Politecnico di Torino

ACADEMIC REGULATIONS

Master's degree programme

in

ELECTRONIC ENGINEERING

Department of Electronics and Telecommunications

Collegio di Ingegneria Elettronica, delle Telecomunicazioni e Fisica

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

Electronic Engineers holding a Master's degree are able to work in research, design and development at the forefront of technology, where not only advanced components and methodologies must be employed, but also new ones need to be developed to implement innovative applications or to achieve optimal cost/performance ratios. This requires the ability to manage complex projects operating at the limits of technological feasibility, to design and implement new custom components and subsystems in the form of integrated circuits or Systems-on-Chip, and to adopt innovative methods and procedures.
Application areas range from various sectors of information technologies (telecommunications, information processing, measurement and sensing) to fields where electronics may not be immediately visible but plays a crucial role in enabling functionalities and performance (e.g., automotive and transportation, aerospace, robotics, environmental monitoring, and consumer goods).
Information Technologies—and electronics in particular—are widely pervasive across industry, services and everyday life, offering new solutions and opportunities in a broad range of application areas. From a design perspective, Master's-level Electronic Engineers are capable of analysing application requirements and translating them into design specifications, even in the case of complex systems.

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
System Analyst Engineer	Functions: As a System Analyst, the Master's-level Electronic Engineer defines the technical requirements of electronic devices, systems or equipment, including those of high complexity, and is able to develop specific elements for the intended application. They draft the design specifications and use simulation models to define the expected behaviour of the product to be subsequently designed. They act as an interface between the client and the design team during the implementation and testing phases, ensuring compliance with specifications. Competencies: The analyst has in-depth knowledge of basic and advanced devices and components used in electronic circuits and systems, as well as their applications in computing, telecommunications, automation and related fields. System-level expertise is essential, meaning the ability to define overall functionality—along with global performance and cost—by selecting and interconnecting building blocks. The analyst is also skilled in electronic measurements, including advanced techniques, which are crucial for testing and verifying compliance with specifications. Potential employers: Manufacturing or service companies operating in the ICT sector or in other economic sectors such as mechanical engineering. Design firms. Public and private organisations.
System Designer	Functions: As a System Designer, the Master's-level Electronic Engineer designs integrated systems implemented either as a single component with complex functionalities embedded in one integrated circuit or as systems composed of multiple integrated circuits. This role involves both integrating pre-existing components and designing new ones, with the aim of developing a highly complex electronic system. Competencies: For this role, the Electronic Engineer has specific expertise in integrated and non-integrated devices and circuits, as well as in design methodologies (hardware/software trade-offs, design optimisation and testing techniques, use of CAD tools). The Electronic Engineer can evaluate the best trade-off between parameters such as performance, power consumption, cost, and reliability. They are also able to manage the production and installation of electronic systems, as well as process and product quality control.

	Potential employers: Manufacturing companies operating in the ICT sector and other industrial sectors.
Circuit Designer	Functions: The Master's-level Electronic Engineer designs and develops electronic systems either by using commercial components or subsystems, or by designing custom components, including integrated ones. This activity includes PCB design and layout, production planning and final testing. In this role, the circuit designer defines and develops analog, digital, or mixed-signal (A/D) circuits and various functional units, based on system requirements. Competencies: The circuit designer has thorough knowledge of the principles and state of the art in analog and digital electronic devices, the technologies involved, and CAD design tools. The circuit designer is also skilled in the technologies and behaviour of active devices, sensors, and actuators. He/she can perform laboratory measurements and calibrate measurement instruments. Potential employers: Companies involved in the production, marketing, and distribution of electronic, IT, and biomedical devices and systems.
RF and Communication Systems Designer	Functions: An RF and communication systems designer develops the hardware and software components of electronic systems operating in the telecommunications field, including both wireless systems (mobile systems, satellite systems, LANs, home automation, broadcasting) and wired systems (optoelectronics, LANs, WANs, automotive applications). Their work focuses mainly on the design of the overall system and its functional units, using integrated circuits and functional blocks at various levels of complexity, from individual devices to complete radio systems. In this context, the Master's-level Electronic Engineer is primarily responsible for hardware-related aspects. Competencies: This role requires advanced knowledge of analog and digital electronics, including radio frequency and microwave systems, reconfigurable systems, A/D and D/A conversion circuits, and design methodologies (hardware/software trade-offs, design optimisation, and testing techniques) for both wireless and wired communication systems. The engineer is also able to install and manage a variety of communication systems. Potential employers: Companies involved in the production, marketing, and distribution of electronic, IT, and biomedical devices and systems.
Research and Development Engineer	Functions: The Master's-level Electronic Engineer working in research and development designs prototypes at various levels in all areas of electronics—analog, digital, and radio frequency. They characterise prototypes in the laboratory using advanced instrumentation, explore new manufacturing techniques for very large-scale integrated circuits, and they patent new devices and production processes. They also present their work at electronics and microelectronics conferences and publish results in specialised journals. Competencies: An R&D engineer possesses broad expertise, ranging from the physics of semiconductors and materials used in microelectronics, to fabrication technologies for devices and integrated circuits, design techniques, characterisation methodologies using electronic instrumentation, and applications of electronics in the information technology industry and related sectors. Potential employers: Research centres and companies engaged in innovation.
Laboratory Manager	Functions: The Master's-level Electronic Engineer may be employed in development or production laboratories as a highly specialised technician or as the laboratory manager. In the managerial role, they are responsible for organising team activities, defining R&D strategies in alignment with the client's goals, and recruiting specialised technical staff required for the laboratory's operations. Competencies:

	A laboratory manager is proficient in all stages of the design, prototyping and production of electronic systems or devices, including highly complex ones based on very large-scale integration technologies. In particular, engineers in this role are familiar with the design and manufacturing technologies of integrated circuits and electronic boards; they can select components based on the best cost-performance trade-off; they are skilled in the use of laboratory instrumentation and design software and have expertise in automatic control systems to manage or develop production tools. They also have competencies in human resource management. Potential employers: Research and development laboratories, testing and characterisation centres for electronic systems and devices, in both public and private companies and research institutions.
Technical Sales Specialist	Functions: The Master's-level Electronic Engineer working in technical sales supports clients throughout all stages—from the definition of technical specifications to the sale and post-sale services—concerning high-tech electronic products or systems that incorporate electronic components. They can organise and deliver presentations and demonstrations of electronic systems and devices, both at specialised trade fairs and directly at client sites. They also act as a liaison between design teams and marketing professionals. Competencies: Managing relationships with clients—whether individuals, companies, or institutions—purchasing electronic systems, particularly those with high added value and complexity, requires strong technical expertise as well as communication and sales process management skills. The Master's-level engineer in a technical sales role has an in-depth understanding of electronic components and system technologies, along with knowledge of reliability, maintenance, performance, and energy consumption. They are also able to assess the various parameters involved in developing applications based on electronic systems of varying complexity. Potential employers: Companies involved in the production, marketing, and distribution of electronic, IT, and biomedical devices and systems.
Freelance Professional	Functions: The freelance Master's-level Electronic Engineer proposes solutions for launching new business ventures and production processes that require the use of electronic devices, either as part of the production infrastructure or as final products. They recommend the most suitable circuit-level or system-level solutions—integrated if needed—for a given application in the field of information technology or related sectors. They design the required device, integrated circuit, or electronic system and manage the manufacturing process, often relying on third-party companies when consulting for clients outside the electronics sector. Competencies: Freelance professionals are skilled in all stages of the design, prototyping and production of electronic systems or devices, including those of very high complexity using very large-scale integration technologies. They are able to select the most appropriate basic electronic components for a given project based on the best cost-performance trade-off. They can propose and design new components that meet project specifications when off-the-shelf solutions are not available. They are proficient in using design software and have expertise in automatic control systems, enabling them to recommend or design new production equipment. In addition, they can provide advice on existing patents and on procedures for filing new ones. Potential employers: Consulting roles in companies, public bodies, courts, and other organisations.

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
2.2.1.4.1	Ingegneri elettronici
2.2.1.4.2	Ingegneri progettisti di calcolatori e loro periferiche

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 an educational qualification obtained outside Italy and recognized as suitable for admission. In addition, they must have gained specific knowledge and competencies during their previous academic path (credits in specific Scientific Disciplinary Fields).

In particular, applicants must have earned:

- minimum 40 credits earned in the following Scientific Disciplinary Fields (settori scientifico-disciplinari): FIS/01, FIS/03, ING-INF/05, MAT/02, MAT/03, MAT/05
- minimum 60 credits earned in the following specific Scientific Disciplinary Fields (settori scientifico-disciplinari): CHIM/07, ING-IND/22, ING-IND/31, ING- IND/33, ING-INF/01, ING-INF/02, ING-INF/03, ING-INF/04, ING-INF/05, ING-INF/06, ING-INF/07.

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

a) 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 required (2): ≥21/30
- more than 5 years– exam weighted average grade required (2): ≥ 24/30

b) admissions by merit-based evaluation of the Evaluation Committee

Applicants who do not have the above-mentioned average grade can take an admission test if they earned their Bachelor's degree in:

- between 4 and 5 years (1) –exam weighted average grade required (2): < 21/30
- more than 5 years– exam weighted average grade required (2): > 21/30 and < 24/30

provided that during their Bachelor's path the weighted average grade of the exams belonging to the Scientific Disciplinary Fields (settori scientifico-disciplinari) ING-INF/01, ING-INF/02 and ING-INF/07 is ≥ 24/30.

The details of the admission test are available in the section below "Merit-based evaluation for applicants from Politecnico di Torino and from other Italian universities".

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 on the basis of 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

A) 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.
B) admissions by merit-based evaluation of the Evaluation Committee

Applicants with a weighted average grade > 21/30 and <24/30 can take an admission test (merit-based evaluation), provided that during their Bachelor's path the weighted average grade of the exams belonging to the Scientific Disciplinary Fields (settori scientifico-disciplinari) ING-INF/01, ING-INF/02 and ING-INF/07 is ≥ 24/30
The details of the admission test are available in the section below "Merit-based evaluation for applicants from Politecnico di Torino and from other Italian universities".

<u>Merit-based evaluation for applicants from Politecnico di Torino and from other Italian universities.</u>

The merit-based evaluation (admission test) aims to ascertain specific requirements in order to verify that prospective students have the knowledge, competencies and aptitude to the contents and learning objectives of the Master's degree programme.
The admission tests consist in an oral interview (it can also be a remote interview) about the subjects of the following Scientific Disciplinary Fields: ING-INF/01, ING-INF/02 and ING-INF/07

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

Students from Politecnico who have been admitted to the programme and have advanced some Master's courses (taken during their Bachelor's path) are allowed to enrol without retaking the admission test also in the next academic year, provided that they meet the other admission requirements.

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.

In addition to having an adequate academic background and certified knowledge of English (minimum B2 level), applicants who wish to enrol in an Italian-taught degree programme also have an Italian language certificate (minimum B2 level), as defined by the Common European Framework of Reference for Languages (CEFR), as an admission requirement.

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The applicant's academic performance and the consistency between the degree programmes offered by Politecnico and the applicant's previous academic background are assessed by the professors designated 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.

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 Master's degree programme in Electronic Engineering has a broad-based approach and offers expertise ranging from technologies to the design of circuits and systems, including algorithmic and application-oriented aspects. The programme provides comprehensive training in the various core fields of electronics, supplemented by in-depth knowledge of measurement systems, electromagnetic fields, and digital information processing.

Given the wide range of possible specialisations—not limited to strictly electronic topics but covering all areas of ICT—the current academic regulations have been designed to offer students a high degree of flexibility. Up to 18 free choice credits can be used to build personalised study paths focused either on specific areas of electronics (such as devices, digital/analog/radiofrequency circuits and systems), or on interdisciplinary paths including substantial content from other ICT domains—particularly computer science (embedded systems), telecommunications (wireless systems), microsystems, and industrial applications.

Over the years, this flexibility has enabled students to enrich their educational experience by acquiring cross-disciplinary skills that complement and extend their core knowledge of electronics. This approach integrates advanced expertise in communications, computer science and information technology more broadly. This choice has also received strong support from local industry, which expresses a clear demand for broad-spectrum electronic engineers, not narrowly focused on just one or two areas of specialisation.

The courses are taught in both Italian and English, and students can choose to attend either an entirely English-taught path or one predominantly in Italian. The curriculum includes a set of compulsory courses and a wide range of optional courses, enabling students to shape their own study plan around specialist areas of electronics, as detailed below.

At the end of the programme students must write a thesis (which may be written in English) under the supervision of a faculty member. Thesis work can also be conducted in collaboration with companies or foreign universities. The programme has established active partnerships with international universities, offering the opportunity to obtain joint or double degrees.

Year 1

In Year 1, several courses are designed to align students' background knowledge in Electronics, Mathematics, and Measurements with the requirements of more advanced courses. These are structured into four course pairs:

1. Digital Electronics / Integrated Digital Systems
2. Measurement Systems and Sensors / Testing and Certification
3. High-Speed Electron Devices / Optoelectronics
4. Analog and Power Electronics / Analog and Telecommunication Electronics

These are complemented by one free choice course in one of the following areas:

- Mathematics: Finite Elements Modeling
- Telecommunications: Signal Processing and Optical Transmission Lab or Signal Processing and Wireless Transmission Lab
- Systems: Embedded Systems Integration

The study plan must include one and only one course from each pair, and one course from the three elective options listed above.

In the "automatically approved study plans", a recommended course is indicated from each pair. This recommendation is not binding but aims to support a coherent academic pathway. Students may also choose the alternative course in each pair—for example, based on language preference.

Interdisciplinary Workshops

The programme includes three interdisciplinary workshops, designed to help students develop transversal skills. These activities are awarded 4 extra-curricular credits and serve a dual purpose:

1. Applying theoretical concepts to real-world cases;
2. Developing and refining soft skills required by the job market, such as teamwork, communication, autonomous learning, and effective presentation of one's work.

Specialist Tracks in the Master's degree programme in Electronic Engineering

The programme offers the following study tracks (a detailed description is provided in the course list of each track):

- Electronic Micro- and Nanosystems (all courses taught in English)
- Devices and Technologies for Integrated Electronics and Optoelectronics (all courses taught in English)
- Design of Power and Analog Electronics (some courses in English)
- Microelectronics (some courses in English)
- Electronic Systems (some courses in English)
- Radiofrequency Systems Design (most courses in English)
- Embedded Systems (all courses in English)
- Electronics for Industrial Applications (some courses in English)

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=37&p_cds=552&p_ori=17204

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_aig_2023.visualizza?sducds=37552&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 is worth 30 credits. Developing and writing a thesis normally requires a period of approximately 6 months of full-time work. Students can choose a 30- credit thesis or, alternatively, a 12-credit internship in a company followed by an 18-credit thesis.

The Final Examination involves an analysis, a project, or an innovative application, on a topic that must be consistent with the educational objectives of the degree programme. Students are required to write a final written document (Master's thesis). The courses offered in Year 2 are organized in a way that leaves sufficient time for the development of the thesis. Students who have completed all the exams are eligible to be admitted to the final examination.

The Master's thesis serves as a comprehensive assessment of the student's mastery of technical content, organizational and communication skills, and individual work capabilities in relation to complex analyses or projects. The final examination typically requires the application of knowledge gained from multiple courses, the integration of additional elements and the ability to propose innovative ideas. The topic and the activities connected with the thesis must be agreed upon with a faculty member from the Politecnico (a thesis supervisor and an internship tutor, if this is the case). Students are allowed to work on their thesis project also at external organizations or companies, in Italy or abroad, under the supervision of a thesis supervisor from Politecnico and a tutor from the external institution.

Students are required to publicly present and discuss the preparation activities for their thesis and the corresponding results (oral defence) in front of a Graduation Examining Committee, who will evaluate both the work carried out and the presentation.

The Master's thesis and its oral defence may be in English.

Each student must agree upon the thesis topic and activities with the Thesis Supervisor who is in charge of guiding the student during the educational path and thesis development.

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.

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:

- quality of the thesis work (commitment, autonomy, methodological rigor, relevance of results achieved, 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 112.51.

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.