Politecnico di Torino

# ACADEMIC REGULATIONS

## Master's degree programme

## in

## MATHEMATICAL ENGINEERING

**Department of Mathematical Sciences**

**Collegio di Ingegneria Matematica**

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 specific objective of the Master's degree programme in Mathematical Engineering is to train professionals who can apply engineering technologies alongside methods from Applied Mathematics and Statistics to describe and solve complex problems that require in-depth analysis, either through mathematical and numerical modelling or probabilistic and statistical approaches.

Characterised by a strong interaction between Mathematics and core Engineering disciplines, the programme enables students to address challenges arising from a wide range of engineering fields—both involving artificial systems and natural phenomena—as well as from sectors such as logistics and finance. In addition, students will acquire the skills needed to analyse data of any size and structure.

The programme specifically aims to prepare Mathematical Engineers to carry out the following activities:

- identify and formulate the most appropriate mathematical or statistical model, balancing complexity and the required level of accuracy;
- perform both qualitative and quantitative analysis of the model output, assessing the consistency of results with the phenomenon or data which is being studied;
- carry out numerical simulations of natural phenomena, industrial processes, and the behaviour of materials and structures;
- conduct statistical data analysis, summarise and adapt data to stochastic models relevant to applications, and use them for forecasting, reliability assessment, risk analysis, and decision-making;
- tackle issues related to complex systems—often highly interdisciplinary in nature—with an engineering mindset, making use of methodologies drawn from various areas of Applied Mathematics and Statistics.

## 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 |
|---|---|
| **Mathematical Engineer specialised in Mathematical Modelling and Numerical Simulation** | Functions:<br>Professionals with both a strong engineering background and solid mathematical training. This dual expertise makes them particularly suited to work in research and development or design teams that require in-depth design studies based on advanced mathematical procedures, aimed at developing mathematical models and performing numerical simulations.<br>Their in-depth knowledge of the mathematical foundations of the problems to be solved numerically, along with sound computing skills, enables them to develop optimised codes tailored to various application contexts.<br><br>Competencies:<br>• Starting from an applied problem, they identify and formulate a mathematical model by balancing the desired level of accuracy with acceptable complexity, ensuring a satisfactory match with reality while optimising time and cost.<br>• They apply state-of-the-art numerical methods and use effective visualisation and representation techniques to communicate results to collaborators from other disciplines.<br>• They make proficient use of the most up-to-date computational tools.<br>• They collect and analyse data and programs that support the company's objectives.<br>• They are proficient in using numerical and statistical software tools, and can develop new computing or interface codes, or adapt existing codes to meet new requirements.<br><br>Potential employers:<br>• Industrial manufacturing companies<br>• IT companies |

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| | • Environmental agencies<br>• Biomedical industries<br>• Companies involved in the design and/or management of complex civil engineering infrastructures<br>• Engineering firms specialising in simulation<br>• Research centres and laboratories |
| **Mathematical Engineer specialised in Probability, Statistics and Data Processing** | Functions:<br>These professionals are able to create and manage databases, including large-scale ones, extract valuable information, and develop interpretative models from data collected in corporate databases, on the internet, and across social networks.<br>They can independently take the initiative in planning experiments or research activities, providing original solutions to colleagues to obtain the necessary data.<br>Thanks to their knowledge in mathematics, statistics, numerical methods, and computer science, Mathematical Engineers can support companies across various production sectors in decision-making and design processes by extracting meaningful insights from available data to enhance management, production, planning, and development activities.<br><br>Competencies:<br>• They independently plan experiments, surveys, and market research with a comprehensive understanding of the company's objectives.<br>• They analyse research results, identify and enhance their informational and inferential value, and provides solid support for corporate decision-making.<br>• They analyse the dynamics of complex networks (social, biological, infrastructural, logistical).<br>• They solve optimisation problems, identifying the best solutions even in constrained scenarios, both continuous and discrete, including those involving networks.<br>• They apply methods from uncertainty mathematics to address issues and contexts characterised by high variability, such as in insurance, finance, quality control, risk analysis, biology, and medicine.<br>• They plan data collection activities by analysing in advance the potential informational content.<br>• They collect and pre-process data for subsequent analysis.<br>• They apply statistical and mathematical methods together with computing tools to classify and extract information from data, also assessing the adequacy and reliability of the tools used in the specific application context.<br>• They apply statistical techniques to continuous improvement in production, using both online (process quality control) and offline (design of experiments for innovation) approaches.<br><br>Potential employers:<br>• Manufacturing companies<br>• Consulting firms<br>• Banks<br>• Insurance companies<br>• Biomedical and pharmaceutical industries<br>• Research centres and laboratories<br>• Service companies |
| **Scientific Consultant in Service Companies for the Industrial Sector** | Functions:<br>Thanks to their interdisciplinary training, Mathematical Engineers are particularly well-suited to work in consulting firms, whether in management or IT. In these contexts, rather than having a narrow specialisation, strong versatility and a multidisciplinary approach are key skills, along with broad-based knowledge in various branches of engineering, economics, and methods for forecasting and simulating possible scenarios.<br><br>Competencies:<br>They support decision-making processes related to specific production and management improvement requests commissioned by the client to the consulting firm, leveraging their solid mathematical and physical background as well as their expertise across multiple engineering fields.<br><br>Potential employers:<br>Industrial manufacturing companies<br>Consulting firms |

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| | IT companies |
| **Preparation for Continuing Studies** | **Knowledge Required to Pursue Further Studies** |
| **Ph.D. programmes** | Thanks to their strong multidisciplinary skills, graduates of the Master's degree programme in Mathematical Engineering are well-equipped to pursue PhD studies not only in the field of Applied Mathematics but also in other areas of Science and Engineering.<br><br>To succeed in a PhD programme, students need:<br>• Excellent mathematical and computational skills, along with in-depth knowledge of engineering-related problems;<br>• A strong aptitude for analysing problems, formulating them in mathematical terms, and solving them using computational methods;<br>• Communication skills aimed at knowledge dissemination, as well as a critical attitude towards established ideas. |

## 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 |
|---|---|
| 2.1.1.3.1 | Matematici |
| 2.1.1.3.2 | Statistici |
| 2.1.1.4.1 | Analisti e progettisti di software |
| 2.6.2.1.1 | Ricercatori e tecnici laureati nelle scienze matematiche e dell'informazione |

## 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 45 credits earned in the following core Scientific Disciplinary Fields (settori scientifico-disciplinari): CHIM/07, FIS/01, FIS/02, FIS/03, FIS/04, INF/01, 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, FIS/01, FIS/02, FIS/03, FIS/04, ICAR/01, ICAR/07, ICAR/08, ICAR/09, INF/01, ING-IND/06, ING-IND/10, ING-IND/11, ING- IND/13, ING-IND/14, ING-IND/16, ING-IND/21, ING-IND/24, ING-IND/31, ING-IND/35, ING-INF/01, ING-INF/03, ING-INF/05, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08, MAT/09, SECS-P/07, SECS-S/01, SECS-S/02, SECS-S/03, SECS- S/06.

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 (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.
In addition to having an adequate academic background and certified knowledge of English at least at B2 level, students applying for degree programmes taught entirely or partially in Italian must also have a B2 level Italian language certificate, as defined by the Common European Framework of Reference for Languages (CEFR), as an admission requirement.
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.

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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 is organized into two tracks: the first track focuses primarily on modelling and numerical aspects relevant to industrial applications, while the other track places greater emphasis on probabilistic and statistical methods, as well as on optimisation problems, network dynamics, and data analysis. The two tracks share a common core and allow for a certain degree of integration, as some compulsory courses in one track are included as elective courses of the other track.

The programme is designed to ensure that students acquire all the necessary knowledge and skills to pursue a professional career as a Mathematical Engineer. Depending on the track, students develop competencies in the following areas to varying extents:

- Mathematical and statistical modelling, aimed at formulating suitable mathematical or statistical models for describing real-world phenomena based on application-driven problems;
- Qualitative and quantitative analysis of solutions, using appropriate theoretical mathematical methods;
- Numerical simulation, aimed at approximating and representing solutions through the most up-to-date numerical techniques;
- Probability and statistics, used to tackle non-deterministic problems, manage and interpret experimental and probabilistic model data, and apply empirical-algorithmic techniques typical of Machine Learning;
- Engineering, focused on acquiring contextual knowledge and understanding the challenges associated with real-world applications.

Through the development and defence of the Master's thesis, students consolidate their knowledge and apply their skills by carrying out a project that typically combines theoretical, applied and/or experimental elements, to which they are expected to contribute original work.

## 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=563

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=32563&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 a significant educational milestone of the Master's degree programme and consists of a thesis that must be developed originally by the students under the supervision of a supervisor and, if applicable, other co-supervisors.

Students required to independently conduct an in-depth study of a real-world application problem, critically review the available documentation, and elaborate on the problem by proposing suitable solutions, possibly performing simulations or processing data using tools developed independently or existing software.
Students can carry out their thesis projects at the University's departments and laboratories, at other Italian or foreign universities, at external research laboratories, or within industries and professional firms with which collaborative agreements have been established.

The thesis may also be written and presented in English.

The final examination is worth 16 credits, corresponding to approximately 400 hours of full-time work.

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.
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. Candidates must demonstrate the ability to work independently, mastery of the topics addressed, and skill in synthesising and communicating the content effectively during the discussion.

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:

- Evaluation of the work carried out for the thesis (commitment, autonomy, and methodological rigour): up to 3 points;
- Adequacy of the description of the mathematical and statistical content: up to 1 point;
- Presentation and defence of the thesis content: up to 2 points;
- Number of exams passed with honours: up to 2 points;
- Excellence of the achieved results, as demonstrated by presentation at conferences, publication of results, implementation of findings by companies involved in supervising the thesis, the level of internationalisation for theses carried out during extended periods abroad, or the level and duration of cross-sector collaborations for theses completed during extended periods in industry: up to 2 points.

A degree with honours (lode) may be awarded if the total score is at least 113 at the Committee's discretion and by qualified majority, meaning at least two-thirds 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.