructures, Haptics and Multisensory Interaction in Extended Reality, Human Modelling In Engineering, Robotic Manufacturing)	2	1	5	5

FA4: Master's Thesis

**Flying humanoid
robot (with IIT)**

**Optimal landing
on other planets
(with NASA)**

**Optimal
trajectory for
autonomous
driving**



FA4: Master's Thesis

**Upper limb
exoskeleton**

**Acoustic
cloaking
through
metamaterials**

**Collaborative
robot for
healthcare**

