Manifesto del
Corso di Laurea Magistrale in Matematica

Approvato nel Consiglio di Facoltà del 29 maggio 2012

Definitions of terms used in this document

- Laurea Magistrale in Matematica = Master of Science in Mathematics = M.Sc. in Maths

  This is what this document is about.

- Laurea = Laurea Triennale

  This is an Italian Bachelor's Degree, lasting three years.

- Credit = Credito formativo universitario = CFU

  This is the European unit for measuring the value of activities such a course, an internship, or a thesis. One credit corresponds to about 7 hours of frontal lectures, and a total of 25 hours of work for the student. 120 credits are required for a M.Sc.

- Course type = credit type = tipo

  Nation-wide Italian rules require students studying for a M.Sc. to collect a certain number of credits in various categories. Some of these categories have self-explanatory names. For instance free-choice credits (*crediti liberi*) can be taken basically arbitrarily, subject to loose rules explained below. The two more arcane categories are probably *caratterizzante* (pl. *caratterizzanti*) and *affine* (pl. a*ffini*). These are best defined below through explicit lists.

- Settore = Settore scientifico-disciplinare = SSD

  This is a nation-wide classification of University courses, sorted out in various categories. The categories for Maths are the following:

SSD	**Italiano**	**English**
MAT/01	Logica matematica	Mathematical Logic
MAT/02	Algebra	Algebra
MAT/03	Geometria	Geometry
MAT/04	Matematiche complementari	Miscellanea
MAT/05	Analisi matematica	Mathematical Analisys
MAT/06	Probabilità e statistica matematica	Probability and Mathematical Statistics
MAT/07	Fisica matematica	Mathematical Physics
MAT/08	Analisi numerica	Numerical Analysis
MAT/09	Ricerca operativa	Operations Research

- Consiglio di Area Matematica = CAM

  A body that comprises all the people teaching courses for Mathematics students at the *Laurea* and *Laurea Magistrale* level. It is chaired by a *Coordinatore*.

- Percorso (pl. percorsi)

  Within the general framework of the M.Sc. in Mathematics, it is possible to aim at gaining an in-depth knowledge and understanding of several areas of advanced Mathematics (*percorso* Mathematical Sciences) or to aim more at acquiring knowledge useful for teaching and communicating mathematics and other sciences (*percorso* Teaching and Scientific Communication). Each *percorso*will have different rules in the choice of courses: see below.

- Piano degli studi = piano di studio = piano di studi = study plan

  Each student of the Laurea Magistrale has to spell out the choices she or he is taking among the various course on offer in a document with this name. This is going to be evaluated and approved by the *Consiglio d'Area Matematica*. Detailed rules for each *percorso* to write a valid *piano* are spelled out later in this document. (The plural of *piano* is *piani*.)

- Piano di studio orientato =suggested study plan

Examples of possible study plans centred on different aspects of mathematical studies. Such plans will be automatically approved by CAM.

- Stage

  The Italian term (actually borrowed from French) for an internship.

- Semestre (pl. semestri) = semester = sem

  Teaching is arranged in two periods, conventionally called semesters = six months, although they last only about 14 weeks each. The first *semestre* starts in mid-September and ends about a week before the end of December. The second *semestre* lasts from mid-February to the end of May/beginning of June.

- MUT = Mutuato = Corso mutuato

  This is a course which is held in a different Faculty, or is a proxy for another course held in a different Faculty.

- N.A. = Not Available = Non attivato

  A course that has been active in previous years, and may well be active again in the future, but is not currently offered.

"Istituzione e attivazione"

The Faculty of Science promotes the *Corso di Laurea Magistrale in Matematica* (Master of Science in Mathematics), belonging to the class "LM-40 - Matematica". The degree is activated starting from the Academic Year 2009/10 through the insertion in the *Database of the Offerta Formativa*.

Instruction language

All courses of the Laurea Magistrale in Mathematics are taught in English.

Goals

The Master of Science in Mathematics ("Laurea Magistrale in Matematica") is aimed at providing an in-depth knowledge and understanding of several areas of advanced Mathematics, and of its relations to other Sciences.

Admission requirements

To apply to the Laurea Magistrale in Matematica, a Bachelor's degree lasting for three years or longer is required; such a degree must provide at least the basic concepts of linear algebra and mathematical analysis. A certificate for a B1 level of English is also required.

In this section, the guidelines used to evaluate whether the Bachelor's degree satisfy these minimum requirements are discussed.

- *Laurea in Matematica (classe "L-35 – Scienze matematiche").*Students with such a degree are automatically admitted to the Laurea Magistrale in Matematica..
- *Lauree affini.* Students that have taken at least 60 CFU in the *settori* MAT/* while working at a Bachelor's Degree (Laurea) in Physics, Computer Science, Engineering or Economics.

  These students might be required to follow a particular *piano degli studi* (study plan).
- In all the other cases, a formal application request is required, including the following information:
  - a detailed study plan of the Bachelor's degree, including titles and syllabi of all the courses taken;
  - a document issued from the University that issued the Bachelor's degree reporting, in Italian or English, the list of courses, the score obtained in each of them and the final score associated to the degree;
  - work and professional experiences;
  - level of knowledge of English Language, certified by internationally recognized organizations or by the University that issued the Bachelor's degree;
  - a motivation statement, explaining why the student is willing to apply to the Corso di Laurea Magistrale in Matematica, and what he/she expects from it.

  These students might be required to follow a particular *piano degli studi* (study plan).

Applications will be evaluated by a committee indicated by the *Consiglio d'Area Matematica*. The committee can require a personal interview (possibly on-line) with the applicants, to better evaluate their curriculum.

Norma transitoria: gli studenti iscritti al Corso di Laurea Specialistica in Matematica (classe 45/S) dell'Università di Trento possono richiedere il passaggio al nuovo ordinamento, con riconoscimento totale dei crediti già acquisiti.

Piano degli studi

Students have to submit a *piano degli studi* (study plan), which satisfies the requisites for one of the two *percorsi* spelled out below. Such a *piano* is subject to approval by the *Coordinatore del Consiglio d'Area Matematica*. Students are not allowed to repeat activities already taken in their earlier career.

To write a proper *piano*, a total of 120 credits have to be chosen in the following categories.

Crediti caratterizzanti

Depending on the *percorso*, whose rules are spelled out below, the students have to select a certain number of *crediti caratterizzanti*, which correspond to certain core Mathematics courses in two groups of *settori*. A list of such courses is given for each *percorso* below.

Crediti affini

Depending on the *percorso*, whose rules are spelled out below, the students have to select a certain number of *crediti affini.* A list of *settori* whose credits are considered *affini* is given below. Note that all Mathematics courses are *affini*. Also, once the proper number of *crediti caratterizzanti* has been chosen, the student can select more *caratterizzanti* courses under the*affini* label.

Crediti liberi/free-choice credits

In the *piano degli studi s*tudents can select any course offered at the University of Trento for their free-choice credits (*crediti liberi*), subject to approval by the *Coordinatore del Consiglio d'Area Matematica*. Students are required to give a detailed motivation for these choices in the *piano di studi*.

Note that further *caratterizzanti* and *affini* courses can be taken under this label.

Language Skills

Students are required to get a B2 (or higher) certficate of English for 3 credits of *Language Skills*. Students who have already used such a certification earlier in their career may alternatively get these 3 credits by getting a higher level certificate of English, or a B1 level in French, German, Spanish, Chinese or Russian.

Stage/Internship and Thesis/tesi

Several internships at companies and institutions are available. An internship has a default credit value of 12.

The thesis has a credit value of 18. Students can choose to take a special *internal internship* (*tirocinio interno*), if they wish to write a thesis for 12 + 18 = 30 credits.

"Percorsi"and "Orientamenti"

The course is organized into two *percorsi:*

- **Mathematical Sciences,** and
- **Teaching and Scientific Communication**.

The *percorso* of **Mathematical Sciences** comprises several recommended *orientamenti*.

Percorso "Mathematical Sciences"

A *piano degli studi* for this *percorso* must obey the following rules

Type	CFU	Settori
Caratterizzanti	24	**MAT/01-05**
Caratterizzanti	12	**MAT/06-09**
Affini	36	
Liberi/free-choice	15	
Language skills	3	
Stage/internship	12	
Tesi/thesis	18	
CFU Total	**120**	

In other words, to write down a valid *piano* for this *percorso*, a student has to choose:

1. 24 credits of *caratterizzanti* courses (see the list below) in the *settori* MAT/01 to 05.
2. 12 credits of *caratterizzanti* courses (see the list below) in the *settori* MAT/06 to 09.
3. 36 credits of *affini* courses, as listed below.

   Please note that once conditions 1 and 2 have been fulifilled, further *caratterizzanti* courses may well be taken under the *affini* label. You will find examples of this in some *orientamenti* below.
4. 15 *free-choice* credits (*crediti liberi*), see above.

   Please note that once conditions 1, 2 and 3 have been fulfilled, further *caratterizzanti* and *affini* courses may well be taken under the *free-choice* label.
5. For the language skills requirements, see above.
6. For thesis and internship, see above.

The following are the ***caratterizzanti*** courses

Course	Codice	CFU	Settore	Semestre	Docente
Mathematical Logic	145146	6	**MAT/01**	1	Stefano Baratella
Computational Algebra	145135	6	**MAT/02**	2	Willem de Graaf
Coding Theory	145134	12	**MAT/02**	1	Massimiliano Sala
Advanced Geometry	145130	9	**MAT/03**	1	Roberto Pignatelli
Algebraic Geometry I	145131	6	**MAT/03**	1	Marco Andreatta
Advanced Analysis	145129	9	**MAT/05**	1	Francesco Serra Cassano
Integral Transforms	145143	6	**MAT/05**	1	Luciano Tubaro
Mathematical Biology	145145	9	**MAT/05**	2	Mimmo Iannelli / Andrea Pugliese
Partial differential equations in biology	145329	9	**MAT/05**	1	Mimmo Iannelli / Alberto Valli
Stochastic Processes (primo modulo)	145157	6	**MAT/06**	2	Luciano Tubaro
Stochastic Differential Equations	145159	6	**MAT/06**	1	Stefano Bonaccorsi
Mathematical Physics	145147	9	**MAT/07**	2	Enrico Pagani
Numerical Methods for PDE	145152	6	**MAT/08**	2	Vincenzo Casulli
Scientific computing	145330	6	**MAT/08**	2	Michael Dumbser
Mathematical aspects of bioelectromagnetism and imaging	145331	6	**MAT/08**	2	Ana Alonos

List of ***affini*** courses offered for the Laurea Magistrale in Mathematics

Course	Codice	CFU	Settore	Sem.	Docente
Set Theory	145156	6	MAT/01	2	Stefano Baratella
Cryptography (= INFORMATICA)	145321	6	MAT/02	1	Massimiliano Sala
Discrete Fourier Analysis	145212	6	MAT/02	2	Sandro Mattarei
Elliptic Curves and Cryptography	145140	6	MAT/03	1	Edoardo Ballico
Partial Differential Equations	145181	6	MAT/05	2	Augusto Visintin
Advanced Topics in Biomathematics	145133	6	MAT/05	1	parzialmente mutuato da **"Partial differential equations in biology"**
Stochastic Processes (secondo modulo)	145158	3	MAT/06	2	Stefano Bonaccorsi
Data Analysis and Exploration	145136	6	MAT/06	1	Andrea Pugliese
Statistics of Stochastic Processes	145193	6	MAT/06	2	Andrea Pugliese
Numerical Methods for Mathematical Finance and Applications	145336	9	MAT/08	2	contratto
Mathematical Finance II	145257	6	SECS-S/06	1	Di Persio Luca
Theoretical biomechanics	145332	9	ICAR/01	1	Davide Bigoni - Giorgio Rosatti
Statistical models	145333	3	MAT/06	1	parzialmente mutuato da **"Data Analysis and Exploration"**
Mathematical finance (modulo 1)	145334	3	SECS-S/06	1	parzialmente mutuato da **"Mathematical finance II"**

The student can choose as affini courses between these courses, the caratterizzanti not already chosen and all courses offered in the Univeristy of Trento in the settori listed below. These have to be listed in a study plan (piano di studi) that has to be approved by the committee. All study plans, listed below as "orientamenti", will be automatically approved.

***Settori* of *affini* courses.**

BIO/*	Biologia
FIS/*	Fisica
ICAR/01	Idraulica
ICAR/02	Costruzioni idrauliche e marittime e idrologia
ICAR/07	Geotecnica
INF/01	Informatica
ING-IND/*	Ingegneria Industriale
ING-INF/*	Ingegneria Informatica
M-FIL/02	Logica e filosofia della scienza
M-FIL/05	Filosofia e teoria dei linguaggi
M-PED/01	Pedagogia generale e sociale
M-PED/02	Storia della pedagogia
M-PED/03	Didattica e pedagogia speciale
M-PED/04	Pedagogia sperimentale
M-PSI/01	Psicologia generale
M-PSI/02	Psicobiologia e psicologia fisiologica
M-PSI/03	Psicometria
M-PSI/04	Psicologia dello sviluppo e psicologia dell'educazione
MAT/*	Matematica

MED/01	Statistica medica
SECS-P/*	Economia
SECS-S/*	Statistica

The student can choose as **free-choice courses** all courses offered by the University, whose contents do not overlap with those of other courses already taken in the Laurea Magistrale or of previous degrees. A motivation for the choices has to be provided in the "piano degli studi"

All courses "caratterizzanti" or "affini" not previously taken can be chosen as "free-choices" and do not need a motivation. Similarly, a motivation is not required for the courses suggested in the piani di studio orientati, as well as for the courses in mathematics offered by Ph.D. schools of the university.

Piani di studio orientati

The following represent suggestions to form coherent *piani di studio* with specific objectives, within the *percorso* of Mathematical Sciences.

Please note that if the number of *caratterizzanti* credits higher than the 24 + 12 = 36 spelled out in the general rules above. In the *piano di studi*, the student will simply enter the *caratterizzanti* credits beyond the required 24 + 12 = 36 under the *affini* label.

Piano orientato ad un'ampia formazione culturale/Higher Mathematics

This is aimed especially at students wishing to pursue a PhD in Mathematics.

Students take the following courses:

Course	codice	Settore	Type	Sem	CFU
Advanced Analysis	**145219**	**MAT/05**	Caratterizzante	1	9
Advanced Geometry	**145130**	**MAT/03**	Caratterizzante	1	9
Computational Algebra	**145135**	**MAT/02**	Caratterizzante	2	6
Stochastic Processes (primo modulo)	**145157**	**MAT/06**	Caratterizzante	2	6
Numerical methods for PDE	**145152**	**MAT/08**	Caratterizzante	2	6
Mathematical Physics	**145147**	**MAT/07**	Caratterizzante	2	9
Stochastic Processes (secondo modulo)	**145256**	**MAT/06**	Affine	2	3
CFU Total					**48**

Please note that Mathematical Physics will have to be entered under the *affini* label in the *piano di studi*, to satisfy the general rules.

Students also take the following credits:

Type	**CFU**
Affini	24
Free-choice/liberi	15
Language Skills	3
Internship/stage	12
Thesis/tesi	18
CFU Total	**72**

Please note that any *caratterizzante* course beyond the ones required above can be taken also as an *affine,* and that any *caratterizzante* or *affine* can be taken as free-choice.

Piano orientato all'Algebra Computazionale, Crittografia e Codici a Correzione d'Errore / Computational Algebra, Cryptography and Error-Correcting Codes

An introduction to modern methods in Computational Algebra, both commutative and non-commutative, and to advanced algebraic and geometric methods in cryptography and coding theory. Internship at leading companies and organizations working in these areas are available.

Students take the following courses:

Course	**codice**	**Settore**	**Type**	**sem**	**CFU**
Computational Algebra	**145135**	**MAT/02**	Caratterizzante	2	6
Coding Theory	**145134**	**MAT/02**	Caratterizzante	1	12
Integral Transforms	**145143**	**MAT/05**	Caratterizzante	1	6
Stochastic Processes (primo modulo)	**145157**	**MAT/06**	Caratterizzante	2	6
One more *caratterizzante* course in the *settori* MAT/06 to 09 for at least 6 CFU		**MAT/06 to /09**	Caratterizzante		6
	CFU Total				**36**

36 CFU to be chosen among the following:

Course	**codice**	**Settore**	**Type**	**sem**	**CFU**
Discrete Fourier Analysis	**145212**	**MAT/02**	Affine	2	6
Cryptography	**145321**	**MAT/02**	affine	1	6
Finite Fields and Symmetric Cryptography	**145141**	**MAT/02**	Affine	Tace nel 2012/13	6
Communication systems	**145189**	**ING-INF/03**	Affine	MUT da Ing. (0335H –cod. **140119)**	12
Digital signal processing	**145190**	**ING-INF/03**	Affine	MUT da Ing. (0335H – cod. (**140124)**	6
Data hiding	**145192**	**ING-INF/03**	Affine	MUT da Ing. (0335H - cod. **140122)**	6

Please note that the course of *Comunicazioni elettriche,* from the Laurea (triennale) in Ingegneria delle Telecomunicazioni, is recommended as a prerequisite to *Communication systems*.

Students also take the following credits:

Type	**CFU**
Free-choice/liberi	15
Language Skills	3
Internship/stage	12
Thesis/tesi	18
CFU Total	**48**

Please note that any*caratterizzante* course beyond the ones required above can be taken also as an *affine,* and that any *caratterizzante* or *affine* can be taken as free-choice.

Piano orientato alla Matematica per l'Economia e la Finanza / Mathematics for Economy and Finance

Aims at preparing students to a career in financial institutions. Internships such at research centres of banks are available.

Students take the following courses:

1st year; semester 1

Course	Codice	Settore	Type	Sem	CFU
Advanced Analysis	**145129**	**MAT/05**	Caratterizzante	1	9
Integral Transforms	**145143**	**MAT/05**	Caratterizzante	1	6
Statistical models	**145333**	**MAT/06**	Affine	1	3
Mathematical Finance (modulo 1)	**145334**	**SECS-S/06**	Affine	1	3
Language skills					3
Financial markets and economic activity	**145335**	**SECS-P/01**	Affine	MUT da Economia (0119H cod. **121008**)	8

1st year; semester 2

Course	Codice	Settore	Type	Sem	CFU
Stochastic Processes (primo modulo)	**145157**	**MAT/06**	Caratterizzante	2	6
Stochastic Processes (secondo modulo)	**145158**	**MAT/06**	Affine	2	3
Statistics of stochastic processes	**145256**	**MAT/06**	Affine	2	6
Laboratorio di simulazioni finanziarie*	**145339**	**SECS-S/03**	Affine	MUT da Economia (0122H cod. **121184**)	6

* Course given in Italian with notes in English; alternatives will be offered to students not proficient enough in Italian.

2nd year; semester 1

Course	Codice	Settore	Type	Sem	CFU
Stochastic Differential Equations	**145159**	**MAT/06**	Caratterizzante	1	6
Mathematical finance (modulo 2)	**145334**	**SECS-S/06**	Affine	1	3

2nd year; semester 2

Course		Settore	Type	Sem	CFU
Numerical Methods for Mathematical Finance and Applications	**145255**	**MAT/08**	Affine	2	9

Students must also take 9 credits in courses *caratterizzanti* in the *settori* MAT/01 to 05

Students must also take **10 credits in free courses**

Students must also take **12 credits for internship/stage; 18 credits for thesis**.

Note: students in their 2nd year in 2012-13 will follow the scheme presented in 2011-12; in particular they will take Mathematical Finance II in the first semester of the second year.

Note: courses advised as free-choice:

- Strumenti di investimento e derivati, 11 crediti from Laurea Magistrale in Finanza*
- Laboratorio di modelli statistici per l'economia e la finanza, 6 crediti from Laurea Magistrale in Finanza*
- Microeconomics and game theory (10 CFU) (1st sem.) from Master in Economics;

For students missing some prerequistes in mathematical analysis or probability theory, it is possible to include appropriate courses (in Italian) from Bachelor's degree (Laurea triennale) among free-choice courses.

- * Students must inform in advance the Coordinator of their intention to attend these courses (in Italian), in order to set up the logistic arrangements with the Faculty of Economics

Piano orientato a Modelli, statistica ed analisi di biosistemi / Modelling, statistics and analysis of biosystems

An introduction to modern mathematical methods in areas of biology as ecology, epidemiology, molecular networks. Internships at leading companies and research centres are available.

Students take the following courses:

1st year; semester 1

Course	Codice	Settore	Type	Sem	CFU
Advanced Analysis	**145129**	**MAT/05**	Caratterizzante	1	9
Integral Transforms	**145143**	**MAT/05**	Caratterizzante	1	6
Biology (**1 modulo**) mutuato parzialmente da **Biologia degli organismi**	**145046**	**BIO/13**	Affine	1	6
Language skills					3
Data analysis and exploration	**145136**	**MAT/06**	Affine		6

1st year; semester 2

Course	Codice	Settore	Type	Sem	CFU
Mathematical Biology	**145145**	**MAT/05**	Caratterizzante	2	9
Stochastic Processes (primo modulo)	**145157**	**MAT/06**	Caratterizzante	2	6
Stochastic Processes (secondo modulo)	**145158**	**MAT/06**	Affine	2	3
Statistics of Stochastic Processes	**145256**	**MAT/06**	Affine	2	6

Biology (**2 modulo**) mutuato parzialmente da **Biologia cellulare**	**145046**	**BIO/13**	Affine	2	6

2nd year; semester 1

Course	**Codice**	**Settore**	**Type**	**Sem**	**CFU**
Stochastic Differential Equations	**145159**	**MAT/06**	Caratterizzante	1	6
Advanced topics in biomathematics	**145133**	**MAT/05**	Affine	1	6

Students must also take 12 credits for internship/stage; 18 credits for thesis.

Notes:

Courses advised as free-choice:

- Simulation of biological systems (6 CFU)
- Laboratory of biological data mining (6 CFU)
- Machine learning (6 CFU) (1st sem.)
- Biomedical imaging (6 CFU) (2nd sem.)
- Numerical methods for PDE (6 CFU) (2nd sem.)
- Partial differential equations (6 CFU) (2nd sem.)

For students missing some prerequistes in mathematical analysis or probability theory, it is possible to include appropriate courses (in Italian) from Bachelor's degree (Laurea triennale) among free-choice courses.

Piano orientato a Modelling and Simulation for Biomedical Applications

A study plan yielding competences in mathematics, numerical computation, physics, physiology, applicable to a range of disciplines in medicine, pharmaceutical industry, sanitary services.

1st year; semester 1

Course	Codice	Settore	Type	Sem	CFU
Theoretical Biomechanics	**145332**	**ICAR/01**	Affine	1	9
Partial differential equations in biology	**145329**	**MAT/05**	Caratterizzante	1	9
Integral transforms	**145143**	**MAT/05**	Caratterizzante	1	6
Statistical models	**145333**	**MAT/06**	Affine	1	3
Physiology mutuato parzialmente da **Fisiologia** x BIO	**145337**	**BIO/09**	Affine	1	6

1st year; semester 2

Course	Codice	Settore	Type	Sem	CFU
Scientific computing	**145330**	**MAT/08**	Caratterizzante	2	6
Mathematical aspects of bioelectromagnetism and imaging	**145331**	**MAT/08**	Caratterizzante	2	6
Biomedical imaging	**145338**	**FIS/07**	Affine	2	6
Mathematical biology	**145145**	**MAT/05**	Caratterizzante		9
Language skills					3

2nd year; semester 1

Course	Codice	Settore	Type	Sem	CFU
Models and numerical methods of blood flow	**Da def.**	**MAT/08**	**Tace nel 2012/13**	1	9
Physiological flow and transport in porous tissues	**Da def.**	**ICAR/01**	**Tace nel 2012/13**	1	6

12 credits of free-choice courses; strongly advised Biomedical applications of mathematics (6 CFU) and Numerical methods for partial differential equations (6 CFU)..

Percorso "Teaching and Scientific Communication"

The rules for this *percorso* are the following.

Students must take 30 credits among the following courses *caratterizzanti:*

Course	Codice	Settore	Type	Semestre	Docente	CFU
Foundations of Geometry	145253	MAT/03	Caratterizzante	2	Luminati Domenico	6
Elementary Mathematics from a higher Viewpoint I	145149	MAT/04	Caratterizzante	1	Beretta Lucia	6
Elementary Mathematics from a higher Viewpoint II	145150	MAT/04	Caratterizzante	2	Ballico Edoardo	6
Laboratory of Didactics of Mathematics	145144	MAT/04	Caratterizzante	1	Delladio Silvano	6
Experimental Mathematics Laboratory at High School Level	145154	MAT/04	Caratterizzante	2	Luminati Domenico	6
Foundations of Analysis	145142	MAT/05	Caratterizzante	1	Bagagiolo Fabio	6

Students must take the following course

Course	Codice	Settore	Type	Semestre	Docente	CFU
Mathematical models for the Physical, Natural and Social Sciences	145151	MAT/06	Caratterizzante	2	Bonaccorsi Stefano	6

Students must take the following courses *affini:*

Course	Codice	Settore	Type	Semestre	Docente	CFU
Experimental Physics Laboratory at High School Level I	145154	FIS/08	Affine	1	Gratton Luigi	6
Experimental Physics Laboratory at High School Level II	145215	FIS/08	Affine	2	Gratton Luigi	6
Modern Physics	145155	FIS/08	Affine	1	Oss Stefano	12
Didactics of Computer Science	145211	INF/01	Affine	2	Mich Luisa	6

Students must also take 6 credits *affini* among all courses *caratterizzanti* or *affini* of area MAT or FIS not chosen from the previous lists, or listed for the percorso Mathematical Sciences, or the course "Physical Science Communication and Teaching methods"

Students also take the following credits, following the general rules spelled out earlier in this document:

Type	CFU
Free-choice/liberi	15
Language Skills	3
Thesis/tesi	30
CFU Total	**48**

Please note that any*caratterizzante* or *affine* course not already chosen *ca*n be taken as free-choice. The courses "Mathematical logic" and "Physical Science Communication and Teaching methods" are recommended for the 6 credis affini and for the free-choiuce courses.