

Master in Signal and image processing

Mobile, autonomous and robotic systems

Presentation

Mobile, autonomous and robotic systems (MARS) is an advanced academic program on mobile robotic and autonomous systems. This highly competitive program includes advanced courses in artificial intelligence, control theory, drones, embedded systems, diagnostic and reliability, cybersecurity and intelligent mobility. In addition, a 5 to 6-month internship, is conducted in a laboratory or within an industrial research center.

The Master degree in Robotics and Autonomous Systems aims at offering an international master program that allows a better understanding of technical and scientific aspects of connected and autonomous mobile robotic systems and to understand their interactions.

It englobes an advanced academic program on:

- Mobile and aerial robots that can act and evolve autonomously in complex environments.
- Perception for detection and tracking of moving objects.
- Navigation and Path Planning
- Robotic operating system (ROS)
- Artificial intelligence planning for autonomous robots requiring little or no supervision
- Machine learning
- Advanced methods for optimal control and predictive control
- Methods to monitor and diagnose dynamic systems with a study on the reliability of a systems subject to failure
 - Distributed optimization and game theory
 - Embedded systems: microcontrollers architectures and sensors for robotics
 - Cyber-security: Make risk analysis, detect cyber-attacks and develop strategies. Implement some cyber-security mechanisms, on the communication infrastructure and on the robot systems
 - Intelligent mobility and transportation to improve the safety of the vehicle and the comfort of the passengers, as well as the detection and reconfiguration of the controllers in case of emergency.
 - Multi-vehicle coordination, in the perspective of understanding the behavior of groups of autonomous and non-autonomous robotic systems.

Registration and scholarships

Access conditions

Courses are taught in English - B1 level required ! English language: B1 level. TOEFL: computer-based: 140 / IBT: 60 / paper-based : 457. TOEFL institution code is 6050, Department : Ense3

TOEIC : 550 - IELTS: 4.5

The master's degree in Robotics and autonomous systems is a highly competitive academic program (duration: one year, 2nd year level). Applicants selection is done on the basis of prior academic and/or scientific achievement as documented by academic transcripts, a cover letter, references, and standardized test scores. Students from countries where English language is not the primary language are required to provide TOEFL test scores. To get master degree, admitted students must obtain the certified level B2.

The selection of applicants is based on the following criteria :

- Administrative rules mentioned above

- Applicants must have previously completed their undergraduate studies and been awarded a bachelor degree in either Science (BSc) or Engineering (BEng) in a field related to Robotics, such as : mechatronics, automatic control, computer science, electrical engineering, mechanical engineering, applied mathematics. For students with a foreign degree, their registration is definitely authorized by the Committee for Academic Accreditation at Grenoble university (CVA). Several meetings are organized several times a year (February, March, April, May, June) to select applications from abroad.

You are strongly encouraged to apply as soon as possible.

[skin.odf-uga:SKIN_ODF_CONTENT_PROGRAM_CANDIDATURE_LABEL](#)

Application to join the MARS 2023-2024 class will open on the 17th of October 2022.

More information on application timeline and procedures on the [ENSE3 website](#).

Target group

This program is intended for a public wanting to work in the field of robotics, automotive, aeronautics, and industry. The courses are given by highly qualified intentionally known staff. The training is supported by researchers from associated research laboratories and practitioners from industrial partners.

Expenses

Tuition rates for academic year 2023/24

For European students (nationals of a member country of the European Union, the European Economic Area, Andorra or Switzerland) and for students from Quebec. Tuition charges will be: €1,473 per year

For non EU-students

Tuition charges will be: €5,000 per year.

And before completing their administrative registration with a higher education institution, students will have to pay off €95 *Contribution Vie Étudiante et de Campus* (CVEC).

Further studies

Graduates are encouraged to pursue a PhD in the field of mobile and aerial robots, autonomous vehicles and systems. This master's degree allows graduated students to find a job in public and private laboratories as well as in industrial research centers.

Practicals informations :

- > Component : Grenoble INP - Ense3 (Energie, eau, environnement)
- > level : Baccalaureate +5
- > Duration : 2 years
- > Course type : Initial and Continuing Education
- > Location(s) : Grenoble - Doyen Gosse

Contacts

Program director

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Program

Core courses – 20 ECTS (5 ECTS for each course):

- **Artificial Intelligence**

The purpose of this course is to give an overview of the main techniques of artificial intelligence and a thorough understanding of how to apply them to the robotics and autonomous systems.

- **Robotics**

The course will focus on the kinematics and control of mobile robots, the environment perception, probabilistic localization and mapping, as well as movement planning. The courses and exercises of this course present several types of robots such as wheeled robots, leg robots and drones. Practical work will be performed with drones.

- **Advanced control**

In this course different control techniques will be taught such as Robust, nonlinear, model predictive controls.

- **Research project** on a subject related to robotic systems, autonomous vehicles, and drones.

Students will be integrated into research teams of partner laboratories.

Elective courses – 10 ECTS (2 courses out of 4):

- **Smart transportation**

This course will present a diverse but synergistic body of knowledge in order to understand the functioning of the future smart city and mobility.

- **Cyber-security and embedded systems for robotics**

This course aims to develop skills necessary for the development and implementation of embedded systems.

Students will study the particular constraints of "embedded" robotic-type systems such as implementation constraints and the limits in terms of security, as well as the implementation of deep security approaches combining infrastructure and stand-alone systems. The normative aspects related to robots and drones will be used in these approaches.

- **Distributed optimization and estimation**

This course will be applied on several robotic communicating robotic mobile systems. It aims at presenting different architectures distributed optimization and identification to obtain experimentally parameters of nonlinear models of robots. Moreover, these techniques allow to control dynamically a group of underlying robots to best fit a common situation.

- **Diagnostic, reliability and prognostic**

The objective of this course is to present the problem of monitoring, diagnosis, reliability, and predictive maintenance, and its application issues in the field of robotics and autonomous systems.

Scientific culture course:

- Seminars
- Laboratory visits and business
- Management of technical innovation
- Scientific ethics
- French language (FLE)