Politecnico di Torino

ACADEMIC REGULATIONS

Master's degree programme
in
AUTOMOTIVE ENGINEERING

Department of Mechanical and Aerospace Engineering
Collegio di Ingegneria Meccanica, Aerospaziale e dell'Autoveicolo

Academic Year **2025/2026**

The English translation of this document is provided as a support to the student community and has no legal effects. The Italian version shall constitute the sole authentic text and will be referred to for any legal matters.

SUMMARY

Art. 1 – Specific learning objectives and career prospects

1.1 Specific learning objectives

As regulations on vehicle consumption and emissions continue to tighten, companies have been prompted to radically rethink vehicle design. In recent years, there has been a clear trend toward electrification and the majority of vehicles in the coming years are expected to be either hybrid or fully electric. Another emerging trend concerns electronic and information technology systems: the availability of high-speed connectivity enabled by 5G networks, onboard sensor systems, and increasingly powerful processing capabilities will make future vehicles connected and autonomous. Furthermore, additive manufacturing and Industry 4.0 are driving a major transformation in production processes. These developments are also highlighted in the studies that analyse current industry trends.

The automotive industry has embraced these transformations, prioritizing them and seeking engineers—both in product and process development—who can work on highly interdisciplinary systems. These changes call for a new course catalogue organized into new specialist tracks (pathways) focused on the various aspects of next-generation vehicles:

- Autonomous and Connected Vehicles, focused on connectivity, autonomous driving and related AI technologies;
- Sustainable Propulsion Systems, which addresses the advanced development of propulsion systems for electric, hybrid, and internal combustion engine vehicles, with a focus on reducing fuel consumption and pollutant emissions;
- Advanced Product Development, dedicated to the methods and tools for vehicle design and development;
- Advanced Manufacturing Engineering, dedicated to the development and management of vehicle production processes, with particular attention to the latest innovations in the sector.

Consultations with the stakeholders have also highlighted the positive educational impact of student participation in Student Teams. These benefits stem from the high level of motivation among students and the opportunity to apply what they have learned to real-world cases.

The specific learning objectives are to provide students with:

- a comprehensive understanding of the vehicle system, its main subsystems, and its manufacturing processes, including: in-depth knowledge of conventional, electric, and hybrid powertrains; vehicle dynamics and driver assistance control systems; vehicle structures and active/passive safety; production processes; project management; logistics;
- the ability to apply what they have learned in class to the design and characterization of automotive components and systems;
- the ability to work in interdisciplinary teams, with a focus on innovation;
- the ability to integrate knowledge from different disciplinary areas and interact with specialists in various domains;
- the ability to work in a company, understanding its internal dynamics.

1.2 Career prospects

The Master's degree programme aims to train a variety of professional profiles. The career prospects and the main functions and competencies associated to each profile are illustrated below.

Professional profile	Main functions and competencies
Vehicle Propulsion System Design Engineer	Functions: • Define system and component specifications for vehicles with hybrid, electric, and conventional propulsion. • Design powertrain systems with internal combustion engines, electric, or hybrid configurations. • Design transmission systems for vehicles powered by internal combustion engines, electric drives, or hybrid solutions. • Develop control algorithms for propulsion systems and transmission systems. • Design thermal management and temperature control systems for vehicle propulsion. Competencies: • Model, characterize, and manage electric motors and their power electronics. • Simulate both electric and internal combustion engines. • Design hybrid and electric drivetrains and related subsystems. • Design internal combustion engines. • Develop control algorithms and architecture for vehicle traction inverters. Potential Employers: • Vehicle manufacturers and suppliers. • Automotive R&D centres. • Automotive consulting and training companies.
Advanced Diver Assistance Systems Design Engineer	Functions: • Define specifications for driver assistance systems and their subsystems. • Define specifications for propulsion management systems (conventional, hybrid, electric) and their subsystems. • Design propulsion management systems aimed at fuel efficiency optimization. • Develop systems for vehicle stability control and driver assistance. • Design mechatronic actuation systems for controlling both the vehicle and its powertrain. Competencies: • Model and design mechatronic systems. • Understand vehicle dynamics. • Apply control methods to automotive systems. • Use sensors and actuators in automotive applications. • Develop signal processing algorithms and apply artificial intelligence. • Design in-vehicle and communication networks. • Design actuation systems. Potential Employers: • Vehicle manufacturers and suppliers. • Automotive consulting and training companies. • Automotive R&D centres.

Product Development Engineer	Functions: • Develop and integrate vehicle systems while verifying compliance with functional, morphological, and economic requirements. • Define production equipment following the principles of Concurrent Engineering, integrating modern CAD/CAM/CAE techniques. • Manage environmental impact across the product life cycle by seeking energy- and resource-efficient solutions, lowering emissions, and increasing recycled content (Product Life Cycle Management). Competencies: • Model, characterize, and manage electric motors and power electronics. • Model and characterize vehicle aerodynamics. • Analyse vehicle dynamics and management systems. • Assess structural behaviour of mechanical and body components. • Design passive safety systems. • Apply product ergonomics. • Use both conventional and additive manufacturing technologies. • Apply strategic marketing and product planning methods. • Analyse product and process quality. Potential Employers: • Vehicle manufacturers and suppliers. • Automotive consulting and training companies. • Manufacturers of machinery and production systems for the automotive industry. • Automotive R&D centres.
Production Engineer	Functions: • Design, build, test, and run production plants; support logistics, with a focus on industrial automation and overall production optimization. • Organize work according to the principles of World Class Manufacturing (cost, continuous improvement, quality, environment, safety, training and development). • Optimize ergonomics and safety in production processes. • Plan and monitor production quality. • Evaluate the potential of innovative production methods (Additive Manufacturing, Industry 4.0). • Manage and assess the environmental impact of production plants, aiming to reduce energy and resource consumption, emissions, and increase the use of recycled material. • Coordinate with suppliers of production equipment. • Optimize logistics and supply chains, considering different modal and intermodal transport systems, as well as institutional and regulatory frameworks. Competencies: • Set up and manage development processes for automotive products. • Design handling systems and warehouses. • Design production systems, particularly with Lean Production applications. • analyse product costs and value. • Manage commercialization processes of vehicles and related services. • analyse and plan plant logistics using mathematical modeling techniques. Potential Employers: • Vehicle manufacturers and suppliers. • Manufacturers of production equipment and machinery for the automotive industry and beyond.

Continuing studies	Background knowledge required for further studies
Ph.D. programme or 2-level Specializing Master's programme	The technical and scientific knowledge that students acquire by the end of the Master's degree programme in Automotive Engineering not only allows for immediate integration into the workforce at a high professional level but also provides opportunities for further in-depth studies. Graduates with a strong inclination for research in technologically advanced fields can enrol in specific Ph.D. programmes (lasting three years), which may focus on automotive-related topics, or they can choose a second-level Specializing Master's programme.

1.3 Professional profiles (ISTAT codes)

With reference to the list of professional profiles classified by ISTAT (Italian National Institute of Statistics, https://www.istat.it/en/), graduates from this Master's degree programme can work as:

ISTAT code	Description
2.2.1.1.1	Ingegneri meccanici
2.2.1.3.0	Ingegneri elettrotecnici e dell'automazione industriale
2.2.1.7.0	Ingegneri industriali e gestionali

Art. 2 – Admission requirements

Italian regulations on enrolment in Master's degree programmes require Italian universities to check that applicants meet the following requirements:

- have a **three-year Bachelor's degree or university diploma**, or **other educational qualification obtained outside Italy** and recognized as suitable for admission;
- meet specific curricular requirements;
- have an **academic performance considered suitable** for admission.

CURRICULAR REQUIREMENTS

As far as curricular requirements are concerned, applicants must have a Bachelor's degree or a three-year university diploma or another educational qualification obtained abroad, recognized as valid. Applicants must also have acquired knowledge and competencies (credits) in specific Scientific Disciplinary Fields (settori scientifico-disciplinari) or in groups of Scientific Disciplinary Fields.

In particular, applicants must have earned:

- minimum 40 credits in the following Scientific Disciplinary Fields (settori scientifico-disciplinari): CHIM/07, FIS/01, FIS/03, ING-INF/05, MAT/02, MAT/03, MAT/05
- minimum 60 credits in the following Scientific Disciplinary Fields (settori scientifico-disciplinari) of specific subjects: ING-IND/08, ING-IND/10, ING-IND/12, ING-IND/13, ING-IND/14, ING-IND/15, ING-IND/16, ING-IND/21, ING-IND/22, ING-IND/31, ING-IND/32, ING-IND/35, ING-INF/01

The credits of the Scientific Disciplinary Fields found both in the first group and in the second group are primarily counted for the first group. The remaining credits are counted for the second group. Therefore, the credits of a course can be counted partly to reach the minimum number of credits of both groups.

Applicants who lack less than 10 credits can be admitted to the programme by the Academic advisor of the degree programme. For applicants who lack more than 10 credits, the evaluation will be subject to the final approval of the Coordinator or the Vice coordinator of the degree programme.

Applicants who do not meet the curricular requirements are required to make up for their unfulfilled curricular requirements (missing credits) before enrolment, by means of:

- **enrolment in single courses in order to make up for unfulfilled curricular requirements**: this is possible for students who need to earn up to a maximum of 60 credits. Students who enrol in single courses for this reason are allowed to include in their Personal Study Plan exclusively the courses assigned by the evaluator.
  or else,
- **credit transfer at Bachelor's level**: this is possible for students who need to earn more than 60 credits. In this case, students need to enrol in the Bachelor's degree programme that offers the credits in the specific Scientific Disciplinary Fields (core subjects and commentary subjects) required for admission to this Master's degree programme.

SUITABLE ACADEMIC PERFORMANCE

Applicants must have a suitable academic performance and an English language certificate (B2 level or above, as defined by the Common European Framework of Reference for Languages: Learning, Teaching, Assessment - CEFR).

The academic performance will be assessed as follows.

1) Applicants from Politecnico di Torino

Applicants can be admitted to the programme if they earned their Bachelor's degree in:

- 4 years or less (1)- no exam average grade required;
- between 4 and 5 years (1)–exam weighted average grade (2) required: ≥21/30
- more than 5 years– exam weighted average grade (2)required: ≥ 24/30

The weighted average grade is calculated on all accrued course credits (graded on a scale of 30) counting towards the

achievement of the Bachelor's degree, after having subtracted the worst 28 credits.

The duration of the Bachelor's path is calculated based on the number of academic years in which the applicant has been enrolled at the university, starting from the first enrolment in the Italian university system:

- for full-time students: the duration of the Bachelor's path is equivalent to the number of academic years of enrolment.
- for part-time students: each year of enrolment is counted as half-year.
- for full-time students taking part in the "Dual Career" programme: each year of enrolment is counted as half-year, as for part-time students.

In the event of credit transfer, the duration of the Bachelor's path must be increased proportionally to the number of credits that have been recognized by Politecnico (10-60 CFU =1 year, etc.). The worst 28 credits must be subtracted proportionally to the number of validated credits.

(1) Applicants must have graduated by the end of the December Graduation Period
*(2) The weighted average is calculated as follows: ∑(grade*credits) / ∑credits*

2) Applicants from other Italian universities

Applicants who have a Bachelor's degree awarded by another Italian university must have a weighted average grade of all the exams ≥ 24/30, regardless of the number of years it took them to graduate. The weighted average grade (∑(grade*credits) / ∑credits) is calculated on all accrued course credits (graded on a scale of 30) counting towards the achievement of the Bachelor's degree, after having subtracted the worst 28 credits.

3) Applicants with a non-Italian educational qualification

To be admitted to Politecnico Master's degree programmes, applicants must have an academic qualification awarded by an accredited/recognized foreign university, earned after completing at least 15 years of total education (including primary school, secondary school and university).
Applicants who have attended a university programme lasting five or six academic years (different from the 3+2 system) without completing it must still meet the minimum requirement of 15 years of total education (of which at least 3 years at university level) and they must have earned at least 180 ECTS credits or equivalent. Pre-university courses or foundation years cannot be counted towards the minimum number of credits or the minimum numbers of years of total education mentioned above.
The applicant's academic performance and the consistency between the degree programmes offered by Politecnico and the applicant's previous academic path are assessed by the professors appointed by Coordinator of the Collegio. The evaluation is carried out on the Apply@polito platform under the section called "applicants with a non-Italian qualification."

A positive evaluation (offer of admission) allows applicants to enrol in the programme only in the academic year in which the application has been submitted. Admitted applicants who do not complete the enrolment process within the deadlines are required to apply again to the programme in the next academic years.

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More information is available at https://www.polito.it/en/education/applying-studying-graduating/admissions-and-enrolment/master-s-degree-programmes

Art. 3 – Programme curriculum

3.1 Programme overview

The educational path includes a common Year 1, during which students learn more in depth about internal combustion engines, electric and hybrid drive systems (including battery packs), energy management, vehicle dynamics, driver assistance systems, vehicle bodywork, and aerodynamics. At the end of Year 1, students begin to study specialization subjects, which anticipate the four specialist tracks of Year 2:

- Autonomous and Connected Vehicles
- Sustainable Propulsion Systems
- Advanced Product Development
- Advanced Manufacturing Engineering

All courses are English-taught.

To conclude the programme students must work on a thesis project either at an external company or at the University.
The specific educational objectives of the thesis are to:

- address engineering topics related to the course of study while applying the competencies gained during the educational path, working independently on company or research projects, with the ability to critically examine the problem at hand.
- collaborate with colleagues in interdisciplinary workgroups to carry out the project.
- present, and discuss the results obtained and the methodologies used. Furthermore, demonstrate the ability to synthesize and communicate the content of one's work during a public presentation (oral defence).

Many students work at their thesis project in collaboration with automotive companies, which allows them to engage with businesses and apply what they have learned. This experience often leads to employment immediately after graduation.

3.2 Organization of educational activities

The list of courses (compulsory and optional), curricula, possible organization of courses into modules, any pre-requisites and exclusions and the list of the faculty members responsible for the courses are available at: https://didattica.polito.it/pls/portal30/sviluppo.offerta_formativa_2019.vis?p_a_acc=2026&p_sdu=32&p_cds=464&p_ori=18173

The list of the Scientific Disciplinary Fields (Settori Scientifico Disciplinari) for each activity (specific subjects and complementary subjects) is available at: https://didattica.polito.it/pls/portal30/sviluppo.vis_aiq_2023.visualizza?sducds=32464&tab=0&p_a_acc=2026

Art. 4 - Student career

The Student Guide is published on the Teaching Portal every year before the beginning of the academic year. There is a specific Student Guide for each Master's degree programme. The Student Guide is available on the web site of the degree programme.

It contains information and deadlines on:

- academic calendar;
- Personal Study Plan and Annual Personal Study Plan;
- free choice credits;
- internships;
- tuition fees;
- dual career;
- classes and exams;
- class delivery;
- foreign language learning;
- studying abroad/mobility programmes;
- exam rules;
- transfers in/out and internal transfers;
- interruption, suspension, withdrawal, forfeiture;
- credit transfer

Art. 5 - Final Examination

The final examination represents an important learning activity of the Master's educational path. Students are required to develop a thesis project in an original manner under the guidance of a supervisor. Candidates must demonstrate the ability to address topics related to the course of study, the capacity to work independently and the ability to critically review available documentation. They must also show the ability to synthesize and communicate the content of their work and defend it during a public discussion (oral defence). More than half of students work on their thesis project in collaboration with automotive companies, which allows them to engage with businesses and apply what they have learned.

Students can choose between a 20-credit thesis or a 12-credit thesis combined with an 8-credit internship.

The opportunity to work on the thesis project at a private company is very important for students. Companies offer various opportunities for integration during the thesis period, and in most cases, in the end students get a job offer.

Students must submit their thesis application and request the thesis topic online through a dedicated procedure available in their personal page on the Teaching Portal, under the section entitled "Thesis," in compliance with the Graduation Periods deadlines published in the Student Guide – Thematic Calendar Section.

Graduands are required to publicly present and discuss their thesis (oral defence) in front of the Graduation Examining Committee. They must demonstrate the ability to work independently, the mastery of the topics, and the ability to synthesize and communicate the content effectively, as well as the capacity to engage in a discussion.

The final grade is given by the Graduation Examining Committee. Its members evaluate the overall average grade of all the exams on a scale of 110. The committee may add up to a maximum of 8 points, considering the following factors:

- quality of the thesis work (commitment, autonomy, methodological rigor, relevance of results, etc.);
- thesis oral defence (clarity in presentation, etc.);
- outstanding results achieved during the academic path (number of honours, time to graduation).

A degree with honours (lode) may be awarded at the Committee's discretion if the total score is at least 110, upon qualified majority (at least 2/3 of the Committee members).

If the thesis meets the required standards, the Committee may grant the *dignità di stampa* (printing honour) only if the final grade is 110 cum laude and the Committee's decision is unanimous.

More Information and Deadlines:

- Student Regulations
- Student Guide

Diploma Supplement:

In compliance with article 11, paragraph 8, of Ministerial Decrees No. 509/1999 and 270/2004. Politecnico di Torino issues the Diploma Supplement, a document that can attached to a higher education qualification. It is designed to improve the transparency of international qualifications, as it provides the description of the curriculum successfully completed by the student. This certificate follows the European model developed by the European Commission, the Council of Europe and UNESCO – CEPES: it is issued in two languages (Italian-English) and it is composed of approximately 10 pages.

More information at https://www.polito.it/en/education/applying-studying-graduating/academic-experience/certificates-and-other-documents

Art. 6 - References

6.1 Student Regulations

The Student Regulations define the rights and responsibilities of students and set out the administrative and disciplinary rules that all students enrolled in a degree programme or in a single learning activity at Politecnico must abide by.

6.2 Other Regulations

Particular aspects of students' academic progress are governed by specific Regulations or Calls for Applications published on its website.
In particular:

- The Tuition Fee Regulations specify the annual tuition fees that students must pay. The procedure for requesting a tuition fee reduction is explained in a dedicated guide.
- The University Regulations on Funds for Student Mobility Abroad outline the principles and rules for awarding and disbursing mobility grants. Standard procedures apply to all types of mobility programmes with unified Calls for Applications published twice a year at https://www.polito.it/en/education/applying-studying-graduating/studying-abroad
- The Code of Ethical Conduct also applies to students.