

School of Science and Technology
Corso di Laurea Magistrale /Master Degree in Mathematics and Applications
Classe LM40 Scienze Matematiche

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1. Introduction

This Student Guide contains key information on the Laurea Magistrale (Master Degree) course in Mathematics and Applications. This course belongs to the class LM40 of the Lauree Magistrali in Mathematics.

The guide illustrates the objectives of the course, how to complete the study plans, mentoring activities, possible curricula., tests to assess the initial preparation of students, the courses that are activated in the academic year 2009-2010.

2. Qualifying Educational Objectives

2.1. Qualifying educational objectives for all courses in the LM40 class

(This section intentionally left in Italian)

I laureati nei corsi di laurea magistrale della classe devono:

- avere una solida preparazione culturale di base nell'area della matematica e una buona padronanza dei metodi propri della disciplina;
- conoscere approfonditamente il metodo scientifico di indagine; avere una elevata preparazione scientifica ed operativa delle discipline che caratterizzano la classe;
- avere conoscenze matematiche specialistiche, anche nel contesto di altre scienze, dell'ingegneria e di altri campi applicativi, a seconda degli obiettivi specifici del corso di studio;
- essere in grado di analizzare e risolvere problemi complessi, anche in contesti applicativi;
- avere specifiche capacità per la comunicazione dei problemi e dei metodi della matematica;
- essere in grado di utilizzare fluentemente, in forma scritta e orale, almeno una lingua dell'Unione Europea oltre all'italiano, con riferimento anche ai lessici disciplinari;

- avere capacità relazionali e decisionali, ed essere capaci di lavorare con ampia autonomia, anche assumendo responsabilità scientifiche e organizzative.

I laureati nei corsi di Laurea magistrale della classe potranno esercitare funzioni di elevata responsabilità con compiti di ricerca sia scientifici che applicativi anche nella costruzione e nello sviluppo computazionale di modelli matematici. La loro attività si potrà svolgere in ambiti di interesse, ambientale, sanitario, industriale, finanziario, nei servizi, nella pubblica amministrazione nonché nei settori della comunicazione matematica e della scienza.

Ai fini indicati, i corsi di Laurea Magistrale della classe comprendono

- attività formative che si caratterizzano per un particolare rigore logico e per un livello elevato di astrazione, in particolare su temi specialistici della matematica;
- possono prevedere attività di laboratorio computazionale e informatico, in particolare dedicate alla conoscenza di applicazioni informatiche, ai linguaggi di programmazione e al calcolo;
- possono prevedere, in relazione a obiettivi specifici attività esterne, come tirocini formativi presso aziende e laboratori, e soggiorni di studio presso altre università italiane ed europee, anche nel quadro di accordi internazionali;

2.2. Specific educational objectives of the course and description

The Laurea Magistrale in Mathematics and Applications aims to consolidate the education in mathematics of his graduates by providing a broad range of advanced courses in algebra, geometry, analysis and mathematical physics, such training accompanied by a significant logical rigor, but also aims to develop the student ability to develop and use methods and mathematical models applied in various fields. The course is designed to give the student the choice between a course in which are accentuated the fundamental aspects of mathematics and a path where more attention is paid to issues related to applications.

The main characteristics of graduates of the Laurea Magistrale in Mathematics and Applications at the University of Camerino are:

- a solid preparation in mathematics and in the methods of this discipline;
- a thorough knowledge of the scientific method;
- advanced computational and data competence;
- high language skills;
- specialist knowledge of mathematics, also contextualized to other sciences and fields of application.

The preparation of the final thesis is an important element. In this period the student, under the guidance of a professor will pursuing a research activity on a topic of particular interest and relevance in mathematics basic or applied.

The course is organized by tying a portion of the offer to courses of institutional nature with the objective of an expansion and completion of the student mathematics culture.

Moreover, in-depth courses are provided which are devoted to the study of advanced topics in different fields of mathematics, with a focus on topics of current research points in mathematics.

3. Learning outcomes

3.1. Knowledge and understanding

- Have advanced knowledge in the field of classical and modern mathematics in the areas of analysis, geometry, algebra and logic, statistics and probability, mathematical physics, numerical analysis and operations research.
- Knowing in detail the scientific method.
- Have capacity of abstraction, particularly in developing logical theories and their formal relations.
- Have advanced computational and computer science expertise.

These results are acquired through lectures, classroom exercises, individual study and home assignments. The verification of the results is carried out through midterm examinations and written or oral exams at the end of teaching activity..

3.2. Applying knowledge and understanding

- Formalize mathematical problems of high difficulty formulated in natural non-mathematical language identifying structural components and applying the more appropriate mathematical techniques.
- Analyze and solve complex problems, even in applicative contexts.
- Demonstrate familiarity with abstract thinking and the logical development of formal theories.
- Produce demonstrations of theorems not identical to those known in the literature but clearly related applying similar demonstration schemes.
- To build mathematical models to analyze real-world situations in the economic/financial fields using specific solution algorithms.
- Formulate complex problems optimizing the solution and interpreting it in the new original contexts.

These results are acquired through classroom exercises, individual study, home assignments, laboratory activities, work group experience. The verification of the results is carried out through midterm examinations and written or oral exams at the end of teaching activity.

3.3. Making judgements

- To possess relational and decisional capabilities, and to be able to work in autonomy, taking scientific and organizational responsibility.
- Build and develop logical arguments identifying assumptions and conclusions and evaluate the potential of these.
- Validate, recognizing the correctness, a demonstration or individuate mathematical errors or incomplete results and propose corrections or additions.
- Generalize known mathematical results. .

These results are primarily acquired through individual study, preparation of seminars and of the final thesis. The verification is done primarily through seminar presentations and final discussion of the thesis.

3.4. Communication skills

- Communicate to specialists in the field and to non-specialists the problems and methods of mathematics.

- Present the results of his/her research activity, scientific literature search both to a specialized audience and to a non-specialist public.
- Use fluently in written and oral form, at least one European Union language besides Italian, with reference to disciplinary vocabularies.

These results are acquired through the preparation of seminars in English language and the preparation of the final thesis. The verification of the results is obtained through the seminars and at the final thesis defense.

3.5. Learning skills

- Identify and acquire by themselves even complex techniques and scientific methodologies to be used in the workplace in collaboration with experts from other disciplines
- Read and learn a subject of mathematical literature.
- Identify, through bibliographic research, the scientific frontier in the different areas of mathematics.
- Continue, even through the reading of advanced scientific articles in Italian and International journals, a study in specific areas of mathematics

These results are acquired through personal study, home assignments, preparation of seminar, reading advanced math and scientific articles in Italian and English and internships experience. The verification of the results is obtained through written and/or oral exams at the end of teaching and seminar presentation.

4. Employment areas for graduates and professional job opportunities

Graduates in Mathematics and Applications will be able to:

- continue the program study and research in PhD programs in Mathematics and Applied Mathematics;
- exercise functions of high responsibility in the communication of mathematics and science;
- carry out high responsibility functions in the construction and development of computational mathematical models in various application areas such as environmental, health, finance, services and public administration.

The course is also the second stage of a study program that continuing with the PhD program, or a training specific program for teaching, leads to job opportunities in the roles of teachers in secondary and post-secondary school and University lecturer and professor.

Graduates in Mathematics will have access to the following study programs:

- PhD programs
- School of Specialization for Teaching or similar in order to achieve the teaching qualification;
- Second-level University Masters.

The course prepares for carriers as

- Mathematicians, statisticians and related professionals
- Researchers, graduates technicians.

5. Required knowledge for access

Students who wish to enroll in the Laurea Magistrale Program in Mathematics and Applications must be in possession of a diploma or other degree, which is recognized as eligible in accordance with the legislation in force.

Students wishing to enroll the Laurea Magistrale in Mathematics and Applications, regardless of previous studies, must know and understand the calculus in one and more variables, linear algebra and the fundamentals of basic mathematics; moreover, they must also be able to read and understand advanced math texts and read research articles in mathematics.

To access the Laurea Magistrale program, it is required that students have already acquired at least 30 credits in basic mathematics, in addition to possession of a certificate of proficiency in the English language at least level B1 or have acquired at least 3 credits in the English language in University level courses..

For students from courses other than degrees in Classes 32 or L-35 may be identified personalized study paths, always respecting the laws in force and ensuring the achievement of educational goals of the Program.

The possession of these skills by the student, which is the prerequisite for entry program will be determined by a commission appointed by the Degree Course through a preliminary entry. The Commission's assessment must reflect the curriculum of the student (where appropriate integrated program of training activities) and the oral interview.

6. Final exam and title acquisition

Objective of the final exam is to check the ability of students to present and discuss a mathematical topic orally and in writing, with clarity and mastery. The work, whether theoretical or experimental, will develop the critical abilities of the student and take place under the guidance of a advisor, usually a member of the Faculty appointed by the Chairman.

The student can start the preparation of the final thesis only after having acquired at least 60 credits.

The final exam consists of public discussion of written paper, and it is addressed to assess the general preparation of the student.

The degree, expressed in 110th with the possibility of the additional recognition of "lode" (with praise), evaluates the student's curriculum, his preparation and scientific achievements by the end of their course of study. The exam will be taken in front of a special Committee constituted in accordance with the University rules.

7. Organization of the Teaching Program

7.1. University Credits (CFU)

The acquisition of skills and knowledge by students is recorded as university credits (CFU). Credits represent the task of learning, including individual study, practice exercises and laboratory work, that required to be done by the students for obtaining the Laurea Magistrale in Mathematica and Applications

The average workload of a year by a student engaged in full-time university studies and have adequate initial preparation is set in 60 credits.

To achieve the Laurea Magistrale in Mathematics and Applications, the student must have acquired 120 credits.

Normally, the teaching activities maintain a ratio of 1 to 3 between frontal lecturing and individual study.

The articulation in four semesters of the Laurea Magistrale in Mathematics and Applications and its total duration (two years) are indicative and used as a reference in the course organization. However, the student could achieve those credits and the corresponding title in less than two years.

A credit corresponds to a standard load of 25 hours of work. As a way of illustration, a credit may correspond to 7 hours of frontal lecturing in classroom, or 6 hours of lecturing and 2 hours of exercise. These values may vary depending on the type of instruction, for example, in the case of laboratory activities, or where the exercise is a replacement for individual work, a credit could correspond to 10 hours of guided work and more 15 hours of personal study. Finally, a credit would be 25 hours of student workload in the preparation of the final thesis.

7.2. Evaluation modality and Timetable

A review of the skills acquired in training every single (or groups of them) is through the assessment of a written and / or an All activities leading to the acquisition of credits must be evaluated. The assessment is carried out by special committees chaired by the responsible of the educational activity. The assessment tests can be conducted in writing and / or orally, or other procedures suited to a particular type of activity can be utilized. In some cases, there could also be a midterm exam, for which participation is optional for the student and any negative result will not preclude admission to the final exam. For courses subdivided into modules, evidence verifying preparation of the students can be carried out at the end of each module.

Unless otherwise indicated, learning activities are evaluated by a mark out of thirty, with the possibility of the additional recognition of "lode" (with praise). For the credits for work experience or internship, verification of attendance is required and a report on the activities countersigned by the teacher / supervisor. The evaluation can be expressed with only two possible grades: "satisfactory" or "not satisfactory".

Teaching is divided into 2 semesters according to the following calendar:

Teaching for Semester I:	5 October 2009 – 29 January 2010
Session I Exams:	30 January 2010 – 28 February 2010
Teaching for Semester II:	1 March 2010 – 11 June 2010
Session II Exams:	13 June 2010 – 31 July 2010
Session III Exams	1 September – 3 October 2010

7.3. Mentoring

The Class Advisory Board encourages regular meetings with students to discuss the trend of educational activities. Each student may request that a mentor be assigned to whom to turn to assess the opportunities and the choice in the curricula.

To every first year student a mentor is assigned to help identify potential problems in

individual lessons and, in general, addressing in particular the problems of transition from school to university. Mentors report back to the Chairman any difficulties of the students in understanding specific topics or to follow particular patterns of work and any trouble linked to teaching organization.

8. Curricula

The Laurea Magistrale degree in Mathematics and Applications is organized in a single curriculum, leaving plenty of space to the student to identify the path that would be better suited to its capabilities and its interests.

Students can submit their own individual curriculum, stating the objectives of training. This curriculum will be consistent with the rules as reported on the website of the course..

I YEAR

N	Teaching Activity	CFUi	Modules	CFU and SSD	Typology	Mark or pass/fail
1	Analisi funzionale (*)	6		MAT/05	b	Mark
2	Geometria Superiore (*)	12	Varietà Differenziabili	MAT/03	b	Mark
			Geometria Differenziale			
3	Logica, Numeri e Crittografia (*)	12	Logica Matematica	MAT/01	c	Mark
			Numeri e Crittografia			
4	Probabilità e Processi Stocastici (**)	12	Probabilità	MAT/06	c	Mark
			Processi Stocastici			
5	Meccanica Superiore (**)	12	Sistemi Dinamici	MAT/07		Mark
			Sistemi Complessi			
	Insegnamento Affine (Gruppo B) 1	6				Mark/pass-fail
	Insegnamento Libero 1	6			d	Mark/pass-fail
	Insegnamento Affine (Gruppo A) 1	6			c	Mark
	Insegnamento Affine (Gruppo A) 2	6			c	Mark

II YEAR

N	Teaching Activity	CFUi	Modules	CFU and SSD	Typology	Mark or pass/fail
1	Analisi superiore (*)	6		MAT/05	b	Mark
2	Matematica per le Applicazione 3 (**)	12	Metodi numerici per le equazioni differenziali	MAT/08	b	Mark
			Ottimizzazione combinatoria	MAT/09		
3	Insegnamento Affine (Gruppo B) 2	6			c	Mark
4	Insegnamento Libero 2	6			d	Mark
5	Insegnamento Affine (Gruppo A) 3	6			c	Mark/pass-fail

6	Prova Finale e Ulteriori attività formative (art.10, comma 5, Ulteriori conoscenze linguistiche 0 - 6 lettera d)	30			e	Mark
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In the 2 years, the students must acquire 24 credits among the teaching activities marked by (*)

In the 2 years, the students must acquire 24 credits among the teaching activities marked by (**)

- a basic course
- b characterizing course
- c integrative course
- d course to be chosen by the student
- e final examination and foreign language verification
- f other

The list of activities (Group A and Group B) offered for the academic year 2009/2010 is shown below. Students may also choose to achieve 6 CFU (Group A) conducting study or research (Independent Study and Research) under the supervision of a responsible teacher. This activity cannot be combined in any way with the final preparation of the thesis, even if it is conducted under the supervision of the advisor of the final thesis. Before the start of this activity, students must submit, in accordance with the teacher and agree a program of study and research. Such a program must be validated by the Class. To this activity training will be given a grade in 30th. The composition of the examination Committee will be defined by the class.

Teaching activities (Gruppo A) Academic Year 2009-2010		
Attività formativa	CFU	Settore
Calcolo parallelo	6	MAT/08
Didattica della matematica	6	MAT/04
Problemi inversi ed applicazioni	6	MAT/05
Geometria 4	6	MAT/03
Teoria ergodica	6	MAT/07
Independent Study and Research	6	MAT/*

Attività Affini (Gruppo B) (lista parziale)		
Attività formativa	CFU	Settore
Computazione Quantistica	6	FIS/02
Computabilità e complessità	6	INF(01)
Grafica computazionale	6	ING-IND/06
Sistemi per l'automazione	12	ING-INF/04

Students can choose activities (particularly for the Group B) by choosing courses from the Lauree Magistrali in classes LM-17 and LM-18 not listed above. The appropriateness of this proposal with the final preparation student will be assessed by the class that will then allow the choice of the student.