



**Master of Science (MSc)**  
**Control and Robotics**

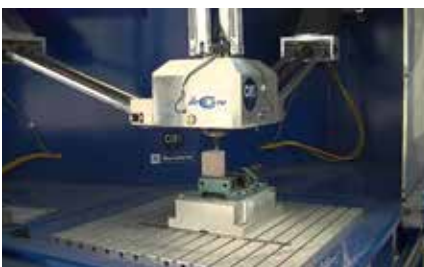
**ADVANCED ROBOTICS**

**OBJECTIVES**

The main objective is to master the modelling and control of complex robots evolving in dynamic environments by using proprioceptive and exteroceptive perception.

The focus is on advanced robotics but more generally, it deals with modern techniques in systems engineering for the modelling, simulation, optimisation, analysis, and control of a variety of robotics systems. It also takes into account the modelling and perception of the environment. The quality of this MSc has been recognized by the European Union: it is involved in the European Master on Advanced Robotics (EMARO+ Erasmus Mundus programme) and the Japan-Europe Master on Advanced Robotics (JEMARO, Erasmus Mundus Joint Master's Degree).

Students applying for this MSc programme can also apply to join the Integrated Master-PhD Track, which brings together the two years of the Master's degree and three years of PhD studies.



**SKILLS**

**Specialism-specific**

- > Master the various fields of advanced robotics and smart robots (kinematic and dynamic modelling, dynamic command, computation, perception organs and mechanical design)
- > Merge design and implantation of robotic systems in their environment
- > Possess a body of knowledge of case studies in growing sectors (production robotics, autonomous vehicles, humanoid robotics...)

**General**

- > Identify models, perform simulation and analyse results
- > Communicate comprehensive results in a meaningful way
- > Undertake bibliographic surveys from international research and professional literature
- > Manage or be part of a project

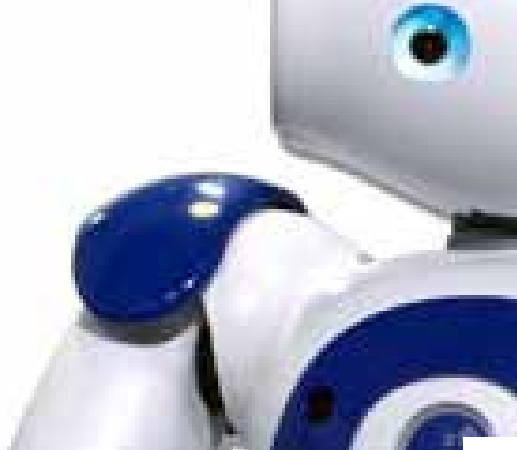
**JOB PROSPECTS & FURTHER PHD STUDIES**

**SECTOR:** Aeronautics, Automotive, Transportation, Wind and Marine Energy, Materials Producers, Consulting.

**FIELDS:** Mechanical Engineering, Robotics engineering, Design, Materials, Advanced Processes, Manufacturing, Research and Innovation.

**JOB POSITIONS:** Mechanical Engineer, Robotics engineer, Process Engineer, Design Engineer, Research and Innovation Engineer (post PhD).





#### Location

Nantes, France -2 hours from Paris

#### International campus life

**87**

nationalities

**43%**

international students



Master of Science (MSc)

## EXAMPLES OF FINAL YEAR INTERNSHIP/MASTER'S THESIS

- > Automated prediction of road surface roughness using lidar data
- > Multi-robot localization and control for infrastructure monitoring
- > Epileptic seizure detection based on ECG signal processing
- > Fully actuated hexarotor with tilted rotors
- > Stiffness analysis of a surgical robot designed for otological endoscopic surgery
- > Task allocation for multi-robot system
- > Intuitive task coordination with a humanoid robot
- > Dataset building strategies for semi-supervised learning and active learning applied to spatio-temporal and multi-sensors-based data
- > Online trajectory planning to avoid dynamic obstacles for a 7-DoF robot arm
- > Design and test of a TAVI (Transcatheter Aortic Valve Implantation) Delivery System handle actuation module

## FACULTY, INDUSTRIAL PARTNERS AND RESEARCH LABS

This MSc relies on the Centrale Nantes' faculty, staff and research facilities of the LS2N Institute. The students have access to LS2N research facilities - autonomous vehicles, drones (airborne / underwater), robotic arms, parallel robots, cable robots etc. - typically during their first year project work or second year thesis.

Companies and institutions with links to the MSc programme: BA System, Airbus, Gaussin, Renault, Akka Technologies, GE, Tecnaia, IRT Jules Verne, Inria

## OTHER PROGRAMME INFORMATION

- > Length of Studies: 2 years
- > Language of instruction: English
- > 3 semesters of courses and 1 semester of Master's thesis

### Tuition & Fees - Scholarships - Application process - Deadlines

**MORE INFORMATION AND FULL PROGRAMME:**  
[www.ec-nantes.fr/masters](http://www.ec-nantes.fr/masters)

**CONTACT:** [master.admission@ec-nantes.fr](mailto:master.admission@ec-nantes.fr)

## CONTENT AND COURSES

(A Master Degree requires the validation of 120 ECTS credits)

M1 - AUTUMN SEMESTER	ECTS
Signal Processing	5
Classical Linear Control	5
Artificial Intelligence	6
Modelling of Manipulators	4
Advanced and Robot Programming	4
Mechanical Design Methods in Robotics	4
Modern Languages	2
M1 - SPRING SEMESTER	ECTS
Group Project	6
Optimization Techniques	5
Mobile Robots	5
Dynamic Model Based Control	4
Software Architecture for Robotics	4
Computer Vision	4
Modern Languages	2
M2 - AUTUMN SEMESTER	ECTS
Advanced Modelling of Robots	6
Research Methodology	5
Task-based control	5
Advanced Visual Geometry*	4
Soft robot modelling*	4
Autonomous Vehicle*	4
Optimal Kinematic Design*	4
Modern Languages	2
M2 - SPRING SEMESTER	ECTS
Master Thesis or Industrial Internship (paid)*	30

\*In France, for internships exceeding 2 months a minimum legal level of remuneration (approximately €600 per month) is fixed by the government. In some professional branches, this amount may be higher.

\*Elective courses - choose 3 out of 4

Students on the Integrated Master-PhD Track follow an adapted version of the above course structure with a limited choice of modules, and the inclusion of a research module and supervised research project.

NB Course content may be subject to minor changes

École Centrale de Nantes. Direction de la communication. Septembre 2023