# UNIVERSITA' DEGLI STUDI DI MILANO
# PROGRAMME DESCRIPTION - ACADEMIC YEAR 2026/27
# BACHELOR
## Mathematics (Classe L-35)
## Enrolled in 24/25 a.y.

## *HEADING*

| | |
|---|---|
| **Degree classification - Denomination and code:** | L-35 Mathematics |
| **Degree title:** | Dottore |
| **Curricula currently available:** | |
| **Length of course:** | 3 years |
| **Total number of credits required to complete programme:** | 180 |
| **Years of course currently available:** | 3rd |
| **Access procedures:** | Open, subject to completion of self-assessment test prior to enrolment |
| **Course code:** | F7X |

## *PERSONS/ROLES*

**Head of Study Programme**

Prof. Ghilardi Silvio

**Tutors - Faculty**

Tutor per orientamento:
ALZATI Alberto, CALANCHI Marta, CAMPI Luciano, CAPOFERRI Matteo, CAVATERRA Cecilia, CIRAOLO Giulio, COLOMBO Giulio, DOLDI Alessandro, FUHRMAN Marco, GARBAGNATI Alice, GORI Anna, LUPERI BAGLINI Lorenzo, MAGGIS Marco, MARI Luciano, MASTROLIA Paolo, MATESSI Diego, MESSINA Francesca, MOLTENI Giuseppe, MONTALTO Riccardo, MONTOLI Andrea, MORALE Daniela, PAYNE Kevin, PENATI Tiziano, PIZZOCCHERO Livio, SCACCHI Simone, STELLARI Paolo, SVALDI Roberto, TARSI Cristina, TASIN Luca, TERRANEO Elide, TORTORA Alfonso, UGOLINI Stefania, VESELY Libor, ZAMPIERI Elena, ZANOTTI Pietro.

**Degree Course website**

https://matematica.cdl.unimi.it/it

**"Piano Lauree Scientifiche" academic tutor**

ASENOVA Miglena

**Admission Test Organization Board**

TERRANEO Elide (Presidente), RIZZO Ottavio

**Bachelor's Degree Study Plan Board**

BERTOLINI Marina (Presidente), SALVATORI Maura, CAUSIN Paola

**Degree programme administration**

via Celoria, 20 Phone 0250316122 su appuntamento https://informastudenti.unimi.it/saw/ess?AUTH=SAML

**Disability academic tutor**

SCACCHI Simone

**Homework academic tutor**

MAZZA Carlo

**Internship academic tutors**

RIZZO Ottavio, BRANCHETTI Laura

**Mathematics Final Exam Board**

TARSI C. (Presidente),MONTALTO R., MORALE D., VENERUCCI R., TERRANEO E., ALZATI A., FIERRO F.

**Mathematics Final Exam Organization Board**

CALANCHI Marta (Presidente), PELOSO Marco, GHILARDI Silvio, VIGNATI Marco

**Orientation and Internship Board**

TORTORA Alfonso (Presidente), NALDI Giovanni, MICHELETTI Alessandra, MAGGIS Marco, COZZI Matteo, BRANCHETTI Laura

**Other Activities and Credit Award Board**

SCACCHI Simone (Presidente), MOLTENI Giuseppe, TORTORA Alfonso

**Programme Transfer and International Qualifications Recognition Board**

ZAMPIERI Elena (Presidente), REGGIO Luca

**Socrates-Erasmus Board**

GAETA Giuseppe (Presidente), GORI Anna, MATESSI Diego, SCACCHI Simone, PAYNE Kevin

**Student registrar**

CONTATTI, SEDI E ORARI https://www.unimi.it/it/node/359 https://www.unimi.it/it/node/360

**Timetables Board**

LOVADINA Carlo (Presidente), ZANOTTI Pietro, ZAMPIERI Elena

**Web pages and website academic tutors**

PALEARI Simone

## *CHARACTERISTICS OF DEGREE PROGRAMME*

**General and specific learning objectives**

The main objectives of the Degree Program in Mathematics are to furnish a solid foundation in the mathematical sciences, to introduce the modern formulation of the discipline, to encourage an active contact with various aspects of the field (including theoretical rigor and attention to applications), and to provide the preparation necessary to comprehend future developments in the field.

**Expected learning outcomes**

The main competences developed by the graduates in mathematics are, according to the Dublin system of descriptors, the following:

A-KNOWLEDGE AND ABILITY TO UNDERSTAND:
Graduates in mathematics,
-They know and know how to use differential and integral calculus in one and more variables and linear algebra;
-have solid bases of mathematical physics, probability and statistic calculation, numerical analysis, differential and algebraic-projective geometry;
-They know and understand the basic applications of mathematics to both natural and economic and social sciences;
-have adequate computational and computer skills;
-they are able to read mathematical texts and research articles in mathematics.

B-APPLICATION CAPACITY:
Graduates in Mathematics:
-are able to solve problems in different fields of mathematics;
-they are able to mathematically formalise different problems, and to use mathematical methods for their study;
-are able to use qualitative and quantitative methods for data analyses;
-they are able to use computer and computational tools.

C-AUTONOMY OF JUDGEMENT:
Graduates in Mathematics:
-are able to construct and develop logical arguments with a clear identification of assumptions and conclusions;
-are able to recognise correct demonstrations and identify misleading reasoning;
-are able to propose and analyse some mathematical models, associated with concrete situations of interest for the natural and socio-economic sciences or deriving from other disciplines and to use these models to facilitate the study of the original situation;
-They have team work experience and they also know how to work independently.

D-COMMUNICATION SKILLS:
Graduates in Mathematics:
-are able to communicate, both in written and oral form, ideas and mathematical methods;
-they are able to communicate with experts from other sectors, recognizing the possibility of mathematically formalizing problems of different types.

E-ABILITY TO LEARN:
Graduates in Mathematics:
-they are able to continue their studies, both in mathematics and in other disciplines, with a good degree of autonomy;
-they have a flexible mentality and are able to readily fit into the workplace, adapting easily to new problems.

**Professional profile and employment opportunities**

The Degree in Mathematics enables employment in both the public and private sectors for positions which require capacity for abstract reasoning, formulation and/or modelling of concrete problems and their solution though the use of tools coming from the mathematical sciences.
Recipients of the Degree in Mathematics find careers in: banks, insurance companies, polling and survey institutes, consulting and accrediting firms, software development companies, medical, biomedical and pharmacological institutes and companies, in the green economy, and in research and development divisions of large corporations, and specific industries such as transportation, telecommunication, and aerospace.
A significant portion of degree recipients in Mathematics continue their studies by enrolling in a Masters Degree Program.

**Initial knowledge required**

Qualifications and knowledge required for admission
High school diploma or equivalent foreign qualification.
To be admitted to the Bachelor's degree programme in Mathematics, applicants must be familiar with basic mathematics and elementary logic, and demonstrate reading comprehension skills.

Admission assessment:
Admission to the Bachelor's degree programme in Mathematics is open, subject to a mandatory, non-selective, assessment test before enrolment. Candidates will have to sit for the TOLC (Test Online CISIA) at the University of Milan or any other member university of CISIA (Consortium of Inter-University Integrated Access Systems). Register to the TOLC test on the CISIA website (www.cisiaonline.it).
The tests providing access to the degree programme in Mathematics are: TOLC-S, and TOLC-I.
Only after taking one of these tests, will you be able to enrol, WHATEVER THE RESULT:
- TOLC-S, divided into 4 sections: Basic mathematics (20 questions - 50 minutes), Reasoning and problems (10 questions - 20 minutes), Reading comprehension (10 questions - 20 minutes), Basic sciences (chemistry, physics and geology - 10 questions - 20 minutes).
- TOLC-I, divided into 4 sections: Mathematics (20 questions - 50 minutes), Logic (10 questions - 20 minutes), Science (10 questions - 20 minutes), Verbal comprehension (10 questions - 20 minutes).
Each question has 5 answer options, of which only one is correct.
Score: +1 for a correct answer, -0.25 for a wrong answer, 0 for a no answer.
Each TOLC test includes an additional English section, consisting of 30 questions to be answered in 15 minutes. This section does not count toward the overall test score.
Other equivalent tests may be accepted with the prior approval of the Academic Board.
For further information please contact the Course management (segrccd.mat@unimi.it)
Test structure and topics: https://www.cisiaonline.it/en/area-tematica-tolc-scienze/struttura-della-prova-e-syllabus/
Registration procedures and deadlines will be provided in the call for applications posted to the University website at https://matematica.cdl.unimi.it/it/iscriversi

Admission of transfer or graduate students
Transfer students from a degree programme of the University of Milan, or another university, and graduate students will be waived from the test requirement only if admitted to years subsequent to Year I.
To this end, they will have to submit a specific request for prior assessment of their academic records using the online service as shown in the call for applications.
These candidates must provide a full transcript of records (listing exams, subject areas, credits, grades) and attach the course syllabi. For more details and dates, please refer to the call for applications.
Students admitted to the first year will be required to take the test.

Additional learning requirements (OFA) and remedial activities
Students who have not achieved at least 10 points in the Mathematics module will have to fulfil additional learning requirements (OFA).
These requirements can be met by passing part A (Syllabus) of the Basic Mathematics exam by December 2023. Students who do not fulfil their OFA may not take any second-year exams before passing one of the following exams: Algebra I, Mathematical Analysis I, Geometry I.
Learn more at https://matematica.cdl.unimi.it/it/studiare/le-matricole

**Compulsory attendance**

Attendance is strongly recommended for each course.

**Internship criteria**

There are two types of internship: industrial and educational. Details are available at:

https://www.unimi.it/en/education/degree-programme-courses/2024/internship-industry and https://www.unimi.it/en/education/degree-programme-courses/2024/educational-training

For further information on how to undertake internships, contact the Mathematics Academic Office (segrccd.mat@unimi.it).

**Degree programme final exams**

Upcoming graduates must pass a final exam, which is worth 3 credits (CFU).

The final exam of the Bachelor's degree in Mathematics consists of two stages: firstly, the student presents and discusses a mathematics-related topic in front of an ad-hoc board (seminar stage); secondly, an ad-hoc board assigns the graduation mark and confers the Bachelor's degree in Mathematics (graduation stage). To access the seminar stage, students must have earned at least 150 credits, whereas to access the graduation stage, they must have earned 177 credits, including the credits required for proficiency in a foreign language.

The final exam regulations, including all practical instructions in this regard, can be downloaded at: https://matematica.cdl.unimi.it/it/studiare/laurearsi

For information on the learning objectives and expected learning outcomes of the final exam, please visit https://matematica.cdl.unimi.it/it/insegnamenti

**Notes**

For-credit assessment B1

In order to obtain their degree, students must be proficient in English at a B1 level under the Common European Framework of Reference for Languages (CEFR). This proficiency level may be certified as follows:

- By submitting a language certificate attesting B1 or higher level in English and issued no more than three years before the date of submission. You will find the list of language certificates recognized by the University at: https://www.unimi.it/en/node/39322). The certificate must be uploaded during the enrolment procedure, or subsequently to the portal http://studente.unimi.it/uploadCertificazioniLingue;
- By taking a placement test offered by the University Language Centre (SLAM) between October and December of the first year. Students who fail the test will be required to take a SLAM course.

The placement test is mandatory for all those who do not hold a valid certificate attesting to B1 or higher level.

Those who have not taken the placement test by the end of December or fail the end-of-course exam six times must obtain the necessary certification privately before graduating.

## *EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM*

The University of Milan supports international mobility by providing its students with the opportunity to spend study and internship periods abroad. It is a unique chance to enrich your educational path in a new exciting environment.

The agreements entered into by the University with over 300 universities from the 27 EU member countries under the European Erasmus+ programme allow regularly enrolled students to carry out part of their studies at one of the partner universities or to undertake internships at companies, training and research centres and other organizations.

Similar international mobility opportunities are provided outside Europe, through agreements with a number of prestigious institutions

The University of Milan is a member of the 4EU+ European University Alliance that brings together eight public multidisciplinary universities: University of Milan, Charles University of Prague, Heidelberg University, Paris-Panthéon-Assas University, Sorbonne University of Paris, University of Copenhagen, University of Geneva, and University of Warsaw. The 4EU+ Alliance offers integrated educational pathways and programmes to promote the international mobility of students (physical, blended and virtual)..

**Study and internships abroad**

The Bachelor of Science in Mathematics has long been committed to characterize its educational activities in an international framework under the Erasmus program. We activated several agreements with other universities in Europe. In particular, we have exchange agreements within the disciplines of both curricula: with Austria, Spain, Portugal, France, Germany, Holland, Denmark, Poland, Czech Republic, Slovenia, Sweden, Norway and Finland.

See the website http://users.unimi.it/erasmusmat/ for collected information on locations and how to recognize the activities carried out abroad.

**How to participate in Erasmus mobility programs**

The students of the University of Milan can participate in mobility programmes, through a public selection procedure.

Ad hoc commissions will evaluate:

- Academic career
- the candidate's proposed study programme abroad
- his/her foreign language proficiency
- the reasons behind his/her application

Call for applications and informative meetings

The public selection for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-

institutional agreement or to find a traineeship position on their own.
The University organizes informative meetings to illustrate mobility opportunities and rules for participation.

Erasmus+ scholarship
The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be supplemented by the University funding for disadvantaged students.

Language courses
Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University Language Centre (SLAM).
https://www.unimi.it/en/node/8/
Learn more at https://www.unimi.it/en/node/274/

For assistance, please contact:
International Mobility Office
Via Santa Sofia 9 (second floor)
Tel. 02 503 13501-12589-13495-13502
Contacts: InformaStudenti; mobility.out@unimi.it
Student Desk booking through InformaStudenti

### *1st COURSE YEAR (disactivated from academic year 2025/26) Core/compulsory courses/activities common to all curricula*

| Learning activity | Ects | Sector |
|---|---|---|
| Algebra 1 | 9 | MAT/02 |
| Elements of Basic Mathematics | 3 | MAT/09, MAT/01, MAT/02, MAT/03, MAT/04, MAT/05, MAT/06, MAT/07, MAT/08 |
| English assessment B1 (3 ECTS) | 3 | NN |
| General Physics 1 | 9 | FIS/08, FIS/07, FIS/06, FIS/05, FIS/04, FIS/03, FIS/02, FIS/01 |
| Geometry 1 | 6 | MAT/03 |
| Geometry 2 | 9 | MAT/03 |
| Mathematical Analysis 1 | 9 | MAT/05 |
| Mathematical Analysis 2 | 6 | MAT/05 |
| Programming 1 | 6 | INF/01 |
| Total compulsory credits | 60 | |

### *2nd COURSE YEAR (disactivated from academic year 2026/27) Core/compulsory courses/activities common to all curricula*

| Learning activity | Ects | Sector |
|---|---|---|
| Algebra 2 | 6 | MAT/02 |
| Geometry 3 | 9 | MAT/03 |
| Mathematical Analysis 3 | 9 | MAT/05 |
| Mathematical Analysis 4 | 6 | MAT/05 |
| Mathematical Physics 1 | 6 | MAT/07 |
| Numerical Analysis 1 | 9 | MAT/08 |
| Probability | 9 | MAT/06 |
| Total compulsory credits | 54 | |

### *3rd COURSE YEAR Core/compulsory courses/activities common to all curricula*

| Learning activity | Ects | Sector |
|---|---|---|
| General Physics 2 | 9 | FIS/08, FIS/07, FIS/06, FIS/05, FIS/04, FIS/03, FIS/02, FIS/01 |
| Mathematical Physics 2 | 6 | MAT/07 |
| Total compulsory credits | 15 | |

### *Elective courses common to all curricula*

**During the second and the third year of the course the student will have to acquire 18 credits free of choice.**
**The teachings specifically activated by CDM are reported annually in the Programme Description (Manifesto). The student will also be able to choose among all the courses activated by the University, and in particular among those activated by the CDM in Mathematics for a curriculum different from that followed by the student. The choice is subject to the approval of the CDM.**

| | | |
|---|---|---|
| | 3 | MAT/07 |

| | | | |
|---|---|---|---|
| Advanced Numerical Analysis 2 | | 3 | MAT/08 |
| Algebra 4 | | 6 | MAT/02 |
| Algebra 4 | | 9 | MAT/02 |
| Constructive Approximation | | 6 | MAT/08 |
| Geometry 5 | | 6 | MAT/03 |
| Introduction to Image Processing | | 6 | (3) MAT/03, (3) MAT/08 |
| Mathematical Analysis 5 | | 6 | MAT/05 |
| Mathematical methods and models for applications | | 6 | MAT/07 |
| Numerical Linear Algebra | | 6 | MAT/08 |
| Programming 2 | | 6 | INF/01 |
| Scientific Computing | | 6 | MAT/08 |
| | | | |
| ***Further elective courses common to all curricula*** | | | |
| **The student must obtain 9 credits by choosing a course from the following:** | | | |
| Algorithms and data structures | | 9 | INF/01 |
| General Physics 3 | | 9 | FIS/08, FIS/07, FIS/06, FIS/05, FIS/04, FIS/03, FIS/02, FIS/01 |
| | | | |
| ***End of course requirements common to all curricula*** | | | |
| Final Exam | | 3 | NN |
| | Total compulsory credits | 3 | |

## *ACTIVE CURRICULA LIST*

General Course years currently available: 3°
Applications Course years currently available: 3°

**Procedure for choosing a curriculum**

Student chooses the curriculum during the second year.

***CURRICULUM: [F7X-A] General***

**Qualifying Training Objectives**

Curriculum A, General.

It is the specific objective of the curriculum to provide in-depth knowledge in the different fields of mathematics. It is foreseen a significant share of formative activities characterized by a particular logical rigor and a high level of abstraction.

It is possible to foresee stays at other European universities, also within the framework of international agreements.

It is possible to foresee, in relation to specific objectives, the carrying out of external activities, for example training courses in public administration structures

| ***2nd COURSE YEAR (disactivated from academic year 2026/27) Core/compulsory courses/activities Curriculum-specific features General*** | | | |
|---|---|---|---|
| **Learning activity** | | **Ects** | **Sector** |
| Geometry 4 | | 6 | MAT/03 |
| | Total compulsory credits | 6 | |
| ***3rd COURSE YEAR Elective courses Curriculum-specific elective courses for General*** | | | |
| **The student must obtain 9 credits with a course of choice among the following:** | | | |
| Algebra 3 | | 9 | MAT/02 |
| Mathematical Physics 3 | | 9 | MAT/07 |
| | | | |
| ***Further elective courses Curriculum-specific features General*** | | | |
| **The student must obtain 6 credits with one or more of the following F-type activities:** | | | |
| | | 3 | MAT/07 |
| Educational Training | | 3 | NN |
| Elements of Basic Mathematics 2 | | 3 | MAT/01 |
| Essay Written under the Direction of a Staff Member | | 3 | NN |
| Laboratory of Mathematical Statistics | | 3 | MAT/06 |
| Mathematical Methods and Models for the Applications | | 6 | MAT/07 |
| Numerical Analysis Laboratory | | 3 | MAT/08 |
| PROBABILITY LAB | | 3 | MAT/06 |
| Topics in Scientific Computing | | 6 | MAT/08 |

***CURRICULUM: [F7X-B] Applications***

**Qualifying Training Objectives**

Curriculum B, Application.

It is the specific objective of this curriculum to provide in-depth knowledge of computational aspects of mathematics, statistics and finance. An important share of formative activities is foreseen, characterised by a particular attention to the

modelling of natural, social and economic phenomena, and of technological problems.
It is possible to foresee stays at other European universities, also within the framework of international agreements.
It is possible to foresee, in relation to specific objectives, the carrying out of external activities, for example training courses at companies, public administration structures and laboratories.

| ***2nd COURSE YEAR (disactivated from academic year 2026/27) Core/compulsory courses/activities Curriculum-specific features Applications*** | | | |
|---|---|---|---|
| **Learning activity** | | **Ects** | **Sector** |
| Numerical Analysis 2 | | 6 | MAT/08 |
| | Total compulsory credits | 6 | |
| ***3rd COURSE YEAR Core/compulsory courses/activities Curriculum-specific features Applications*** | | | |
| **Learning activity** | | **Ects** | **Sector** |
| Mathematical Statistics | | 9 | MAT/06 |
| | Total compulsory credits | 9 | |
| ***Further elective courses Curriculum-specific features Applications*** | | | |
| **The student must obtain 3 credits with one or more of the following F-type activities.** | | | |
| Educational Training | | 3 | NN |
| Elements of Basic Mathematics 2 | | 3 | MAT/01 |
| Essay Written under the Direction of a Staff Member | | 3 | NN |
| Internship in Industry | | 3 | NN |
| PROBABILITY LAB | | 3 | MAT/06 |
| *not active for the 2025/26 academic year* | | 3 | MAT/07 |
| Laboratory of Mathematical Statistics | | 3 | MAT/06 |
| Numerical Analysis Laboratory | | 3 | MAT/08 |

## *COURSE PROGRESSION REQUIREMENTS*

For the students who matriculated from the Academic Year 2019/2020 on, passing the exam of the course "Elementi di Matematica di Base" is mandatory for the exams of all the courses of the second and the third year. This rule applies to all the Curricula. Furthermore, the students should take into account the teachers' suggestions regarding possible preliminary useful courses.