Overview
The Master Degree in “Advanced Automotive Engineering” fits within a collaboration between the four major Universities in Emilia-Romagna and the main Companies involved in the design and manufacturing of automobiles and motorbikes in the premium and racing sector: Automobili Lamborghini Spa, Dallara Automobili SpA, Ducati Motor Holding Spa, FCA Group - Maserati e Alfa Romeo, Ferrari Spa, Haas F1 Team, Magneti Marelli Spa, Scuderia Toro Rosso Spa (see https://motorvehicleuniversity.com/)

The course aims to provide knowledge and skills related to the design of motor vehicles and motorcycles, high-performance and racing.

The main features of the Master program are:

- Professors are selected by an Interuniversity Coordination Committee open to the involved Companies among academics and professionals, Italian and foreign, with recognized experience in the field, to maximize educational quality.
- Students, maximum 120 per year, are admitted to the master after a careful evaluation of their previous academic performance and motivation.
- Students are assigned, based on their ranking, and on the preferences they have expressed, to one of the six curricula offered in the Master.
- The first semester is common for all the students, and it is offered at the Engineering Department “Enzo Ferrari” in Modena, to provide common and solid engineering basis.
- Starting with the second semester, students are divided into six curricula (max. 25 seats each):
  - Advanced Powertrain – Bologna (offered in Bologna)
  - Advanced Motorcycle Engineering (offered in Bologna)
  - Advanced Sportcar Manufacturing (offered in Modena)
  - Advanced Powertrain- Modena (offered in Modena)
  - High Performance Car Design (offered in Modena)
  - Racing Car Design (second semester offered in Modena, and second year in Parma)
- All courses are offered in English, many with a laboratory part to be taken at one of the involved Universities, or at the facilities of the partner Companies, with a “Learning-by-Doing” logic.
- Internships for Master Thesis or activities in “Project Working” mode, taking place within the most important industrial companies in the automotive sector, or in University labs.

Admission
To be admitted to the master one needs:

- To have a First-level Italian degree, as defined either in DM 509/1999, or in DM 270/2004, or alternatively a Degree in any of the pre-existing “Ordinamenti”, or an equivalent Degree obtained abroad.
- To possess a proficiency in the English language that allows fluently reading a scientific text, and understanding and discussing topics during lectures.
- To be graduated with an overall mark not less than 95/110 (or equivalent for non-Italian candidates).

According to criteria established by the annual Call for applications, a suitably nominated Commission evaluates each candidate individually to ascertain technical skills and motivation.
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**Advanced Automotive Engineering**

**Studying abroad**
The Master Degree in “Advanced Automotive Engineering” allows students to study abroad by means of student mobility Programmes such as the Erasmus one, and to visit international laboratories or companies to perform internship and thesis activities.

**Continuing education**
After the graduation in “Advanced Automotive Engineering”, one may continue education by entering a PhD Programme or attending a second-level Master.

**Working opportunities**
The professional profile of the graduate student in Advanced Automotive Engineering is that of a professional who is able, based on an overall view of the vehicle system, to design, develop and build the main sub-systems that make cars and motorcycles. The focus is on premium and racing vehicles, and on mastering their technology and production processes.

The main functions in the industrial context are vehicle and powertrain architecture definition, and the design and development of subsystems and components related to: internal combustion, hybrid and electric powertrains, inclusive of innovative and alternative storage and energy conversion solution, and related modeling and control issues; production systems characterized by the typical aspects of the new industry 4.0 scenery (industrial robotics, engineering and supply chain management, big data, etc.); mechanical architecture of cars and motorcycles, both in the industrial and racing sector.

The multidisciplinary nature of the job profile is the Master main strength. However, given the increasing complexity of the new generation of motor vehicles, and the subsequent, progressive specialization of engineering functions, five specific job profiles have been designed, and implemented into six curricula:

1. powertrain systems specialist, deals with powertrain design and contributes to the development of traditional and innovative propulsion systems, with emphasis on their optimization, control and environmental and energy issues (Advanced Powertrain curriculum, Bologna and Modena);
2. motorcycle specialist, deals with the design and development of high-tech production and racing motorcycles. He can solve problems ranging from electronics engineering to industrial design, with a specific focus on motorcycle application (Advanced Motorcycle Engineering curriculum, Bologna);
3. production specialist, plans, develops and manages production systems in the automotive sector. The main knowledge areas are: process engineering, plant design and industrial systems, production management and optimization, automation solutions, digital factory technologies (curriculum Advanced Sportcar Manufacturing).
4. road vehicle specialist, is responsible for setting up and developing the vehicle system, based on the understanding of the fundamental aspects of the main mechanical groups and subgroups of high-performance road vehicles (curriculum High Performance Car Design, Modena);
5. racing vehicle specialist, is responsible for setting up and developing the vehicle system, based on the understanding of the fundamental aspects of the main mechanical groups and subgroups of racing vehicles. It differs from the previous one for greater specialization on the aerodynamic aspects, on the use of lightweight materials (Carbon Fiber Reinforced Materials), and on a strong ability to perform experimental activities (curriculum Racing Car Design, Modena and Parma).
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Study Plan (number of ECTS is reported between parentheses)

First Year

First common semester - Modena

Second semester
Advanced Powertrain – Bologna
Powertrain Design and Manufacturing (6) Electronics systems /Automatic controls (12) Electric Drives / Internal Combustion Engines (12)

Advanced Motorcycle Engineering
Powertrain Design and Manufacturing (6) Electronics systems /Automatic controls (12) Electric Drives/Internal Combustion Engines (12)

Advanced Sportcar Manufacturing
Powertrain Design and Manufacturing (6) Electronics systems /Automatic controls (12) Electric Drives/Internal Combustion Engines (12)

Advanced Powertrain - Modena

High Performance Car Design
CFD fundamentals and aerodynamics (9) FEM fundamentals and chassis design (9) Vehicle dynamics (12) Automotive Computer Aided Design CAD (12)

Racing Car Design
CFD fundamentals and aerodynamics (9) FEM fundamentals and chassis design (9) Vehicle dynamics (12) Automotive Computer Aided Design CAD (6)
Master Degree in
Advanced Automotive Engineering

Study Plan (number of ECTS is reported between parentheses)

Second Year

*Advanced Powertrain – Bologna*

*Advanced Motorcycle Engineering*

*Advanced Sportcar Manufacturing*

*Advanced Powertrain Modena*

*High Performance Car Design*
Vehicle NVH testing (6) Automotive Electronic systems (6) Automatic controls (6) Automotive fluid power systems (6) A Scelta (12) Tesi (12) Tirocinio e/o Laboratorio (12)

*Racing Car Design*
Experimental aerodynamics (6) Chassis and body design (6) Dynamic testing of vehicles (6) Lightweight materials and composites (6) A Scelta (12) Tesi (12) Tirocinio e/o Laboratorio (12)

Duration: 2 years
Total ECTS: 120
Diploma Class: LM-33 Mechanical Engineering Master