

UNIMORE
UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



**UNIVERSITÀ
DI PARMA**

PhD Program in Automotive for Intelligent Mobility

**A Joint Program between the University of Bologna,
the University of Modena and Reggio Emilia and the University of Parma**



<https://phd.unibo.it/ami>

PhD Program in Automotive for Intelligent Mobility

The Motivations

New challenges for a carbon neutral and a sustainable mobility are asking for highly skilled and educated engineers and researchers to exploit, conceive and realize innovative solutions

Sustainable and Intelligent mobility asks for integrated competences, from design and manufacturing to connectivity through clean and carbon neutral powertrain

The PhD Program in Automotive for Intelligent Mobility matches all these goals in a long term-perspective of sustainable mobility

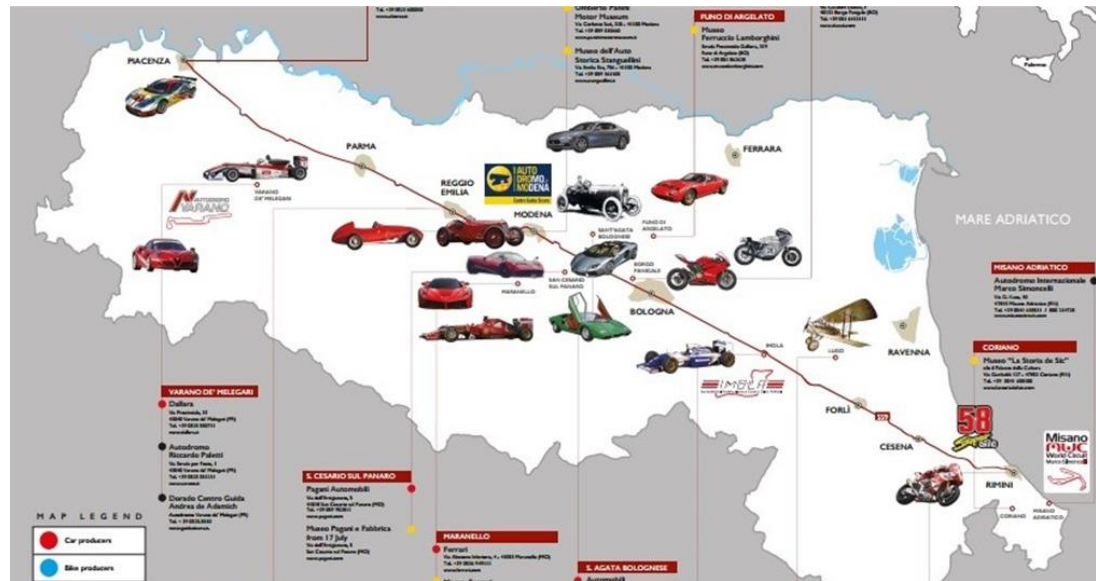


PhD Program in Automotive for Intelligent Mobility

The Stakeholders

It is fully integrated into the production context of Emilia Romagna - where the Automotive sector is represented by companies of worldwide importance in the production of high-end cars and motorcycles, agricultural machinery, cars and motorcycles for sports competitions, vehicle components.

The Automotive sector in the Region is the first industrial sector with a turnover of more than 10 billion euros, about 200 companies and 20,000 employees.



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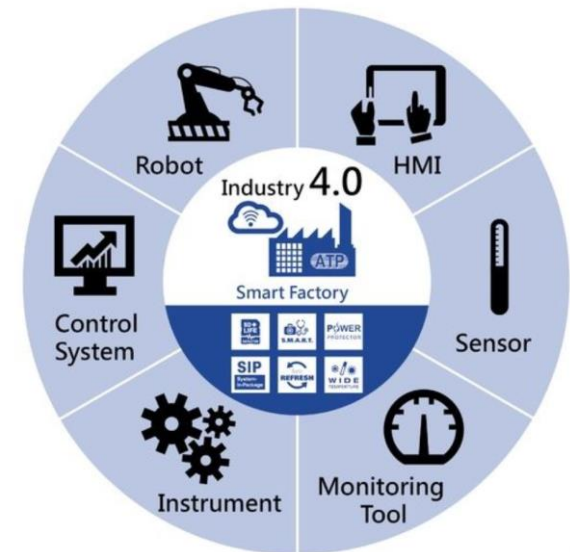
PhD Programme Structure

1. The Mission

1. Provide **High-Qualified** Engineering profiles in the **Automotive and Mobility Sectors**

2. The Ph.D. engineer outcome **profile**:

- Highly qualified personnel with multidisciplinary skills,
- Able to direct the development and research, also in the industrial field, of innovative vehicles,
- Able to create a meeting point between mechanical, industrial, electronics, telecommunications, controls, electrical, IT, logistics and civil engineering



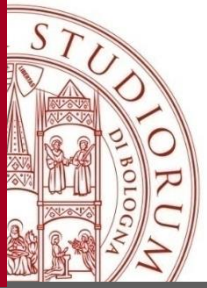
PhD Program in Automotive for Intelligent Mobility

What and How

2. Overview

1. The PhD Programme was established in A.Y. 2018/19
2. More than **17** PhD positions funded by companies in the first two cycles
3. It is offered as a **full time 3 years PhD Course**
4. It is composed of three different educational curricula
5. Web site: <https://phd.unibo.it/ami>
6. PhD Coordinator: Prof. Nicolò Cavina
(email: nicolo.cavina@unibo.it)





PhD Program in Automotive for Intelligent Mobility

PhD Programme Structure

2. Curricula

Curriculum 1: Vehicle Design, Manufacturing and Systems Integration

The curriculum pursues the education of researchers and high-qualified engineers, operating in the areas of design and manufacturing of the automotive sector.

Curriculum 2: Energy Systems, Powertrains, Vehicle Performance

The curriculum pursues the education of researchers and high-qualified engineers, operating in the areas of vehicle dynamics and energy management.

Curriculum 3: Vehicle Informatics and Connectivity

The curriculum pursues the education of researchers and high-qualified engineers, operating in the areas of vehicle digitalization and connectivity.

PhD Program in Automotive for Intelligent Mobility

PhD Programme Structure

2. Curricula

Curriculum 1: Vehicle Design, Manufacturing and Systems Integration

- Industry 4.0 and Advanced Manufacturing Technologies
- Supply Chain Management
- Industrial Automation and Robotics
- Big Data and Cloud Computing for Manufacturing
- Materials, Lighting Technology and Design
- Methods for improving Efficiency and Safety of Vehicles
- Vehicle Lifecycle Assessment. Circular Economy: Vehicle refurbish, re-use of Vehicle Parts.



PhD Program in Automotive for Intelligent Mobility

PhD Programme Structure

2. Curricula

Curriculum 2: Energy Systems, Powertrains, Vehicle Performance

1. Electrification and Power Electronics
2. Electric, Hybrid and ICE-based Powertrains
3. Advanced Combustion and Aftertreatment Systems
4. Batteries and Energy Storage Systems
5. Vehicle Energy Management and Energy Optimization
6. Vehicle Dynamics and Control



PhD Program in Automotive for Intelligent Mobility

PhD Programme Structure

2. Curricula

Curriculum 3: Vehicle Informatics and Connectivity

1. Vehicle Human Machine Interface and Infotainment systems
2. V2V - Vehicle to Vehicle and V2G - Vehicle to smart Grid interfacing
3. Gamification for Improving Driver Behavior
4. Vehicular networks, Vehicular Sensors and Big Data for Mobility
5. Automatic and Autonomous Drive
6. Connectivity for V2I - Vehicle to Infrastructure,
7. Data Analytics and Advanced Prediction Models



PhD Program in Automotive for Intelligent Mobility

PhD Programme Structure

3. Educational Activity

The PhD program in Automotive for Intelligent Mobility has the mission to pursue the highest level of education of the PhD student

Students must spend at least three months at a research center located outside Italy

Different seminars and events are scheduled by inviting lecturer from both Academia and Industry

The educational activity is designed to provide students with both high-level scientific competences and soft skills

Due to the subdivision in three curricula, most of the technical education activity is vertically oriented to each curriculum



PhD Program in Automotive for Intelligent Mobility

PhD Programme Structure

4. Interaction

The PhD Program takes advantage of well-established **national** academic interactions

1. Bottom-up educational thrust from:
 - Master Programs like MUNER (Master Program in Automotive)
 - Learning-by-doing Projects (Formula Student, MotoStudent)
2. Strong interaction between the University of Bologna, the University of Modena and Reggio Emilia and the University of Parma and other National Universities and Research Centres



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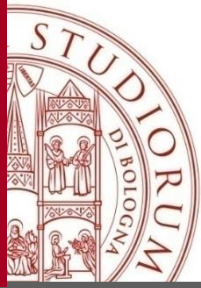
PhD Programme Structure

4. Interaction

The PhD Program takes advantage of well-established **international** academic interactions

1. High-level academia and research centers cooperation for exchanging students
2. Dual-degree agreements:
 - Agreement for International Joint Doctorate Supervision with MINES ParisTech, Paris, France
 - Framework Agreement for Awarding Dual Doctoral Degrees with Macao Polytechnic Institute
 - Dual/Joint Doctoral Degree Program with National Chiao Tung University (NCTU), Taiwan





PhD Program in Automotive for Intelligent Mobility

Information for Applicants

5. Admission

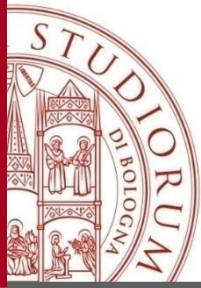
Students must hold a University Master of Science degree (or equivalent).

To be admitted to the Doctorate Program applicants must apply through a **competitive selection process** (<https://www.unibo.it/en/teaching/phd/information-enrolling-phd-programme/how-to-apply-phd-programme>)

The application window is open once a year between April and June

Knowledge of English is required (B2)





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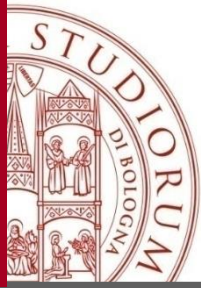
Information for Applicants

6. The approach to research

High-quality research is a priority for the Doctoral Course in Automotive for Intelligent Mobility.

High-quality research is pursued combining scientific rigor and technical relevance and it is characterized by:

1. Multi-disciplinarity
2. Multiple methodologies
3. Experimental methods, quantitative modelling, case studies and other qualitative methodologies, collaborative and action research
4. Leveraging on networks with centers of excellence (Academia and Industry)



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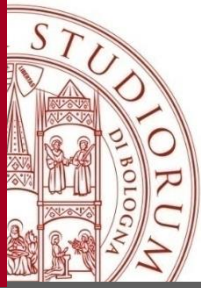
Information for Applicants

7. Career and Placements

Ph.D. graduates will have distinctive skills and advanced knowledge to pursue a high-profile professional career especially in the automotive and mobility engineering field and to carry out high-quality research at universities or other research institutions.

Job and Career opportunities include:

- Highly qualified position in the design, project management and management in the automotive and mobility industry, i.e, personnel able to drive innovation in the sectors of Automotive and intelligent, autonomous and connected vehicles in the coming decades
- Post doc positions, research fellows and young lecturers in Italian and foreign universities;

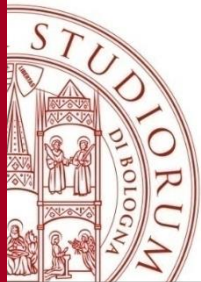


PhD Program in Automotive for Intelligent Mobility

Information for Applicants

8. Examples of Latest Ph.D. Projects (2020)

- Topological optimization for additive manufacturing of motorcycle components
- Lightweighting of automotive components by optimization of Selective Laser Melting process and heat treatment of high strength steels and light alloys
- Development and testing of control and diagnosis methodologies for innovative combustion systems
- Multicomponent modeling of reciprocating engine in-cylinder lubricant dilution
- Electrical engineering for high-efficiency and high-reliability electric vehicles
- Connected Vehicles for Beyond 5G Scenarios
- Integrated systems for autonomous driving



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