UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2022/23
MASTER DEGREE
Mathematics (Classe LM-40)
Enrolled from 2012/13

HEADING

Degree classification - Denomination and code:	LM-40 Mathematics
Degree title:	Dottore Magistrale
Curricula currently available:	A - General / Applications / C- Industrial
Length of course:	2 years
Credits required for admission:	180
Total number of credits required to complete programme:	120
Years of course currently available:	1st , 2nd
Access procedures:	Open, subject to entry requirements
Course code:	F4Y

PERSONS/ROLES

Head of Study Programme

Prof. Lovadina Carlo

Tutors - Faculty

Tutor per orientamento:
ALZATI Alberto, BIANCHI Mariagrazia, BRESSAN Nicoletta, CALANCHI Marta, CAMPI Luciano, CAVATERRA Cecilia, CIRAOLO Giulio, FUHRMAN Marco, GARBAGNATI Alice, GORI Anna, LUPERI-BAGLINI LORENZO, MAGGIS Marco, MASTROLIA Paolo, MATESSI Diego, MOLTENI Giuseppe, MONTALTO Riccardo, MONTOLI Andrea, MORALE Daniela, PAYNE Kevin, PENATI Tiziano, PIZZOCCHERO Livio, RIZZO Ottavio, SCACCHI Simone, STELLARI Paolo, SVALDI Roberto, TARSI Cristina, TASIN Luca, TERRANEO Elide, TORTORA Alfonso, TURRINI Cristina, UGOLINI Stefania, VEESER Andreas, VESELY Libor, ZAMPIERI Elena

Degree Course website

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

"Piano Lauree Scientifiche" academic tutor

CAUSIN Paola

ALGANT academic tutor

MAZZA Carlo

Degree programme administration

via Cesare Saldini 50 Phone 0250316107 09.30-11.30 Email: segrccd.mat@unimi.it

ECMI academic tutor

CAUSIN Paola

Master's Degree Admission Board

VIGNATI Marco (Presidente), ALZATI Alberto, BIANCHI Mariagrazia, SCACCHI Simone

Master's Degree Organization Board

CALANCHI Marta (Presidente), BERTOLINI Marina, LOVADINA Carlo

Master's Degree Study Plan Board

COLOMBO Elisabetta (Presidente), PIZZOCCHERO Livio, PAYNE Kevin, UGOLINI Stefania

Orientation and Internship Board

TORTORA Alfonso (Presidente), MAGGIS Marco, MICHELETTI Alessandra, NALDI Giovanni,PENATI Tiziano

Other Activities and Credit Award Board

SCACCHI Simone (Presidente), MOLTENI Giuseppe, TORTORA Alfonso

Programme Transfer and International Qualifications Recognition Board

BIANCHI Mariagrazia (Presidente), ZAMPIERI Elena

Socrates-Erasmus Board

GAETA Giuseppe (Presidente), CIRAOLO Giulio, GORI Anna, MATESSI Diego, SCACCHI Simone

Student registrar

CONTATTI Phone 0250325032 https://www.unimi.it/it/node/359

Student registrar

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

Timetables Board

ZAMPIERI Elena (Presidente), MORALE Daniela

Web pages and website academic tutors

PALEARI Simone, TURRINI Cristina

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The main objective of the Master Degree Program in Mathematics is to furnish a solid foundation in the mathematical sciences, including the knowledge of the state of the art in at least one research area. The degree recipient will be able to comprehend future developments in the field.

Expected learning outcomes

In compliance with the European principles of harmonization, skills output, in terms of learning outcomes, developed by graduates in the Master of Science respond to the specific requirements identified for the class LM-40, and are given below according to the system the Dublin Descriptors:

A - KNOWLEDGE AND UNDERSTANDING:
Graduates in Mathematics Master have expert knowledge in at least one of the following areas:
- Algebra
- Mathematical analysis
- Numerical analysis
- Probability and mathematical statistics
- Mathematical finance
- Mathematical physics
- Geometry
- Industrial mathematics
- History and the foundations of mathematics
- Number theory

and are able to read and understand texts and articles in Advanced Mathematics.
This knowledge is provided according to the guidelines indicated.

B - CAPACITY FOR APPLICATIONS:
Graduates of the Mathematics Master program:
- Are able to produce rigorous proofs of mathematical results, even original;
- Are able to solve difficult problems in at least one field of mathematics;
- Are able to formalize mathematically highly complex problems formulated in natural language, and to profit from this formulation to clarify or resolve them;
- Are able to use tools and computational support to acquire additional information.

C - AUTONOMY IN JUDGEMENTS:
Graduates of the Mathematics Master program:
- Are able to develop logical arguments with a clear identification of the assumptions and the conclusions;
- Are able to recognize and identify incorrect proofs and fallacious reasoning;
- Are able to propose and analyze mathematical models associated with concrete situations of interest for the natural and socio-economic sciences as well as models derived from other disciplines and to use these models to facilitate the study of the original situation;
- Have experience in team work as well as individual research.

D - SKILLS IN COMMUNICATION:

Graduates of the Mathematics Master program:
- Are able to communicate problems, ideas and solutions from Mathematics, both to collegues and to a specialized or general audience;
- Are able to communicate with experts in other fields, to recognize the opportunity to formalize situations of practical, industrial or financial interest mathematically and to identify the appropriate mathematical models to support activities in various areas.

E - ABILITY TO LEARN:
Graduates of the Mathematics Master program:
- Can continue their studies in PhD program, with a good degree of autonomy;
- Have a flexible mindset and are able to fit in quickly in the workplace, easily adapting to new issues.

Professional profile and employment opportunities

The Master Degree in Mathematics enables employment in both the public and private sectors for positions which require the capacity for abstract reasoning, the formulation and/or modelling of concrete problems and their solution through the use of tools coming from the mathematical sciences.
Recipients of the Masters 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, as well as transportation, telecommunication, and aerospace companies and in other high tech industries.
Recipients of the Masters Degree can also plan for a teaching career in the public school system, upon completion of the educational certification and selection process established by law.

Initial knowledge required

- Candidates must hold a scientific Bachelor's degree consistent with the study plan of the class-40 Master's degree programme, or an equivalent qualification obtained abroad.
- They must have a good basic knowledge of mathematics, physics and computer science. As a guideline, the Mathematics Academic Board has prepared a list of contents required for enrolment on the Master's degree programme in Mathematics. This list is available on the website https://matematica-lm.cdl.unimi.it/it/iscriversi

Admission assessment:
Candidates are required to submit a specific application for admission to the Master's degree programme in Mathematics (see the link: https://www.unimi.it/en/study/bachelor-and-master-study/degree-programme-enrolment/enrolment-masters-programme/open-admission-master-programmes).
We discourage students who, as of 14 September 2022, fall short of the 180 credit (CFU) requirement for earning a Bachelor's degree by more than 40 CFU, from applying for admission.
Those who graduated from the Bachelor's degree programme in Mathematics of the University of Milan with at least 95/110 will be waived from the knowledge and curricular assessment requirement.

Applications will be reviewed by a special commission of the Mathematics Academic Board, which will meet at least twice a year. The commission may consider only the documents submitted by applicants, though as a rule it will also interview them. Interviewees must show a photo ID.

Interview dates:
16 June 2022: Board room of the Department of Mathematics (or possibly online)
16 September 2022: Board room of the Department of Mathematics (or possibly online)
24 November 2022: Board room of the Department of Mathematics (or possibly online)
10 January 2023: Board room of the Department of Mathematics
The time will be announced later on.

The Commission may decide:
a) to admit the applicant without any restrictions;
b) to admit the applicant with the requirement to include certain courses (possibly within a Bachelor's degree programme) in his/her study plan. Any requirements are included in the 120 CFU provided for by the programme and do not constitute an additional requirement for the applicant;
c) not to admit the applicant.

Compulsory attendance

Attendance is strongly recommended for each course.

Internship criteria

The regulations for teaching and dissemination laboratories are available at https://matematica-lm.cdl.unimi.it/it/studiare/stage-e-tirocini.

Degree programme final exams

For candidates to be admitted to the final exam, they must have earned 90 credits. The exam test consists of defending a thesis worth 30 credits prepared under the guidance of a faculty member (supervisor).

The regulations are available at https://matematica-lm.cdl.unimi.it/it/studiare/laurearsi

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.

Study and internships abroad

The Master of Science in Mathematics has long been committed to insert its educational activities in an international framework through integrated programs of study. We activated several international cooperation agreements with other universities in Europe and in the world (in Canada, South Africa and India).

The programs ALGANT, Master in Algebra, Geometry and Number Theory, and ECMI, Master in Industrial Mathematics, programs are unique in Europe for pure and industrial mathematics.
These programs are supported by international university consortia and are targeted to the conferment of academic value recognized abroad (that is double degrees) and to the promotion of European higher education. For more information see the institutional web pages

http://www.algant.eu/

http://www.ecmi-indmath.org/

Moreover, in the Erasmus program, we have exchange agreements with universities Austria, Britain, Czech Blind, Denmark , Finland, France, Germany, Holland , Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Turkey.
See the website http://users.unimi.it/erasmusmat/ for information collected on the various programs of internationalization and 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:
•A cademic 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

End of course requirements common to all curricula			
Final Exam		30	NA
	Total compulsory credits	30	

ACTIVE CURRICULA LIST

A - General Course years currently available: 1st , 2nd
Applications Course years currently available: 1st , 2nd
C- Industrial Course years currently available: 1st , 2nd

Procedure for choosing a curriculum

NOTE (applies to all curricula): Following the recent regulations set out by the Ministry for Education, Universities and Research (MUIR) regarding the initial training programme for accessing secondary school teaching roles, students on the Master's Degree in Mathematics course can also include lessons on disciplines relating to anthropology, psychology and pedagogy in their study plans, provided that

- they are included in the teaching syllabus for the For24 Programme of Study set out by the University
- for this purpose a maximum of 12 type d) elective university credits are used, in accordance with the Teaching Activities Regulations regarding the study programme.

Any requests to insert study plans for courses on disciplines relating to anthropology, psychology and pedagogy (still using a maximum of 12 type d) university credits, and observing the regulations) that differ from those contained in the course syllabus for the For24 Programme of Study will be assessed on a case-by-case basis.

CURRICULUM: [F4Y-A] A - General

Qualifying Training Objectives

Curriculum A, "General".

The curriculum aims to provide a very thorough knowledge in at least one area of Mathematics, by providing a significant amount of training activities characterized by a particular logical rigour and a high level of abstraction.

It is also a common goal of all curricula to provide specific subject knowledge for those who intend to pursue a teaching career.

Skills acquired

Natural tendency to abstract reasoning, capability for formalization and/or modeling of concrete problems, problem solving skills using the many tools provided by Mathematics.

Professional profile and employment possibilities

Graduates in Mathematics find job opportunities at: banks and financial companies, insurance companies, surveys institutes, consulting or certification societies, companies of software design and development, centers and companies operating in the medical, biomedical and pharmacological field, as part of scientific communication, in the context of ecology and sections of research and development of large companies, in the areas of transport, telecommunications, aerospace companies, and, more generally, in high-tech industry. Graduates can also join a teaching occupation in the school, once achieved the teaching qualification as requested by law.

Further elective courses Curriculum-specific features A - General		
CHARACTERIZING ACTIVITIES: 57 ECTS **Students must obtain at least 18 ects in the sectors Mat/01-02-03-04-05, by choosing courses that appear in the following table 1A.**		
Advanced Probability	9	MAT/06
Algebraic Number Theory	6	MAT/02
ALGEBRAIC TOPOLOGY (FIRST PART)	6	MAT/03
Commutative Algebra	6	MAT/02
Complements of Mathematics 1	6	MAT/04
Complex Analysis	6	MAT/05
COMPLEX GEOMETRY(FIRST PART)	6	MAT/03
Complex manifolds	6	MAT/03
Didactics of Geometry (first part)	6	MAT/04
Didactics of Infinitesimal Calculus (first part)	6	MAT/04
DIFFERENTIAL GEOMETRY (FIRST PART)	6	MAT/03
Dynamical Systems 1	6	MAT/07
Elements of Functional Analysis	6	MAT/05
Hamiltonian Systems 1	6	MAT/07
Mathematical Logic 1	6	MAT/01
Mathematical Methods in Quantum Mechanics	6	MAT/07

Numerical Methods for Partial Differential Equations 1	9	MAT/08
Numerical Methods for Partial Differential Equations 2	9	MAT/08
Partial Differential Equations	6	MAT/05
Real Analysis	9	MAT/05
Relativity 1	6	MAT/07
Representation theory	6	MAT/02
Stochastic Calculus and Applications	9	MAT/06
Students must obtain at least 12 ects in the sectors Mat/01-02-03-04-05, by choosing courses that appear in the following table 2A.		
Advanced Mathematical Statistics	9	MAT/06
Advanced Partial Differential Equations	6	MAT/05
Advanced Topics in Analytic Number Theory	6	MAT/05
Advanced Topics in Stochastics Calculus	6	MAT/06
Algebra 4	6	MAT/02
Algebraic Combinatorics	6	MAT/02
Algebraic Surfaces	6	MAT/03
Automated Reasoning	6	MAT/01
Biomathematics 2	6	MAT/06, MAT/07, MAT/08
Categorical dualities in logic and algebra	6	MAT/01
Category Theory	6	MAT/01, MAT/02, MAT/03, MAT/04
Computability and computational complexity	6	INF/01
Constructive Approximation	6	MAT/08
Differential Topology	6	MAT/03
Elementary Mathematics from an Advanced Standpoint 1	6	MAT/04
Epistemology of the Mathematical processes	6	MAT/01, MAT/04
Fourier Analysis	6	MAT/05
Geometry 5	6	MAT/03
Geometry of schemes	6	MAT/03
Group Theory	6	MAT/02
Harmonic Analysis	6	MAT/05
HIGHER GEOMETRY 1	6	MAT/03
History of Mathematics 1	6	MAT/04
Homological Algebra	6	MAT/02
Homotopical Algebra	6	MAT/02
Lie Groups	6	MAT/03
Mathematical Logic 2	6	MAT/01
Mathematics education	6	MAT/04
Non Linear Partial Differential Equations	6	MAT/05
Numerical Linear Algebra	6	MAT/08
Operating systems and computer networks.	6	INF/01
Point Processes and Random Sets	6	MAT/06
Preparation of didactical experiences 1	6	FIS/08, FIS/07, FIS/06, FIS/05, FIS/04, FIS/03, FIS/02, FIS/01
Preparation of future teachers 2	6	(9) FIS/08, (9) FIS/07, (9) FIS/06, (9) FIS/05, (9) FIS/04, (9) FIS/03, (9) FIS/02, (9) FIS/01
Projective Algebraic Geometry	6	MAT/03
Riemannian Geometry	6	MAT/03
Scientific Computing	6	MAT/08
Statistical Mechanics	6	MAT/07
Stochastic Control Optimization	6	MAT/06
Students must obtain at least 6 ects in the sectors Mat/06-07-08-09, by choosing courses that appear in Tables 1A and 2A.		
Students must obtain the ects remaining to reach the total of 57 by choosing courses in any sector Mat/xx among those appearing in Tables 1A,2A,1B,2B,1C,2C.		
COMPLEMENTARY ACTIVITIES: 12 ECTS **Students must take at least 12 ects in a sector different from Mat/xx, by inserting in their curriculum those courses that appear in Tables 1A,2A,1B,2B,1C,2C.** **Students also have the opportunity to enter courses in sectors different from Mat/xx, as long as these sectors are included in the list in the "Ordinamento" del CDL degree in Mathematics,** **http://www.mat.unimi.it/users/ccd_mat/OrdinamentoMagistrale.pdf. The choice must be approved by the CDM.** **Students also have the opportunity to replace the courses mentioned above with others in the sectors Mat/xx. The choice must be approved by the CDM.**		
ADDITIONAL TRAINING ACTIVITIES: 3 ECTS **Students must obtain 3 ects preparing a seminar on a topic assigned by a staff member chosen by the student or by participating in other activities such as those provided for curriculum C or by doing the exam of the course "Mathematical Modelling Laboratory" or through the "Criptovalute and Blockchain" activity (Contact Prof. Maggis) or the "Laboratory of mathematical methods and models in Python"(Contact Prof. Paleari); students can also obtain 3 ects through Laboratorio Didattico and Internship (please contact Prof. Turrini).**		
FREE CHOICE ECTS : students must take the missing ects to reach 90 ects, by following free choice courses. **The courses of the undergraduate programme which are not mandatory for all can be included in the study plan only among the free ects.** **The courses of the undergraduate programme which are mandatory for all can only be assigned by the Admissions Committee.**		

CURRICULUM: [F4Y-B] Applications

Qualifying Training Objectives

Curriculum B, "Applied mathematics".

This curriculum specifically aims to provide in-depth knowledge in at least one of the areas of mathematics by providing a significant portion of training activities intended to provide techniques useful for mathematical modeling and numerical simulation of natural, biomedical, social and economic phenomena and technological problems.
Outdoor activities in relation to specific goals, such as internships in companies and laboratories, are avaiable.

It is also a common goal of all curricula to provide specific subject knowledge for those who intend to pursue a teaching career.

Skills acquired

Natural tendency to abstract reasoning, to formalization and/or modeling of concrete problems, to problem solving skills using the many tools provided by Mathematics.

Professional profile and employment possibilities

Graduates in Mathematics find job opportunities at: banks and financial companies, insurance companies, surveys institutes, consulting or certification societies, companies of software design and development, centers and companies operating in the medical, biomedical and pharmacological field, as part of scientific communication, in the context of ecology and sections of research and development of large companies, in the areas of transport, telecommunications, aerospace companies, and, more generally, in high-tech industry. Graduates can also join a teaching occupation in the school, once achieved the teaching qualification as requested by law.

Further elective courses Curriculum-specific features Applications		
CHARACTERIZING ACTIVITIES: 57 ECTS		
Students must obtain at least 9 ects in the sectors Mat/01-02-03-04-05, by choosing courses that appear in the following table 1B.		
Advanced Mathematical Statistics	9	MAT/06
Advanced Probability	9	MAT/06
Complements of Mathematics 1	6	MAT/04
Complex Analysis	6	MAT/05
Didactics of Geometry (first part)	6	MAT/04
Didactics of Infinitesimal Calculus (first part)	6	MAT/04
Dynamical Systems 1	6	MAT/07
Elements of Functional Analysis	6	MAT/05
Hamiltonian Systems 1	6	MAT/07
Mathematical Finance 1	9	SECS-S/06
Mathematical Methods in Quantum Mechanics	6	MAT/07
Numerical Methods for Partial Differential Equations 1	9	MAT/08
Numerical Methods for Partial Differential Equations 2	9	MAT/08
Partial Differential Equations	6	MAT/05
Real Analysis	9	MAT/05
Relativity 1	6	MAT/07
Stochastic Calculus and Applications	9	MAT/06
Students must obtain at least 6 ects in the sectors Mat/01-02-03-04-05, by choosing courses that appear in the following table 2B, or in the previous table 1B.		
Advanced Partial Differential Equations	6	MAT/05
Advanced Topics in Financial Mathematics	6	SECS-S/06
Advanced Topics in Stochastics Calculus	6	MAT/06
Algebra 4	6	MAT/02
Biomathematics 2	6	MAT/06, MAT/07, MAT/08
Computability and computational complexity	6	INF/01
Constructive Approximation	6	MAT/08
CYTOLOGY AND HISTOLOGY	9	BIO/06
DECISION METHODS AND MODELS	6	MAT/09
ECOLOGY	9	BIO/07
Elementary Mathematics from an Advanced Standpoint 1	6	MAT/04
Fourier Analysis	6	MAT/05
GENERAL PHYSIOLOGY AND ANIMAL PHYSIOLOGY	9	BIO/09
GENETICS	9	BIO/18
Geometry 5	6	MAT/03
Harmonic Analysis	6	MAT/05
History of Mathematics 1	6	MAT/04
Lie Groups	6	MAT/03
LOGISTICS	6	MAT/09
Mathematical Finance 2	6	SECS-S/06
Mathematical Modelling Laboratory	6	MAT/09, MAT/06, MAT/07, MAT/08
Mathematics education	6	MAT/04
MOLECULAR BIOLOGY AND BIOINFORMATICS	12	BIO/11
Non Linear Partial Differential Equations	6	MAT/05
Numerical Linear Algebra	6	MAT/08
Operating systems and computer networks.	6	INF/01
OPERATIONS RESEARCH	6	MAT/09
Point Processes and Random Sets	6	MAT/06
Scientific Computing	6	MAT/08
Statistical Mechanics	6	MAT/07
Stochastic Control Optimization	6	MAT/06
Students must obtain at least 12 ects in the sectors Mat/06-07-08-09, by inserting in their curriculum courses that appear in		

Table 1B.

Students must obtain at least 12 ects in the sectors Mat/06-07-08-09, by choosing courses that appear in Table 2B.

Students must obtain the remaining ects for the achievement of 57 ects by choosing courses in any sector Mat/xx through the entries in Tables 1A,2A,1B,2B,1C,2C.

COMPLEMENTARY ACTIVITIES: 12 ECTS
Students must obtain at least 12 ects in a sector different from Mat/xx, by inserting in their curriculum those courses that appear in Tables 1A,2A,1B,2B,1C,2C.
Students also have the opportunity to enter courses in sectors different from Mat/xx, as long as these sectors are included in the list in the "Ordinamento" del CDL degree in Mathematics,
http://www.mat.unimi.it/users/ccd_mat/OrdinamentoMagistrale.pdf. The choice must be approved by the CDM.
Students also have the opportunity to replace the courses mentioned above with others in the sectors Mat/xx. The choice must be approved by the CDM.

ADDITIONAL TRAINING ACTIVITIES: 3 ECTS
Students must obtain 3 ects by preparing a seminar on a topic assigned by a staff member chosen by the student or by participating in other activities such as those provided for curriculum C or by doing the exam of the course "Mathematical Modelling Laboratory" or through the "Criptovalute and Blockchain " activity (Contact Prof. Maggis) or the "Laboratory of mathematical methods and models in Python" (Contact Prof. Paleari); students can also obtain 3 ects through Laboratorio Didattico and Internship (please contact Prof. Turrini).

FREE CHOICE ECTS: students must take the missing ects to reach 90 ects, by following free choice courses.
The courses of the undergraduate programme which are not mandatory for all can be included in the study plan only among the free ects.
The courses of the undergraduate programme which are mandatory for all can only be assigned by the Admissions Committee.

CURRICULUM: [F4Y-C] C- Industrial

Qualifying Training Objectives

Curriculum C, "Industrial".
This curriculum aims to provide in-depth knowledge in at least one of the areas of mathematics by providing a large amount of educational and interdisciplinary activities aimed at modeling, simulation and optimization of industrial, social, economic, technological and biomedical problems and developing of teamwork and communication skills.
Performance of outdoor activities, such as internships in companies and laboratories, in relation to specific goals, are avaiable.

It is also a common goal of all curricula to provide specific subject knowledge for those who intend to pursue a teaching career.

Skills acquired

Natural tendency to abstract reasoning, to formalization and/or modeling of concrete problems, to problem solving skills using the many tools provided by Mathematics.

Professional profile and employment possibilities

Graduates in Mathematics find job opportunities at: banks and financial companies, insurance companies, surveys institutes, consulting or certification societies, companies of software design and development, centers and companies operating in the medical, biomedical and pharmacological field, as part of scientific communication, in the context of ecology and sections of research and development of large companies, in the areas of transport, telecommunications, aerospace companies, and, more generally, in high-tech industry. Graduates can also join a teaching occupation in the school, once achieved the teaching qualification as requested by law.

Natural tendency to abstract reasoning, formalization and/or modeling concrete problems, problem solving through the many tools of Mathematics.

Further elective courses Curriculum-specific features C- Industrial

CHARACTERIZING ACTIVITIES: 45 ECTS
Students must obtain at least 15 ects in Mat/05 sector, 9 ects in Mat/06, 9 in Mat/08, by inserting in their curriculum those courses that appear in the table 1C below. If this is not possible for some SSD (eg. when the examination of some of these teachings had already been claimed during a previous undergraduate course) the student must include in his study plan all teachings remaining in table 1C (for that SSD) and, if necessary, add the teachings of that SSD to obtain the expected ects, choosing among those activated and shown in Table 2C.

Advanced Mathematical Statistics	9	MAT/06
Dynamical Systems 1	6	MAT/07
Elements of Functional Analysis	6	MAT/05
Hamiltonian Systems 1	6	MAT/07
Numerical Methods for Partial Differential Equations 1	9	MAT/08
Numerical Methods for Partial Differential Equations 2	9	MAT/08
Partial Differential Equations	6	MAT/05

Real Analysis	9	MAT/05
Stochastic Calculus and Applications	9	MAT/06
Students must obtain at least 6 ects in the sectors mat/06-07-08-09, by inserting in their syllabus courses that appear in the table below 2C.		
Advanced Partial Differential Equations	6	MAT/05
Advanced Probability	9	MAT/06
Advanced Topics in Financial Mathematics	6	SECS-S/06
Biomathematics 2	6	MAT/06, MAT/07, MAT/08
Complex Analysis	6	MAT/05
Constructive Approximation	6	MAT/08
DECISION METHODS AND MODELS	6	MAT/09
Fourier Analysis	6	MAT/05
Geometry 5	6	MAT/03
Harmonic Analysis	6	MAT/05
LOGISTICS	6	MAT/09
Mathematical Finance 1	9	SECS-S/06
Mathematical Finance 2	6	SECS-S/06
Mathematical Methods in Quantum Mechanics	6	MAT/07
Non Linear Partial Differential Equations	6	MAT/05
Numerical Linear Algebra	6	MAT/08
Operating systems and computer networks.	6	INF/01
OPERATIONS RESEARCH	6	MAT/09
Point Processes and Random Sets	6	MAT/06
Relativity 1	6	MAT/07
Scientific Computing	6	MAT/08
Statistical Mechanics	6	MAT/07
Stochastic Control Optimization	6	MAT/06
Students must obtain 45 ects by choosing courses in any sector mat/xx through the entries in Tables 1C,2C.		

COMPLEMENTARY ACTIVITIES: 18 ECTS

Students must obtain at least 12 ects in a sector different from Mat/xx, by inserting in their curriculum those courses that appear in Tables 1A,2A,1B,2B,1C,2C.

Students also have the opportunity to enter courses in sectors different from Mat/xx , as long as these sectors are included in the list in the "Ordinamento" del CDL degree in Mathematics,
http://www.mat.unimi.it/users/ccd_mat/OrdinamentoMagistrale.pdf . The choice must be approved by the CDM.

ADDITIONAL TRAINING ACTIVITIES: 12 ECTS

Students can obtain 12 ects through an internship/industrial training (6 ects) or by doing the exam of the course "Mathematical Modelling Laboratory" (6 ects) or through participation in the activities of the ECMI Modelling Week which are going to be held in San Pietroburgo (Russia) in the summer of 2020 (6 ects; for information please contact Prof. Causin.
Alternatively, they can be achieved by:
Activity "Criptovalute and Blockchain " (3 CFU), please contact Prof. Maggis or the "Laboratory of mathematical methods and models in Python".
Algant students can acquire 3 ects after active participation to an Algant Summer School and / or by TER (=Travaux d'étude et de recherche) certificate from a University which is an Algant French partner.
At most 3 CFU can also be acquired by preparing a seminar, on a topic assigned by a teacher or through the "Criptovalute and Blockchain" activity (Contact Prof. Maggis) or the "Laboratory of mathematical methods and models in Python" (Contact Prof. Paleari).
At most 3 ects can be acquired also preparing a seminar on a topic assigned by a teacher, as long as the topic concerns a theme or industrial application, students can obtain 3 ects through Laboratorio Didattico and Internship (please contact Prof. Turrini).

FREE CHOICE ECTS : students must take the missing ects to reach 90 ects, by following free choice courses.
The courses of the undergraduate programme which are not mandatory for all can be included in the study plan only among the free ects.
The courses of the undergraduate programme which are mandatory for all can only be assigned by the Admissions Committee.