Politecnico di Torino

ACADEMIC REGULATIONS

Master's degree programme

in

BIOMEDICAL ENGINEERING

Department of Mechanical and Aerospace Engineering
Collegio di Ingegneria Biomedica

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 Biomedical Engineering builds on the foundational knowledge acquired during the Bachelor's degree programme (biomedical instrumentation, prosthetics, physicochemical principles underlying biological systems), exploring it more in depth and integrating it with more specialised expertise in both traditional and emerging fields.

The programme aims to train biomedical engineers capable of designing and managing medical devices, supporting healthcare professionals in the correct use of complex and/or innovative technologies and contributing to research activities.
To ensure a common background of competencies, the study plan includes four core courses covering different areas of biomedical engineering (biomechanics of solids and fluids, biomedical signal processing, artificial intelligence in medicine and bio nanotechnology). The goal is to enable graduates to meet the demands of the labour market across a wide range of topics.

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
Biomedical device design specialist	Functions: These professionals are engineers who work within a company to support the design of medical devices, including implantable ones, intended for monitoring, diagnosis, and therapeutic intervention. Key responsibilities include defining technical specifications, coordinating the design activities of other professionals (such as electronic and computer engineers), conducting testing, validation, experimentation, and product certification. Competencies: • Applying EU regulations on medical devices during both the design and certification phases • Defining device specifications by combining knowledge of operating principles and technical features of the device with an understanding of its clinical use • Using techniques for biopotential acquisition, standards for medical software design, and methods for biomedical signal and image processing • Contributing to material selection for device development Potential Employers: Companies designing biomedical instrumentation
Specialist designer of artificial organs and prostheses	Functions: These professionals support the design of devices intended to assist or replace the structural and/or functional roles of biological organs or functions—whether sensory, motor, or metabolic. Key responsibilities include defining specifications, designing the device, conducting experimental validation, and certifying the product. Competencies: • Applying EU regulations on medical devices during both the design and certification phases • Defining device specifications by combining knowledge of operating principles and technical features of the device with an understanding of its clinical use • Using design methodologies (functional, structural, fluid dynamic) and corresponding experimental validation methods • Contributing to material selection for device development • Identifying the most appropriate manufacturing processes for device production Potential Employers: Companies designing orthoses, prostheses, or artificial organs

Product specialist	Functions: Product specialists support the sales department, both before the —by helping define the appropriate specifications—and after sale, by providing customer support and/or training. They develop specialised expertise in a specific set of products and interact directly with product users to ensure safe and effective usage. They also collaborate with design teams to assess the suitability of products and may suggest improvements to enhance safety and competitiveness. Competencies: • Applying knowledge of regulations, operating principles, and technical features of the device to assist clients in selecting the right product and providing training when necessary • Supporting users to ensure the correct use of the device, drawing on knowledge of human anatomy and physiology and of device functionalities • Contributing to defining product specifications and identifying necessary modifications during its commercial lifecycle, also based on feedback, suggestions and criticism from users Potential Employers: Companies marketing electromedical devices, prostheses and orthoses, or medical software
Clinical Engineer	Functions: Clinical engineers work within healthcare facilities and are responsible for the acquisition and management of healthcare technologies. Specifically, they collaborate with healthcare staff to define plans for purchasing new devices or replacing obsolete equipment. They also assist healthcare staff and the procurement office during the procurement process, oversee preventive and corrective maintenance processes and support healthcare professionals in the correct and safe use of medical devices to minimise clinical risk and ensure device effectiveness. Competencies: • Applying knowledge of technical features and operating principles of medical devices during the procurement process to draft technical specifications and evaluate bids • Supporting users in the correct use of devices through knowledge of their operating principles and clinical applications, as well as human anatomy and physiology • Applying EU regulations on medical devices • Contributing to quality assurance and accreditation activities within healthcare facilities, clinical risk management related to medical devices, and health technology assessment (HTA) Potential Employers: Public and private healthcare facilities; companies providing clinical engineering services
Research and Development Engineer	Functions: These professionals work within a corporate research centre, focusing on the design of innovative medical devices. Biomedical engineers in R&D roles are expected to deepen their expertise by analysing scientific literature, applying and/or developing innovative methodologies, and supporting the clinical validation of the developed product. Competencies: • Applying EU regulations on medical devices • Applying and/or developing innovative methodologies and/or technologies in the field of biomedical engineering Potential Employers Research centres within public and private companies

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
2.2.1.8.0	Ingegneri biomedici e bioingegneri

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 particular, the curricular requirements are automatically met by the applicants who have a Bachelor's degree in class L-8 or L-9.

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

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

SUITABLE ACADEMIC PERFORMANCE

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

The academic performance will be assessed as follows.

1) **Applicants from Politecnico di Torino**

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

- 4 years or less (1) - no exam average grade required
- between 4 and 5 years (1) –exam weighted average grade 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 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 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

Students can study more in depth a specific area of biomedical engineering by choosing one of the specialist tracks (orientamenti).

The **Biomechanics** specialist track focuses on engineering methods for mechanical modelling and the study of biological, physiological, and pathological processes, as well as biological structures, tissues, cells, and subcellular structures. It also covers the mechanical design of medical devices for diagnostic and/or therapeutic purposes.

The **Bio nanotechnologies** specialist track focuses on the acquisition of theoretical, methodological, and practical-experimental knowledge for designing enabling technologies for regenerative medicine, including tissue engineering, advanced therapies, nanomedicine and the development of in vitro tissue and organ models.

The **Digital healthcare and artificial intelligence** specialist track enhance students' skills in applying ICT technologies to healthcare processes and artificial intelligence.

The **Rehabilitation and Neural Engineering** specialist track focuses on the integration of ICT technologies to develop solutions for the assessment, recovery and compensation of physical and cognitive functions lost due to disease or injury, as well as for assessing physical condition in healthy individuals.

The **Biomedical Instrumentation** specialist track focuses on the design, development, maintenance and management of medical devices and telemedicine technologies used in diagnostic, therapeutic, and monitoring processes.

Each specialist track is complemented by courses in related disciplinary fields (materials science, mechanics, electronics, measurement) and by a set of courses that offer a comparison between technical and clinical perspectives.
Students have 18 free choice credits to further explore topics within their chosen track or to include topics from other tracks.
At the end of the programme students must develop a thesis project, which may be carried out in the laboratories of Politecnico, in companies in the biomedical or healthcare sectors, or in laboratories at universities abroad.

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=480

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=32480&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 key educational milestone of the Master's degree programme and consists of a thesis, developed by the student under the guidance of a supervisor.

Students are expected to carry out an in-depth analysis of a technical or scientific problem, critically review the relevant literature and solve the problem by proposing appropriate solutions. Students can work at their thesis project in the departments and laboratories of Politecnico, in companies, institutions or professional firms.

Students are required to publicly present and defend their thesis before the Graduation Examining Committee. During the defence, students must demonstrate the ability to work independently, a solid understanding of the topics covered, as well as the capacity to clearly communicate key concepts and effectively engage in academic discussion.

The thesis may be written and presented in English.

The workload required for the thesis corresponds to 22 ECTS credits.

Students must submit their thesis topic request online through the dedicated procedure available in the "Thesis" section of their personal page on the Teaching Portal, in accordance with the deadlines published in the Student Guide – Thematic Calendar section.

After submitting this application submission, students are required to work at their thesis projects. They must include the objectives of their work, the methods used and the results achieved.

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, experiences at foreign universities or research centres, extracurricular activities, participation in Student Teams etc).

A degree with honours (cum laude) may be awarded at the Committee's discretion if the total score is at least 110 by qualified majority, i.e. at lasts 2/3 of the Committee members.

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

More Information and Deadlines:

- Student Regulations
- Student Guide

Diploma Supplement:
In compliance with article 11, paragraph 8, of Ministerial Decrees No. 509/1999 and 270/2004. Politecnico di Torino issues the Diploma Supplement, a document that can be 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.