GRADUATE STUDY
INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITY OF ZAGREB
Faculty of Electrical Engineering and Computing

Control Systems and Robotics

What are Automation and Robotics?

Automation and Robotics are interdisciplinary fields representing a synergy of electrical engineering and computer science with a strong mathematical foundation and, as such, cover a wide range of theoretical and practical knowledge.

What do we learn in Automation and Robotics?

Central study topics of our profile are robots and control systems - we learn how to mathematically model, design and program them. Feedback (what is the state of the process?) and controllers (how to act on the process to achieve desired outcome?) are cornerstones of control systems. Examples of such systems can be found all around us – from basic room temperature control to control of autonomous robots using artificial intelligence or control of complex technical systems such as nuclear power plants.

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Skills

By designing robotics and control systems for different technical processes, students will acquire the following skills:

- mathematical modeling, simulation and optimization of robots and other technical systems,
- modeling and control of actuators,
- sensors modeling and data acquisition,
- inference about the state of the system by artificial intelligence methods,
- technologies and methods to develop autonomous systems,
- implementation of robotics and automation systems (embedded computers, PLC, ROS),
- application of knowledge to autonomous systems, smart buildings and industrial production processes.

Career

Because of the broad knowledge they gain during their studies, our students thrive in the job market. The emphasis in teaching is set on the development of analytical thinking skills and solving of complex problems, which enable fast advancement of our former students in their work teams.

Jobs range from a development engineer for robotic systems or automation systems, to leading roles responsible for controlling complex technical and non-technical systems.

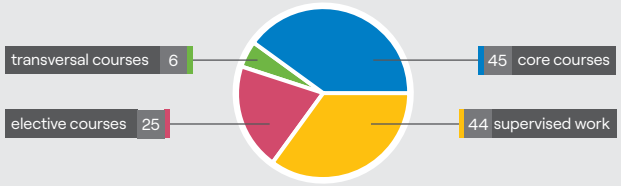
Hands-on experience

Our profile covers a wide range of areas, from control of reusable energy sources to autonomous robotic systems and application of artificial intelligence. Our doors are always open to our students and we encourage work and learning in a friendly atmosphere. Students have the opportunity to expand their theoretical knowledge by working on lab exercises, as well as on our scientific projects through seminars, projects and theses.

If you are interested in control of smart buildings, you can try it on the FER skyscraper, the top of which, in addition to a great view, also has its own wind turbine, all within LARES laboratory. Are you interested in drones? Our students and professors in LARICS program them to open valves and deliver packages. Do you dream of controlling a robot on Mars? You are going to learn how to process and analyze data from various sensors, such as cameras, LiDAR sensors, sonars (underwater and ground), IMUs, GPSs etc. Mobile robotics is the subject of several LAMOR and LARICS projects, and it has its own course. If you are more of a marine type interested in marine robotics, LABUST is the laboratory for you. Organic farming is the future - in several projects you can see what role robots play there. Learning opportunities are broad and don't fit on this flyer. If you want to know more, please visit air.fer.hr.

PLAN OF STUDY	SEMESTER	ECTS
Core courses		20
Networking Technologies	1	5
Fundamentals of Robotics	1	5
Seminar 1	1	3
Estimation Theory	2	5
Embedded Systems*	2	5
Seminar 2	2	3
Research seminar	3	5
Project	3	3
Diploma thesis	4	30
Core elective courses		25
Digital Control Systems	1	5
Computer Controlled Systems	1	5
Systems Dynamics Modeling and Simulation	1	5
Fundamentals of Power Electronics	1	5
Machine Learning 1	1	5
Automation of Plants and Processes	2	5
Robotic Sensing, Perception, and Actuation	2	5
Control of Electromechanical Systems	3	5
Multi-robot Systems	3	5
Autonomous Mobile Robots	3	5
Nonlinear Control Systems	3	5
Elective courses recommended for the profile	2,3	10
Elective courses	1, 2, 3	15
Transversal courses	1, 2, 3	6

* the course is also offered at the undergraduate level (if the course is passed at the undergraduate level, it can be replaced by the Elective course recommended for the profile)



The pure power of an electric car's propulsion system requires a control algorithm that makes optimal use of the physics of the tire, engine, and battery. Studying Automation and Robotics gave me a solid knowledge base of software, hardware and mechanics, which were easy to apply to the C_two electric hypercar.

Kruno Hrvatinić
Head of Control Engineering, Rimac Automobili d.o.o.

I work at Montelektro, a company that successfully deals with all segments of automation in the process industry. The focus of my work are projects in the brewing industry. The work is challenging and exciting, it gives me the opportunity to participate directly in shaping the way we produce and create products.

Aida Bečić
Team Leader, Montelektro d.o.o.

As part of my master thesis, I am developing a system for the detection and flexible manipulation of fruit using a robotic gripper. The goal is to enable a robotic manipulator to use an RGB-D camera and force sensor to build a 3D model of the object it interacts with, which I will apply to assess fruit ripeness within an autonomous greenhouse.

Jelena Tabak
graduate student, FER