

# Master of Sciences in Robotics & Transport



## MRT Objectives

The international Master MRT is designed to train international students interested in developing their professional knowledge and skills in engineering sciences, and more specifically in the areas of autonomous robotics in healthcare, 3D printing, automobile, aeronautics,...

## Contents

A two-year (4 semesters, 30 ECTS each) Master programme, with courses taught in English. The Master program is based on multidisciplinary lectures which integrate the concept of integrated design and intelligent prototyping.

## Prospects

The graduates from this program will have multi-skilled competences, providing them with different possible professional positions as product designers, innovators and managers. The students will also gain autonomy in their project work - a highly appreciated quality in the industrial world. Along with the scientific and technological knowledge and skills offered by the program, the master MRT students will also benefit from the opportunity to acquire knowledge of French language and culture through diversified courses and cultural visits.

2019-2020



[www.master-mrt.eu](http://www.master-mrt.eu)

Polytech'Lille, Centrale'Lille  
Cité Scientifique,  
Avenue Paul Langevin  
59655 Villeneuve d'Ascq  
Tel : + 33 (3) 28 76 74 86  
Fax :+ 33 (3) 28 76 73 01

Autonomous Robotics  
Intelligent Transport  
Integrated Design  
Prototyping

# Technological Innovation through MRT Programme



## Study Program

The curriculum is spread over four semesters (S1 = 424h, S2 = 424h, S3 = 420h, S4=560h). Semesters S1; S2 and S3 are academic semesters while S4 is devoted to a full-time internship in a company or laboratory. Each semester is worth 30 ECTS. Thus, the curriculum is divided into two parts:

✓ **Common core courses:** These courses concern all master students and are distributed over three semesters S1, S2 and S3S. The main scientific units of the core courses for MR&T are: **Structure & Mechanics, Propulsion, Detection and Perception, Piloting, Management, Integrated Design, Management, French Culture** and **Scientific Project**.

✓ **Specialization:** The last two semesters (S3, S4) are devoted to the specialization of the student and concern two courses:

- **Autonomous Robotics:** *This course focuses on integrated design and prototyping of autonomous robotic systems*
- **Intelligent Transport:** *This course focuses on the integrated design in the field of air and road transport. At the end of the program, the MRT students should be able to master the development of Mechatronic systems in the fields of Robotics and Transport.*



## Language courses

A French as a foreign language course will be offered to EU and non EU students each semester. A primary test will be conducted to define the proficiency level of each student and two level-group classes will be offered.

An advanced English as Foreign Language course will also be offered to French students



## French Culture

The course objective is to provide foreign students with a flavour of the rich French culture. This course will cover France's history, literature and art. Visits of historical places and museums will be organized.



# Program of the 1<sup>st</sup> Year – M1 : Common Core



1<sup>st</sup> Semester

S7: September – January

Lec. : Lecture

Proj. : Project

Tut. : Tutorial

Lab. : Practical Laboratory

Stud. Student

Courses	Lec.	Tut	Lab.	Proj.	Exam	Course Hours	Stud. Hours	ECTS Credits	Code
<b>Unit UE.0: Structure &amp; Mechanics 1</b>							96	6,5	
Applied Mechanics	10	4	8		2	24	24	1,5	MRT 001
Design Tools	10	4	8		2	24	24	1,5	MRT 002
Materials	10	2	12			24	24	1,5	MRT 004
Transmission	5	2	4		1	12	12	1	MRT 005
Thermal and Thermodynamic	5	2	4		1	12	12	1	MRT 011
<b>Unit UE.1: Propulsion 1</b>							80	6,5	
Thermal Engines	8	2	4		2	16	16	1,5	MRT 101
Electrical Engines	5	2	4		1	12	12	1	MRT 102
Macro-Actuators	8	6	4		2	20	20	1,5	MRT 105
Power sources	8	2	4	4	2	20	20	1,5	MRT 107
Energy Storage	4	2	6			12	12	1	MRT 108
<b>Unit UE.2: Detection and Perception 1</b>							16	1,5	
Sensors 1	4	6	6			16	16	1,5	MRT 201
<b>Unit UE.3: Piloting 1</b>							38	2,5	
Automatic Control	10	8	4		2	24	24	1,5	MRT 301
Real-Time Systems	7	2	4		1	14	14	1	MRT 303
<b>Unit UE.4 Integrated Design 1</b>							88	6	
Multi-domain Modeling	6	2	16			24	24	1,5	MRT 401
Embedded Electronics	10	4	8		2	24	24	1,5	MRT 404
Dimensioning	9	2	4		1	16	16	1,5	MRT 405
Rapid Prototyping	10	4	8		2	24	24	1,5	MRT 406
<b>Unit UE.6 Scientific Project 1</b>							50	3	
Scientific Project				50		50	50	3	MRT 601
<b>Unit UE.7 Languages, French Culture 1</b>							56	4	
French Language		34		4	2	40	40	3	MRT 701
French Culture		15			1	16	16	1	MRT 704
<b>Total :</b>							424	30	

The student workload of 1<sup>st</sup> semester (S7) amounts to 424 core curriculum hours (1 hour = 60mn), covering 7 learning areas (UE) and giving 30 ECTS credits.



# Program of the 1<sup>st</sup> Year – M1 : Common Core



2<sup>nd</sup> Semester  
S8: February - June

Courses	Lec.	Tut	Lab.	Proj.	Exam	Course Hours	Stud. Hours	ECTS Credits	Code
<b>Unit UE.0: Structure &amp; Mechanics 2</b>									
Design Tools	8	16				24	24	1,5	MRT 003
Mechanics for flying systems	12	4				16	16	1,5	MRT 007
Mechanics for rolling systems	9	2	4		1	16	16	1,5	MRT 008
<b>Unit UE.1: Propulsion 2</b>									
Micro and Nano Actuators	12			8		20	20	1,5	MRT 106
Pollution Control	6	2	3		1	12	12	1	MRT 109
<b>Unit MRT.2: Detection and Perception 2</b>									
Sensors	4	6	6			16	16	1,5	MRT 202
Micro-Sensors	8	8	8			24	24	1,5	MRT 203
Sensor Fusion	6	6	10	2		24	24	1,5	MRT 204
<b>Unit UE.3: Piloting 2</b>									
Reliability	10	4	8		2	24	24	1,5	MRT 302
Advanced Control	14	8			2	24	24	1,5	MRT 304
Artificial Intelligence	8	2	4	4	2	20	20	1,5	MRT 305
Numerical Control Machine	2	20	2			24	24	1,5	MRT 306
Planning and flight control	6		8		2	16	16	1,5	MRT 307
<b>Unit UE.4 Integrated Design 2</b>									
Functional and Structural Analysis	9	2	4		1	16	16	1	MRT 402
Advanced Programming	9	2	4		1	16	16	1	MRT 403
<b>Unit MRT.5 Management 1</b>									
Project Management	10	10				20	20	1,5	MRT 501
Marketing and Economy	14				2	16	16	1,5	MRT 502
Human Resources Management	16					16	16	1	MRT 503
<b>Unit UE.6 Scientific Project 2</b>									
Scientific Project				40		40	40	2,5	MRT 602
<b>Unit UE.7 Languages, French Culture 2</b>									
French Language		21		2	1	24	24	1,5	MRT 702
French Culture		15			1	16	16	1	MRT 705
<b>Total :</b>							<b>424</b>	<b>30</b>	

The student workload of 1<sup>st</sup> semester (S8) amounts to 424 core curriculum hours, covering 8 learning areas (UE) and giving 30 ECTS credits.



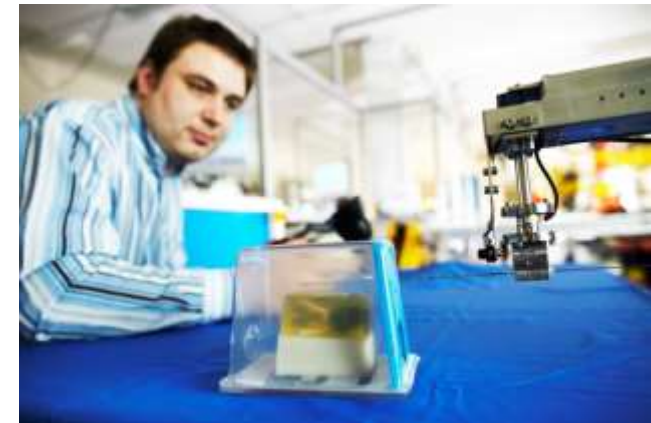
# Program of the 2<sup>nd</sup> Year – M2 : Autonomous Robotics



3<sup>rd</sup> & 4<sup>th</sup> semesters  
S9: September – January  
S10: February - June

Courses	Lec.	Tut	Lab.	Proj.	Exam	Course Hours	Stud. Hours	ECTS Credits	Code
<b>Unit UE. 0: Structure &amp; Mechanics 3</b>									
Kinematics and Dynamics for Robotized Structure	8	2	12	2		24	24	2	MRT 006
Fluid Mechanics	9	2	4		1	16	16	1,5	MRT 009
Aerodynamics	15				1	16	16	1,5	MRT 010
<b>Unit UE.1: Propulsion 3</b>							<b>26</b>	<b>2,5</b>	
Reactor	10	4				14	14	1,5	MRT 103
Helix, rotary wing	9	3				12	12	1	MRT 104
<b>Unit UE.2: Detection and Perception 3</b>							<b>12</b>	<b>1</b>	
Reactor	10	4				14	14	1,5	MRT 103
Helix, rotary wing	9	3				12	12	1	MRT 104
<b>Unit UE.3: Piloting 2</b>							<b>108</b>	<b>7,5</b>	
Sensor Network	11				1	12	12	1	MRT 205
<b>Unit UE.5: Management 2</b>							<b>10</b>	<b>0,5</b>	
Valorisation and Intellectual Property	8	1			1	10	10	0,5	MRT 205
<b>Unit UE.7 Languages, French Culture 3</b>							<b>44</b>	<b>3</b>	
French Language		25		2	1	28	28	2	MRT 703
French Culture		15			1	16	16	1	MRT 706
<b>Unit UE.8 Autonomous Robotics</b>							<b>272</b>	<b>18</b>	
Industrial Robotics	10		24		2	36	36	2,5	MRT 801
Medical Robotics	16		8	10	2	36	36	2,5	MRT 802
Mobile Robotics & Autonomous Vehicles	18		12	4	2	36	36	2,5	MRT 803
Bionic Robotics	18		12	4	2	36	36	2,5	MRT 804
Service Robotics	10		6	16		32	32	2,5	MRT 805
Grasping and Haptic Control	10	2	4	4	2	22	22	1,5	MRT 806
Final Project				74		74	74	4	MRT 807
<b>Total :</b>						<b>420</b>	<b>420</b>	<b>30</b>	

The student workload of 3<sup>rd</sup> semester (S9) amounts to 148 core curriculum hours, covering 6 learning areas (UE) and 272 hours of 1 UE in scientific and technical skills applied to Autonomous Robotics. The total hours represent 30 ECTS credits.



The 4<sup>th</sup> semester (S10) is entirely spent doing an industrial internship. The 6-month internship takes place in a company or in a research laboratory.

# Program of the 2<sup>nd</sup> Year – M2 : Intelligent Transport



3<sup>rd</sup> & 4<sup>th</sup> semesters  
S9: September – January  
S10: February - June

Courses	Lec.	Tut	Lab.	Proj.	Exam	Course Hours	Stud. Hours	ECTS Credits	Code
<b>Unit UE. 0: Structure &amp; Mechanics 3</b>							56	5	
Kinematics and Dynamics for Robotized Structure	8	2	12	2		24	24	2	MRT 006
Fluid Mechanics	9	2	4		1	16	16	1,5	MRT 009
Aerodynamics	15				1	16	16	1,5	MRT 010
<b>Unit UE.1: Propulsion 3</b>							26	2,5	
Reactor	10	4				14	14	1,5	MRT 103
Helix, rotary wing	9	3				12	12	1	MRT 104
<b>Unit UE.2: Detection and Perception 3</b>							12	1	
Reactor	10	4				14	14	1,5	MRT 103
Helix, rotary wing	9	3				12	12	1	MRT 104
<b>Unit UE.3: Piloting 2</b>							108	7,5	
Sensor Network	11				1	12	12	1	MRT 205
<b>Unit UE.5: Management 2</b>							10	0,5	
Valorization and Intellectual Property	8	1			1	10	10	0,5	MRT 205
<b>Unit UE.7 Languages, French Culture 3</b>							44	3	
French Language		25		2	1	28	28	2	MRT 703
French Culture		15			1	16	16	1	MRT 706
<b>Unit UE.9 Intelligent Transport</b>							272	18	
Regulatory and Certification	10			4		14	14	1,5	MRT 901
Embedded Electronics (2)	9	2	4		1	16	16	1,5	MRT 902
Airframe	16					16	16	1,5	MRT 903
Drones	8	10	6			24	24	1,5	MRT 904
Rotorcraft	14	1	7		2	24	24	1,5	MRT 905
Motorization	22	6	8			36	36	2,5	MRT 906
Interaction Tire-Road	10		8		2	20	20	1,5	MRT 907
Traction	12	6	6			24	24	1,5	MRT 908
Test Bench	9	2	4		1	16	16	1	MRT 909
Final Project				82		82	82	4	MRT 910
<b>Total :</b>							<b>420</b>	<b>30</b>	

The student workload of 3<sup>rd</sup> semester (S9) amounts to 148 core curriculum hours, covering 6 learning areas (UE) and 272 hours of 1 UE in scientific and technical skills applied to Intelligent Transport. The total hours represent 30 ECTS credits.



The 4<sup>th</sup> semester (S10) is entirely spent doing an industrial internship. The 6-month internship takes place in a company or in a research laboratory.

# Practical Information



## Admission

- ✓ Admission to the first semester of M1 is available to holders of a Bachelor's Degree or equivalent. This study level should be justified by the validation of 180 ECTS credits in the fields of: Mechanical, Electrical, Software, Automation, Mechatronics Engineering
- ✓ Admission for the second semester of M1 is open to students having earned **210 ECTS credits**, validated by their university.
- ✓ Admission for the first semester of M2 is open to students having earned **240 ECTS credits**, validated by their university, or by professional experience in the field of Robotics and Intelligent Transport.



## Registration

Online registration should be done after filling the application form available on: [www.master-mrt.eu](http://www.master-mrt.eu) and send it by email to: [admission@master-mrt.eu](mailto:admission@master-mrt.eu) or by mail. The admissions will be communicated continuously until **June 30<sup>th</sup> 2019**

## Tuition Fees

- ✓ **M1: 10,000 €/year**
- ✓ **M2 : 7,500€/year**
- ✓ **M1+M2 : 17,500€**

The candidate can apply for scholarships through the French Ministry of Foreign Affairs or specific mobility grant schemes depending on their native country.

## Location

Classes are held in Lille on the 'Cité Scientifique' University Campus in Villeneuve d'Ascq.

Lille is located in the North of France, only 1 hour from Paris center by train, 50 minutes from CDG Airport, 1 hour 20 minutes from London, 38 minutes from Brussels and 2h 40 from Amsterdam. Lille is also located in the Flanders region, which is a cultural metropolis, very attractive for studies within an appropriate environment, offering a wide range of local services. The monthly living costs in Lille, including accommodation, food and transportation are estimated at **800 €/month**.

## Degree Title

The Master "Robotics & Intelligent Transport" is a Master of Science, accredited by the French Ministry of Higher Education and Research. It is an international Master degree delivered jointly by Polytech'Lille and Centrale'Lille, two highest academic and research institutions in engineering Sciences.

## Language

All the courses are taught in English. Students are required to take specific courses of French Language and Culture during the three first semesters.



**Polytech'Lille** is a graduate institute of engineering located in **University of Sciences and Technology of Lille1** in the North of France. The school is located on a vast 110-hectar campus in the heart of a large scientific and technical campus.

With 500 graduate and post graduate students per year and 8,500 working engineers, Polytech'Lille is the largest engineering institute North of Paris. It offers a 3-year curriculum which concludes 5-year engineering studies.

Polytech'Lille is a founder member of the **Polytech Group** which is a national network of 13 graduate institutions schools of engineering within France's leading science universities. It offers 8 degree programmes in engineering

The main mission of **Centrale'Lille** is to train high-level multi-disciplinary engineers who join the management levels of many companies every year. Centrale'Lille is a leading state institution in engineering science and management.

Centrale' Lille trains about 500 graduate and post graduate students per year and relies on 8000 engineers within the alumni network. Centrale'Lille is one of the highest level engineering institutes North of Paris. It offers a 3-year selective curriculum which concludes 5-year engineering studies, at Master level.

Centrale'Lille is a member of the **Groupe des Ecoles Centrales** which is a national network of 5 top graduate institutions.

