Politecnico di Torino

ACADEMIC REGULATIONS

Master's degree programme

in

COMPUTER ENGINEERING

Department of Control and Computer Engineering

Collegio di Ingegneria Informatica, del Cinema e Meccatronica

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

The Master's degree programme in Computer Engineering trains professionals capable of designing, engineering, developing, and managing complex information systems.

The main areas of education include:

- Automation and Intelligent Cyber-Physical Systems, with a focus on the design and both theoretical and experimental analysis of complex systems;
- Embedded systems, aimed at the logical-level design of complex digital systems;
- Graphic and multimedia, with a focus on modelling and rendering, representation environments, and the compression and transmission of audio and video signals;
- Software applications, for the design and management of enterprise information systems and the coordination of software development projects;
- Computing and Network infrastructures, for software development in distributed and cloud-based environments, and for the performance evaluation of distributed systems;
- Data analytics and artificial intelligence, to acquire both theoretical and technological tools for data processing using AI-based technologies.

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
Designer of distributed, networked, data center and cloud systems	Functions: Graduates in Computer Engineering who specialise in the design of distributed, networked, data center and cloud systems can design and implement complex computer systems based on networked computers and devices. These may include enterprise systems, systems for telecom operators and service providers, or IoT (Internet of Things) systems connected to the cloud. They can work at various levels, from the infrastructure level (e.g. the design and sizing of corporate IT networks) to the application level (e.g. the design and development of software systems operating on the Internet, intranets and cloud platforms). Competencies: In their work, designers of distributed, networked, data center and cloud systems can: • define system requirements and architecture; • select appropriate hardware and software components; • specify and implement new components for integration; • identify specific security and protection requirements for distributed systems; • ensure compliance with the complex system and user requirements that characterise distributed systems. Potential employers: IT departments of medium to large companies; IT and non-IT consulting firms; Cloud service companies; IoT system integrators; Telecommunication operators and service providers; Manufacturers of telecommunication equipment.
Designer in Computer Graphics and Multimedia	Functions: Graduates in Computer Engineering specialising in graphics and multimedia design and develop graphical and multimedia systems and applications. Their work may involve the development of interactive systems and applications as well as platforms for offline multimedia content creation (e.g. computer-animated films). Application domains cover all areas of graphics and multimedia—from web applications to

	entertainment, from virtual reality to mixed and augmented reality systems. Competencies: Graphics and multimedia specialists in Computer Engineering can: • design and develop interactive graphical systems and applications; • use commercial software tools (e.g. modelling and simulation tools) to create computer animations; • design and develop image processing algorithms, including those based on artificial intelligence techniques; • design and develop virtual and augmented reality applications; • critically select the most suitable combination of hardware, software, and networking solutions for different application scenarios, including multimedia encoding techniques, transmission paradigms (client-server or peer-to-peer), network protocols, quality-of-service control techniques, resource dimensioning, and the measurement of perceived quality for end users. Potential employers: Software development and web production companies; Advertising and marketing firms; Multimedia and publishing companies, including those in video production; Companies operating in image processing and computer vision.
Software Application Designer	Functions: Graduates in Computer Engineering with a focus on software can define the architecture and design complex software systems based on specifications. They also plan and manage the development of software products or services. Modern systems typically include a user interface (web, mobile, or traditional), a business logic layer, and a database; they rely on commonly available and usually standard hardware platforms and operating systems and are often built by integrating and adapting software components available on the market. Application domains include high-level software solutions supporting business operations, organisational processes, and public administration services. Competencies: Software application designers can: • analyse the requirements of complex systems; • evaluate alternative solutions in terms of both functional and non-functional requirements (e.g. reliability, usability, performance, cost); • define the architecture and design software systems; • assess and select programming languages, development technologies, libraries, and software components; • carry out software verification and testing. Potential employers: IT departments of medium to large companies; IT and non-IT consulting firms; Software development companies.
Designer of intelligent control and industrial automation systems	Functions: Graduates in Computer Engineering specialising in intelligent control and automation systems are involved in the modelling, optimisation, and control of both complex applications (such as robotic, automotive, and aerospace systems, or smart grids) and industrial manufacturing processes. Particular attention is paid to the integration of physical system dynamics with computation, communication, and control components (cybernetics), which represents a key aspect of the so-called Fourth Industrial Revolution. Competencies: Computer engineers specialising in intelligent control and industrial automation systems can: • design and implement optimisation, estimation, and control algorithms for the automatic management of complex and/or distributed cyber-physical systems. These competencies can be applied across various industrial domains, including automotive, robotics, factory automation, and energy distribution. Potential employers: Companies operating in the industrial sectors of robotics, aerospace, automotive, and energy

	production/distribution; Manufacturing companies requiring automated production systems.
Embedded Systems Designer	Functions: Graduates in Computer Engineering who work as embedded systems designers can design hardware/software systems based on specific requirements. These systems are typically implemented on dedicated hardware and are capable of meeting application-specific constraints such as performance, power consumption, size, reliability, and cost. Application areas include all sectors that rely on electronic systems and devices, such as telecommunications, biomedical technologies, automotive, avionics, home automation, and, more broadly, the Internet of Things (IoT). Competencies: Embedded systems designers can: • integrate basic components already designed or available (Intellectual Properties – IP); • design new hardware components at the device, board, and system level; • identify the most suitable operating system for the given scenario and develop the specific low-level software (firmware) for the hardware in use; • develop software applications using both high-level languages and assembly, considering applicable standards and regulatory constraints; • analyse hardware/software trade-offs; • optimise hardware design by incorporating testing techniques and considering non-functional constraints (e.g. reliability and power consumption), in order to achieve the best possible balance among performance, power consumption, cost, and reliability. Potential employers: Companies operating in the consumer electronics, automotive, biomedical, and avionics sectors; Technology-intensive industrial companies; IT consulting firms.
Designer of IT systems for artificial intelligence and data analytics applications	Functions: Graduates in Computer Engineering who work as data analysts perform the following tasks: • analyse the requirements of systems and data analysis processes; • design IT systems and processes for data extraction, secure transmission, storage, visualisation, and analysis of large volumes of heterogeneous data; • develop and implement methodologies for data analysis processes; • use and adapt machine learning and artificial intelligence algorithms to perform data analysis, build predictive models, and optimise processes. Competencies: Data analysts can perform requirements analysis and design IT systems and data analysis processes thanks to the following competencies: • knowledge of IoT systems and techniques for designing communications among devices and distributing computation across edge/cloud environments; • understanding of distributed systems and NoSQL databases used to collect, store, and analyse large volumes of heterogeneous data; • ability to solve data-driven problems; • knowledge of methodologies and programming languages for big data applications; • familiarity with machine learning, deep learning, and artificial intelligence algorithms used for data analysis; • ability to integrate and redesign learning and AI methodologies. Potential employers: IT departments of medium to large companies; IT and non-IT consulting firms; Software development companies; Large corporations with dedicated departments for data analysis and predictive modelling; Companies specialising in the development of artificial intelligence methodologies.

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
2.1.1.4.1	Analisti e progettisti di software
2.1.1.4.2	Analisti di sistema
2.1.1.4.3	Analisti e progettisti di applicazioni web
2.1.1.5.2	Analisti e progettisti di basi dati
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).
The curricular requirements are automatically met by the applicants who have a Bachelor's degree belonging to classes L-8 or L-31.
In all other cases, admission applications will be evaluated by the Academic Advisor of the degree programme, or by a delegate.

In particular, applicants must have earned:

- minimum 40 credits earned in the following core Scientific Disciplinary Fields (settori scientifico-disciplinari): FIS/01, FIS/03, INF/01, ING- INF/05, MAT/02, MAT/03, MAT/05, MAT/08
- minimum 60 credits earned in the following specific Scientific Disciplinary Fields (settori scientifico-disciplinari): INF/01, ING-IND/31, ING-INF/01, ING- INF/03, ING-INF/04, ING-INF/05, MAT/06, SECS-S/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** may be admitted to the programme by the Academic Advisor. 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 (1) or less - 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

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

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 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.

Students whose native language is not Italian must prove knowledge of the Italian language (minimum A2 level - CEFR) by taking an internal exam organized by Politecnico or by presenting an internationally recognized Italian language certificate. Specific information is available in the Student Guide.

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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 programme is organized across four levels of coursework:

- compulsory courses (which characterise the entire Master's degree programme and are considered essential for the professional profile of a Computer Engineer),
- core courses for each specialist track (a set of courses specific to each of the six available tracks, which provide in-depth knowledge in the relevant area),
- elective courses (two 6-credit courses selected from a list aligned with the six tracks, which include suggested choices consistent with each track), and
- free-choice credits, which includes interdisciplinary courses, the elective courses mentioned above, and courses offered by other degree programmes.

The compulsory courses are mainly offered in Year 1, the core courses span both Year 1 and 2, and the two elective courses are taken during the first and second semester of Year 2, respectively.

The compulsory courses focus on the following areas: computer architecture, system programming, database technologies, software engineering, automatic control, network technologies and services, and IT security.

Students can tailor their education by selecting a set of courses within one of the six available specialist tracks, allowing them to complete their advanced training in one of the following areas: industrial automation, embedded systems, graphics and multimedia, software applications, computer networks, and data science.

In particular:

- The Automation and Intelligent Cyber-Physical Systems track focuses on the design and both theoretical and experimental analysis of models for prediction, control, and diagnostics of internal mechanisms. It also addresses topics related to logistics and mobility management for vehicles, people, and goods, with attention to both the application domain and foundational automation and control processes.
- The Embedded systems track provides the skills needed for logical-level design of complex digital systems. It covers hardware description methodologies and their use in the field of automatic synthesis systems, as well as optimisation techniques aimed at improving system performance in terms of power consumption, speed, and reliability. It also addresses correctness and reliability issues by analysing the impact of verification and optimisation techniques. Courses in this area are English-taught.
- The Graphics and multimedia track covers modern techniques for modelling and rendering, introduces hardware architectures for graphics systems and devices for interactive graphics and virtual reality, and teaches how to design interactive and real-time environments. It also includes techniques for representing, compressing, and transmitting audio and video signals.
- The Software applications track focuses on the design and management of business information systems to support organisations and corporate needs. Particular attention is given to managing large-scale software projects, involving multiple developers over long periods. Topics include various challenges such as debugging and maintenance of software products.
- The Computing and Network Infrastructures track expands students' knowledge of network infrastructure and distributed systems, including wide-area networks and cloud computing. Topics covered include distributed software development, performance evaluation of distributed systems, design and management of complex communication networks, cloud and high-performance computing (HPC) data centres, development of advanced services and applications on such infrastructures, high-performance network software, and cloud programming. Special attention is given to communication, synchronisation, and interaction between application products and hardware components, as well as the design of corporate networks and private data centres, and the analysis of communication systems based on the most advanced technologies.
- The data analytics and artificial intelligence track provides both the theoretical and technological foundations for large-scale data analysis and teaches machine learning, deep learning, and AI algorithms for data analytics. Emphasis is placed on the mathematical and theoretical principles underlying data analysis methods, technologies for handling big data, distributed processing systems, and advanced AI and deep learning techniques.

At the end of the programme students are required to prepare and present a written thesis. Students also have the opportunity to do an internship at a partner company in the field.

There are international agreements with foreign universities that offer students the opportunity to earn double or joint degrees.

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=562

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=37562&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 typically focuses on an innovative analysis, project, or application, related to topics consistent with the educational objectives of the degree programme. It should reflect the candidate's individual contribution and result in a final written report (Master's thesis). The courses offered in Year 2 are organized in a way that leaves a sufficient time for the development of the thesis.

The Master's thesis represents a comprehensive assessment of the student's mastery of technical content, as well as organizational, communication, and individual skills, in the context of developing 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 final examination is worth 30 credits, corresponding to a period of time of approximately one semester of full-time work. Students who are interested in doing a curricular internship, they can request that the 30 credits are split in a12-credit thesis plus a 10-credit internship.

The topic and activities connected with the thesis must be agreed upon with a faculty member from the Politecnico (thesis supervisor). Students are allowed to work at 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 who have earned at least 48 credits 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.
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 must be in English.

The Graduation Examining Committee gives the final grade evaluating the student's overall academic path, his/her maturity, capacity for intellectual reasoning and the quality of the thesis.
The members of the Graduation Examining Committee 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 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.