UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2021/22
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, MAGGIS Marco, MASTROLIA Paolo, MATESSI Diego, MOLTENI Giuseppe, MONTOLI Andrea, MORALE Daniela, PAYNE Kevin, PENATI Tiziano, PIZZOCCHERO Livio, RIZZO Ottavio, SCACCHI Simone, STELLARI Paolo, TARSI Cristina, TASIN Luca, TERRANEO Elide, TORTORA Alfonso, TURRINI Cristina, UGOLINI Stefania, VEESER Andreas, VESELY Libor, VIGNATI Marco, ZAMPIERI Elena, ZANCO Clemente.

Degree Course website

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

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secretariat of the course of study

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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.

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 and other Extra-EU 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, Polonia, Portugal, Romania, Slovenia, Spain, Sweden.
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:
• 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 generally begins around February each year with the publication of a call for applications specifying the destinations, with the respective programme duration (from 2/3 to 12 months), requirements and online application deadline.

Every year, before the deadline for the call, the University organizes informative meetings to illustrate opportunities and rules for participation to students.

Erasmus+ scholarship
The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which is 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.

Learn more at https://www.unimi.it/en/international/study-abroad/studying-abroad-erasmus

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

In every curriculum, students must acquire a total of 120 ects.

For the completion of their program of study, it is recommended that each student should:
1) refer to the form available at the office for teaching or to link http://users.mat.unimi.it/users/alzati/personale/modulo.rtf, and read the NOTE below for the proper use of this form;
2) consult the list of the guidelines prepared by the CDM (= Mathematics College Staff) which is available at the link http://files.ccdmat.unimi.it/modulo/formati/formati702947.pdf.

Moreover, the Commission "Study Plans" of the CDM recommends that each student should comply with the following guidelines (NB: SSD = area, CDL = course of study):

CURRICULUM A
a) at least 15 ects must be achieved in courses of SSD MAT / 02-03-05 (Algebra, Geometry and Analysis) chosen in Tables 1A or 2A;
b) the total number of ects earned through courses of other SSD MAT / xx. and / or activities that provide cfu of type f) may not exceed 24;
c) at most two exams of the triennial CDL not present in the following tables (see the form for the preparation of the curriculum), may be included.

CURRICULUM B
a) at least 6 ects must be achieved in courses of SSD MAT / 02-03-05 (Algebra, Geometry and Analysis) chosen in Tables 1B or 2B;
b) at most two exams of triennial CDL not present in the following tables (see the form for the preparation of the curriculum), may be included.

NOTE 1: The study plans must be submitted approximately halfway through the second year of the course, electronically online. Exceptions are the curricula of Erasmus students and any other plans containing exams not paid for by the university. Other exceptions are special curricula that are not accepted online due to the rigidity of the electronic module.
In all cases in which the study plan can not be submitted electronically students have to present it using the form on paper.
Students can also complete the form and return it to the committee during the first year of study in order to obtain a preliminary opinion on their plan, writing "fac-simile or draft" on the form. This procedure is very appropriate for Erasmus students, before leaving, and by those whose curriculum is not standard.

NOTE 2: Following the recent provisions of the MIUR relating to the system of initial training and access in the roles of teacher in secondary school, students of the Master's Degree in Mathematics are allowed to include courses related to the anthropological disciplines in their study plans psycho-pedagogical, provided that
- are among those contained in the educational offer of the For24 training course, prepared by the University
- for this purpose, a maximum of 12 credits of the type d) can be used, with free choice, while respecting the Academic Regulations of the course of study.
Possible proposals for inclusion in a study plan of courses relating to the anthropo-psycho-pedagogical disciplines (always using a maximum of 12 credits of type d) and respecting the Regulations) different from those contained in the educational offer of the For24 training course, will be evaluated case by case.

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.

	6	MAT/04
	6	MAT/04
Advanced Probability	9	MAT/06
Algebraic Number Theory	6	MAT/02
Algebraic Topology	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
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.

	6	INF/01
	6	MAT/03
	6	MAT/04
	6	SECS-S/06
	6	INF/01
Advanced Mathematical Statistics	9	MAT/06
Advanced Partial Differential Equations	6	MAT/05
Advanced Topics in Complex Analysis	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
Analytic Number Theory	6	MAT/05
Automated Reasoning	6	MAT/01
Biomathematics 1	6	MAT/07
Calculus of Variations	6	MAT/05
Category Theory	6	MAT/01, MAT/02, MAT/03, MAT/04
Celestial Mechanics	6	MAT/07
Dynamical System 2	6	MAT/07
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 (first part)	6	MAT/03
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
Non Linear Partial Differential Equations	6	MAT/05
Numerical Linear Algebra	6	MAT/08
Numerical Methods for Partial Differential Equations 3	9	MAT/08
Numerical Optimization	6	MAT/08
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
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.

	6	MAT/04
	6	MAT/04
Advanced Mathematical Statistics	9	MAT/06
Advanced Probability	9	MAT/06
Complements of Mathematics 1	6	MAT/04
Complex Analysis	6	MAT/05
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.		
	6	INF/01
	6	MAT/04
	6	SECS-S/06
	6	INF/01
Advanced Partial Differential Equations	6	MAT/05
Advanced Topics in Complex Analysis	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 1	6	MAT/07
Calculus of Variations	6	MAT/05
Celestial Mechanics	6	MAT/07
CYTOLOGY AND HISTOLOGY	9	BIO/06
DECISION METHODS AND MODELS	6	MAT/09
Dynamical System 2	6	MAT/07
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
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
MOLECULAR BIOLOGY AND BIOINFORMATICS	12	BIO/11
Non Linear Partial Differential Equations	6	MAT/05
Numerical Linear Algebra	6	MAT/08
Numerical Methods for Partial Differential Equations 3	9	MAT/08
Numerical Optimization	6	MAT/08
OPERATIONS RESEARCH	6	MAT/09
Point Processes and Random Sets	6	MAT/06
Scientific Computing	6	MAT/08
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 partecipating 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.

	6	INF/01
	6	SECS-S/06
Advanced Partial Differential Equations	6	MAT/05
Advanced Probability	9	MAT/06
Advanced Topics in Complex Analysis	6	MAT/05
Advanced Topics in Financial Mathematics	6	SECS-S/06
Biomathematics 1	6	MAT/07
Calculus of Variations	6	MAT/05
COMBINATORIAL OPTIMIZATION	6	MAT/09
Complex Analysis	6	MAT/05
DECISION METHODS AND MODELS	6	MAT/09
Dynamical System 2	6	MAT/07
Fourier Analysis	6	MAT/05
Geometry 5	6	MAT/03
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
Numerical Methods for Partial Differential Equations 3	9	MAT/08
Numerical Optimization	6	MAT/08
OPERATIONS RESEARCH	6	MAT/09
Point Processes and Random Sets	6	MAT/06
Relativity 1	6	MAT/07
Scientific Computing	6	MAT/08
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.

Students must obtain additional 6 ects in a section different from Mat/xx, by inserting in their curriculum 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 on the "Ordinamento" del CDL degree in Mathematics, http://www.mat.unimi.it/users/ccd_mat/ordinamento.doc . The choice will 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: 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 de recherche et d' Actude) 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.