Politecnico di Torino

ACADEMIC REGULATIONS
Master's degree programme
in
MATERIALS ENGINEERING FOR INDUSTRY 4.0

Department of Applied Science and Technology
Collegio di Ingegneria Chimica e dei Materiali

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

Safeguarding the planet and its resources requires radical changes in production methods.
Designing, developing and then introducing into the market efficient products manufactured through sustainable processes are key to implementing these ambitious changes. This is one of the paradigms of the Fourth Industrial Revolution – Industry 4.0 – and innovation in materials and technologies is one of its foundational pillars. Designing products using newly developed materials enables lighter structures, improved performance, reduced energy consumption, better durability and greater end-of-life recyclability. Innovation in materials processing and manufacturing technologies ensures efficient use of raw materials, reduced production waste and lower consumption of lubricants. Products conceived and manufactured in this way can work longer and more efficiently, ultimately resulting in a reduced environmental impact, both during use and at end of life.

In this context, Industry 4.0 is not only about introducing new technologies and digitising existing ones, but also about advancing the knowledge and skills needed to leverage them effectively for the benefit of society. Furthermore, acknowledging from the design stage the critical issues related to the use of raw materials and the recyclability of materials used in manufacturing is perfectly in line with the principles of the Circular Economy.

Materials Engineering for Industry 4.0 is an inter- and multi-disciplinary Master's degree programme that provides graduates with the skills to design innovative, high-performance, economically competitive yet sustainable materials, and to produce and process them using the most advanced manufacturing technologies.

The programme's specific educational objectives are to:

- provide graduates with a solid foundation in both conventional and advanced processing and manufacturing technologies (Key Enabling Technologies, KETs), fostering the ability to critically assess the limitations, benefits and economic and environmental impacts of the proposed solutions;
- equip graduates with the principles and methodologies for modern materials design and design with materials in engineering applications;
- provide graduates with the scientific and technological fundamentals of materials for engineering applications, while strengthening their background in industrial engineering;
- develop graduates' awareness of the potential of modern digital design and manufacturing tools, and their ability to collaborate effectively with professionals from other engineering fields involved in product and process development;
- enable graduates to apply what they have learned through laboratory and project-based activities, both individually and in teams, within the academic setting and in collaboration with institutions and companies.

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
Materials Engineer	Functions: After gaining appropriate professional experience, this role involves taking on responsibilities in product and process innovation, with a specific focus on metallic, polymeric, ceramic and composite materials, as well as on innovative structural and functional materials. Materials engineers are expected to optimise consolidated industrial materials and technologies or to design and develop innovative materials and technologies. Over time, this role may also lead to career paths as product or process manager and project manager. Competencies: The main competencies associated with this role include: • managing production processes (plants for material manufacturing, heat treatment facilities, semi-finished and finished products) for traditional materials;

	• managing quality control laboratories and technical product departments, performing assessments of material properties, process control, and qualification for industrial applications; • managing the selection process of innovative materials within design and product innovation activities; • managing the development of innovative industrial technologies for materials production and processing; • managing the technological transition of industrial processes by integrating advanced technologies. Potential employers: Graduates typically find employment in the public and private industrial sectors (including manufacturing, energy, automotive, aerospace, biomedical, electronics) in roles related to the production and transformation of metallic, polymeric, ceramic, glassy and composite materials, within industrial laboratories and R&D centres of companies and public or private institutions. Upon passing the State Examination for Professional Practice, Master's graduates may qualify as Professional Engineers – Section A – and register as Senior Industrial Engineers. The knowledge acquired also allows graduates to continue their studies with a PhD programme in the field of Materials Science and Engineering. The most natural continuation of the academic path is the PhD programme in Materials Science and Technology at Politecnico di Torino.
Materials Engineer for Advanced Manufacturing	Functions: After gaining appropriate professional experience, this role includes operational and/or managerial responsibilities in product and process development. Thanks to their technical expertise, Master's graduates can take on supervisory roles in research as well. The specific training in metallic materials across various classes allows them to contribute to the design of innovative products and processes, as well as to the sustainable optimisation and transformation of existing ones. Competencies: The main competencies associated with this role include: • managing the integration of materials into advanced manufacturing processes; • managing production processes (plants for material manufacturing, heat treatment facilities, semi-finished and finished products) for traditional materials; • managing the selection process of innovative materials within design and product innovation activities; • managing the development of innovative industrial technologies for materials production and processing; • managing the design of new materials and technologies to be introduced in industrial products and processes; • managing the qualification process of products and processes. Potential employers: Graduates typically find employment in the public and private industrial manufacturing sector, particularly in the fields of transportation and energy, and in the production and processing of metallic, polymeric, ceramic, glassy, and composite materials. Other employment opportunities may be offered by industrial laboratories and in R&D centres of companies and public or private institutions. Upon passing the State Examination for Professional Practice, Master's graduates may qualify as Professional Engineers – Section A – and register as Senior Industrial Engineers. The knowledge acquired also allows graduates to continue their studies with a PhD programme in the field of Materials Science and Engineering. The most natural continuation of the academic path is the PhD programme in Materials Science and Technology at Politecnico di Torino.

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
2.2.1.2.1	Ingegneri metallurgici
2.2.1.5.2	Ingegneri dei materiali

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): CHIM/07, FIS/01, FIS/03, ING-INF/05, MAT/02, MAT/03, MAT/05, MAT/06, SECS-S/02
- minimum 60 credits earned in the following specific Scientific Disciplinary Fields (settori scientifico-disciplinari): CHIM/02, CHIM/05, CHIM/06, CHIM/07, FIS/03, ICAR/08, ING-IND/04, ING-IND/06, ING-IND/08, ING-IND/09, ING-IND/10, ING-IND/13, ING-IND/14, ING-IND/15, ING-IND/21, ING-IND/22, ING-IND/23, ING-IND/24, ING-IND/27, ING-IND/31, ING-IND/32, ING-IND/34, ING-IND/35, SECS-P/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

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

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). 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".

Merit-based evaluation for applicants from Politecnico di Torino and from other Italian universities

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 about the subjects of the following disciplines:

- Science and Technology of Metallic Materials
- Science and Technology of Polymeric Materials
- Science and Technology of Ceramic Materials

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 the English language (minimum B2 level), students applying to a degree programme delivered in Italian or partially taught in Italian must 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.

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 conducted 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 Master's degree programme in Materials Engineering for Industry 4.0 requires students to earn 120 ECTS credits and has a standard duration of two years.

The educational programme is organized into three specialist tracks: one entirely taught in English (Materials Engineering for Advanced Manufacturing) and two mainly taught in Italian (Functional Materials and Structural Materials).

Through an innovative teaching approach, students will acquire knowledge and skills related to materials and processes, based on their final application as products for various industrial sectors (transportation, aerospace, energy, telecommunications, electronics, etc.); sustainable design of innovative materials; and the environmental impact of manufacturing processes and final products.

Many of the courses include hands-on laboratory activities, where students can adopt a "learning by doing" approach to gain experience with processing technologies, advanced material characterization techniques, data analysis, teamwork and communication skills (soft skills).

In Year 2, students from all tracks have the opportunity to personalise their academic path by selecting 14 ECTS credits of optional courses, based on their specific interests in different material classes or application fields. Each track provides a list of recommended optional courses that have a compatible timetable. Students may also select optional courses from the list of a different specialist track; in this case, Politecnico cannot guarantee that classes will not overlap.

The Master's degree programme has strong connections with industries at the regional, national and European level and is committed to promoting cultural exchange with European and non-European academic institutions. The programme has established a number of agreements with other universities to offer students the opportunity to spend one or two semesters abroad or to earn a double degree. Similarly, students may choose to work only on their Master's thesis abroad.

This Master's degree programme, together with the strong interdisciplinarity of its three tracks, enable students to acquire knowledge and skills aligned with national and European projects to revitalise the manufacturing industry—such as the National Smart Specialisation Strategy, the National Reform Plan, and the Industry 4.0 and European Institute of Innovation & Technology (EIT) initiatives.

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=486

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=32486&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 a key educational component of the Master's degree programme and consists of a thesis that must be developed independently and originally by the student under the guidance of a Supervisor.

Students are expected to independently carry out an in-depth study of a scientific, technical, or design-related problem, critically review the relevant literature or documentation, and analyse the problem by proposing appropriate engineering solutions.

Students can work on their thesis project at Politecnico departments and laboratories, at other Italian or international universities, at external research centres, or in collaboration with companies and professional firms with which formal partnerships have been established.

Students are required to publicly present and defend their thesis in front of a Graduation Examining Committee. During the defence, the candidate must demonstrate the ability to work independently, a sound understanding of the topic addressed, and the ability to summarise and effectively communicate the main contents while engaging in critical discussion.

The Master's thesis may be written and presented in English.

The workload required to complete the thesis is approximately 400 hours, corresponding to 16 ECTS credits.

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 may choose from the thesis proposals made available by the teaching staff of the degree programme, communicated in class, published on the News Board of the programme or on the teaching portal. Alternatively, students may work on their thesis project at a company or at other universities or research institutions in Italy or abroad, subject to confirmation that a Polito faculty member of the degree programme is available to act as internal Supervisor.

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, experience at foreign universities or research centres, extracurricular activities, participation in Student Team, etc.).

More details on the determination of the final grade are available on the News Board of the programme (https://didattica.polito.it/bacheca/area_ing2/materiali40.html).

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.