



UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2020/21
MASTER DEGREE
Physics (Classe LM-17)
Enrolled from academic year

HEADING

Degree classification - Denomination and code:	LM-17 Physics
Degree title:	Dottore Magistrale
Curricula currently available:	Specialist Curriculum / Multi-Sector Curriculum
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 completion of self-assessment test prior to enrolment
Course code:	F95

PERSONS/ROLES

Head of Study Programme

Prof. Alberto Pullia

Degree Course Coordinator

Prof. Alberto Pullia

Tutors - Faculty

Prof. Alberto Pullia (Tutor per i piani di studio) (Study plan tutor)
Prof. Alberto Pullia (Tutor per stage e tirocini) (Internship tutor)
Prof. Nicola Piovella (Tutor per la mobilità internazionale e l'Erasmus) (Erasmus and international mobility tutor)
Prof. Roberta Vecchi (Tutor per laboratori e altre attività) (Laboratory Classes)
Prof Giuseppe Bertin (Tutor per trasferimenti) (University and programme transfer tutor)
Prof. Marcel Di Vece (Tutor per trasferimenti) (University and programme transfer tutor)
Prof. Marcello Fanti (Tutor per trasferimenti) (University and programme transfer tutor)
Prof. Giancarlo Maero (Tutor per trasferimenti) (University and programme transfer tutor)
Prof Giuseppe Bertin (Tutor per riconoscimento crediti) (Credit recognition tutor)
Prof. Marcel Di Vece (Tutor per riconoscimento crediti) (Credit recognition tutor)
Prof. Marcello Fanti (Tutor per riconoscimento crediti) (Credit recognition tutor)
Prof. Giancarlo Maero (Tutor per riconoscimento crediti) (Credit recognition tutor)
Prof Giuseppe Bertin (Tutor per ammissioni alla Laurea magistrale) (Master's degree admission tutor)
Prof. Marcel Di Vece (Tutor per ammissioni alla Laurea magistrale) (Master's degree admission tutor)
Prof. Marcello Fanti (Tutor per ammissioni alla Laurea magistrale) (Master's degree admission tutor)
Prof. Giancarlo Maero (Tutor per ammissioni alla Laurea magistrale) (Master's degree admission tutor)
Prof. Bassano Vacchini (Tutor per tesi di Laurea) (Dissertation tutor)
Dott. Fabrizio Castelli (Tutor per tesi di Laurea) (Dissertation tutor)
Prof. Fabio Crespi (Tutor per tesi di Laurea) (Dissertation tutor)
Prof. Davide Maino (Tutor per tesi di Laurea) (Dissertation tutor)
Prof. Valentino Liberali (Tutor per tesi di Laurea) (Dissertation tutor)
Prof. Ivan Veronese (Tutor per tesi di Laurea) (Dissertation tutor)
Prof. Daniela Bettega (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Franco Camera (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Simone Cialdi (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Gianluca Colò (Tutor per l'orientamento) (Academic guidance tutor)
Dott. Leonardo Gariboldi (Tutor per l'orientamento)(Academic guidance tutor)
Prof. Mauro Giudici (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Alessandra Guglielmetti (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Giuseppe Lodato (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Nicola Manini (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Luca Molinari (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Stefano Olivares (Tutor per l'orientamento) (Academic guidance tutor)

Prof. Matteo Paris (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Paolo Piseri (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Pierre Pizzochero (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Massimo Sorbi (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Guido Tiana (Tutor per l'orientamento) (Academic guidance tutor)
Prof. Alessandro Vicini (Tutor per l'orientamento) (Academic guidance tutor)

Tutors - Students

Francesca ASTORI
Caterina BERTI
Giorgio FRANGI
Clara IAQUINTA
Fabiana LAURO
Sergio MARCHESE
Matteo MARTINELLI
Nicolò PEDRANI
Davide ROTA
Martino ZANETTI

Degree Course website

<https://www.unimi.it/it/corsi/corsi-di-laurea/fisica-magistrale>

Admission

Email: commissione.ammissione@fisica.unimi.it

Enrollment

<https://www.unimi.it/it/node/92/>

Program Transfer

Email: commissione.ammissione@fisica.unimi.it

Recognition of Prior Learning

Email: commissione.ammissione@fisica.unimi.it

Reference Office

Via Celoria 16 - 20133 Milano Phone 02.50317401 Email: cl.fisica@unimi.it

CHARACTERISTICS OF DEGREE PROGRAMME

General and specific learning objectives

The aim given to the Master's course in Physics is to enable the graduate student to either continue with further studies or to take part in research or professional activity with the necessary competence, having learnt the use of scientific methods and experimental basis, theoretical and mathematical, on which physics is based.

The Master's degree course will enable the student to deepen acquired knowledge in classic physics, relativity and quantum physics as regards to phenomenological aspects, theoretical aspects and their mathematical formulas.

Having acquired adequate mathematical and computer instruments, the student will be able to carry out tests in formulations in the use of mathematical models and in the use of calculus techniques for problem solving in physics.

The Master's Degree course is open to further development and in-depth study in post-graduate courses. It foresees different majors which permit the graduate student to enter basic research and/or applied research and in work-related areas which require experimental-applicative competences, the knowledge of innovative methods, the use of complex equipment.

Expected learning outcomes

Master's graduates will be able to work with wide autonomy, even assuming responsibility for projects and groups, and to use the specific knowledge acquired for modeling complex systems in most fields of applied sciences.

Professional profile and employment opportunities

Among the line of study that graduate students will undertake, are the following:

- scientific research in Italian and foreign universities;
- scientific research in public and private institutions, Italian and foreign;
- scientific research in industries;
- professional and project work in fields related to physics, industry, the environment, health, art and in public administration;
- the high-level diffusion of scientific education with particular reference to theoretical aspects, experimental and applicative aspects to classic and modern physics;
- promotion and development of scientific innovation and technology.

Notes

A minimum English language proficiency at level B1 within the Common European Framework of Reference for Languages (CEFR) is an admission requirement.

The English level B1 or B2 is assessed by the University Language Centre SLAM throughout the admission process in the following ways:

- language certificate achieved no more than three years prior to the submission, at level B1 or B2 or higher, recognised by the University (the list of recognised language certificates can be found at: <https://www.unimi.it/en/node/297/>). The language certificate must be uploaded during the admission process;
- level of English assessed by SLAM (and/or through a computer-based test) during the bachelor's degrees obtained at the University of Milan. English levels B1 and B2 achieved no more than four years previously are deemed valid. The verification is automatic with no need to attach any certificate during the application phase;
- entry test, organised by SLAM, which will take place on September 22, 2020 at 9.30 a.m. for graduate students and on January 11, 2021 at 9.30 a.m. exclusively for students who are about to graduate or have graduated after the September's date of examination. If the language certificate or level is not valid, the candidate will be summoned for the entry test through the admission procedure. Candidates who fail the entry test will not be admitted to the master's degree programme and cannot take further tests.

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 30 different 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 thesis work is often carried out in prestigious research centers like CERN or GSI, or important Universities worldwide, in the frame of international collaborations and research programs.

How to participate in Erasmus mobility programs

How to participate in Erasmus+ mobility programmes

The students of the University of Milan can participate in mobility programmes, which last 3 to 12 months, through a public selection procedure.

Ad hoc commissions will evaluate:

- 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, 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 Festa del Perdono 7 (first floor)

Tel. 02 503 13501-12589-13495-13502

E-mail: mobility.out@unimi.it

Desk opening hours: Monday to Friday 9 am - 12 noon

1st COURSE YEAR Core/compulsory courses/activities common to all curricula		
Learning activity	Ects	Sector
CLASSICAL ELECTRODYNAMICS	6	FIS/01
English proficiency B2 (3 ECTS)	3	
INFORMATICS ABILITY	3	
	Total compulsory credits	12
2nd COURSE YEAR Core/compulsory courses/activities common to all curricula		
Learning activity	Ects	Sector
FINAL EXAM	36	
	Total compulsory credits	36

ACTIVE CURRICULA LIST

Specialist Curriculum Course years currently available: 1st , 2nd
Multi-Sector Curriculum Course years currently available: 1st , 2nd

Procedure for choosing a curriculum

When enrolling in the program students must choose between:

- Specialist Curriculum, oriented to gaining a deep knowledge in one field of Physics
- Multi-Sector Curriculum, oriented to teaching and Science dissemination

CURRICULUM: [F95-A] Specialist Curriculum

Qualifying Training Objectives

The Specialist curriculum program provides skills for theoretical and experimental research, as well as for entering post-graduate courses with advanced scientific contents. The provided skills match job requirements related to research in University and/or in Research Institutes, in Public Departments, in Industry. The teachings included in the specialist curriculum program are strongly connected with the research activities of teachers in the experimental and theoretical fields. In most laboratory courses the advanced equipment and/or technologies used by our research groups are made available to students. The contents of the theoretical and experimental Physics courses are related to the research topics of interest to the teachers. Several courses are taught, within the framework of conventions, by established researchers of Public Research Agencies such as INFN and CNR.

Other learning activities chosen by the student specific to the curriculum Specialist Curriculum		
Courses of type "CARATTERIZZANTI" (42 credits)		
The student must complete 42 credits of this type by choosing a minimum of 6 credits in each of the groups below. The Classical Electrodynamics course (6 credits) belongs to the "Experimental Application" group and therefore covers the minimum request for this group.		
"Experimental Application"		
ACCELERATOR PHYSICS 1	6	FIS/01
APPLIED SUPERCONDUCTIVITY	6	FIS/01
DATA STRUCTURES AND ALGORITHMS OF PHYSICS OF DATA	6	FIS/07, FIS/01
ELECTRONICS 1	6	FIS/01
ELECTRONICS 2	6	FIS/01
ENVIRONMENTAL PHYSICS	6	FIS/07
HEALTH PHYSICS	6	FIS/07
OPTICAL ANALYSIS FOR CULTURAL HERITAGES	6	FIS/07
RADIOBIOLOGY	6	FIS/07
Theory and Fundamentals of Physics		
MANY BODY THEORY 1	6	FIS/02
MANY BODY THEORY 2	6	FIS/02
MATHEMATICAL METHODS IN PHYSICS: GEOMETRY AND GROUP THEORY 1	6	FIS/02
MATHEMATICAL METHODS IN PHYSICS: GEOMETRY AND GROUP THEORY 2	6	FIS/02
QUANTUM FIELD THEORY 1	6	FIS/02
QUANTUM FIELD THEORY 2	6	FIS/02
STATISTICAL MECHANICS 1	6	FIS/02
STATISTICAL PHYSICS OF COMPLEX SYSTEMS	6	FIS/02
STATISTICAL QUANTUM FIELD THEORY 1	6	FIS/02
THEORY OF FUNDAMENTAL INTERACTIONS 1	6	FIS/02
Microphysics and Structure of Matter Field		
ACCELERATOR PHYSICS LABORATORY	6	FIS/04
ADVANCED STATISTICAL PHYSICS	6	FIS/03
ASTROPARTICLE PHYSICS	6	FIS/04
COHERENCE AND CONTROL OF QUANTUM SYSTEM	6	FIS/03
ELECTROWEAK INTERACTIONS	6	FIS/04
INTERACTION AND DETECTION OF NUCLEAR RADIATION	6	FIS/04
LASER PHYSICS LABORATORY 1	6	FIS/03

MACHINE LEARNING	6	FIS/04, FIS/03
MAGNETIC PROPERTIES AND FINE ANALYSIS OF LOW DIMENSIONAL MATTER	6	FIS/03
NUCLEAR ELECTRONICS	6	FIS/04
NUCLEAR PHYSICS	6	FIS/04
NUCLEAR SPECTROSCOPY LABORATORY	6	FIS/04
OPTICS 1	6	FIS/03
OPTICS LABORATORY AND APPLICATION	6	FIS/03
PARTICLE DETECTORS	6	FIS/04
PARTICLE PHYSICS	6	FIS/04
PHYSICS OF ELECTRONIC DEVICES	6	FIS/03
PHYSICS OF SOLIDS 1	6	FIS/03
PHYSICS OF SOLIDS 2	6	FIS/03
PHYSICS PROTEIN 1	6	FIS/03
PLASMA PHYSICS AND CONTROLLED FUSION	6	FIS/03
PLASMA PHYSICS LABORATORY 1	6	FIS/03
PROBABILITY AND STATISTICS	6	FIS/04, FIS/03
QUANTUM OPTICS	6	FIS/03
QUANTUM OPTICS LABORATORY	6	FIS/03
QUANTUM THEORY OF MATTER 2	6	FIS/03
RADIOACTIVITY	6	FIS/04
SEMICONDUCTOR PHYSICS	6	FIS/03
SURFACE PHYSICS 1	6	FIS/03
Astrophysics, Geophysics and Space Science Field		
ASTRONOMY 1	6	FIS/05
ASTRONOMY 2	6	FIS/05
ATMOSPHERIC PHYSICS	6	FIS/06
COSMIC PHYSICS 1	6	FIS/05
COSMOLOGY	6	FIS/05
EARTH PHYSICS	6	GEO/12
INTRODUCTION TO CONTINUUM PHYSICS	6	FIS/06
LABORATORY OF DATA MODELLING	6	FIS/06, FIS/05
NUCLEAR RELATIVISTIC ASTROPHYSICS 1	6	FIS/05
RADIO ASTRONOMY 1	6	FIS/05
THEORETICAL ASTROPHYSICS 1	6	FIS/05
The student must also complete 18 credits by choosing from the following courses of type "AFFINI E INTEGRATIVI"		
ALGEBRAIC TOPOLOGY	6	MAT/03
ATOMIC PHYSICS	6	FIS/03
BIOPHYSICS	6	FIS/07, FIS/03
CLASSICAL MECHANICS 2	6	MAT/07
COMPUTATIONAL BIOPHYSICS	6	BIO/10, INF/01, FIS/03
COMPUTATIONAL PHYSICS LABORATORY	6	FIS/02
CONDENSED MATTER PHYSICS LABORATORY 2	6	FIS/03
COSMOLOGY 2	6	FIS/05
DIFFERENTIAL GEOMETRY	6	MAT/03
DIGITAL ELECTRONICS	6	ING-INF/01
DOSIMETRY	6	FIS/07
DYNAMICAL SYSTEMS 1	6	MAT/07
EARTH PHYSICS LABORATORY	6	GEO/12
ENVIRONMENTAL PHYSICS LABORATORY	6	FIS/07
FOUNDATIONS OF PHYSICS	6	FIS/02
GEOMETRY 2	6	MAT/03
GEOPHYSICAL AND ENVIRONMENTAL MODELING	6	GEO/12
GRAVITY AND SUPERSTRINGS 2	6	FIS/02
HEALTH PHYSICS LABORATORY	6	FIS/07
HISTORY OF PHYSICS	6	FIS/08
IMAGING TECHNIQUES FOR BIOMEDICAL APPLICATIONS	6	FIS/07, FIS/01
INSTRUMENTATION APPLIED TO MEDICINE	6	FIS/07
INTRODUCTION TO ASTROPHYSICS	6	FIS/05
INTRODUCTION TO GENERAL RELATIVITY	6	FIS/02
INTRODUCTION TO HEALTH AND MEDICAL PHYSICS	6	FIS/07
LABORATORY OF SPACE INSTRUMENTATION (1)	6	FIS/05
LIQUID-STATE AND SOFT-MATTER PHYSICS	6	FIS/03
MATHEMATICAL ANALYSIS 4	6	MAT/05
METHODS OF DATA ANALYSIS	6	FIS/01
NUCLEAR RELATIVISTIC ASTROPHYSICS 2	6	FIS/05
NUCLEAR WEAPONS, DISARMAMENT AND NUCLEAR PROLIFERATION	6	CHIM/03, FIS/04
NUMERICAL SIMULATION LABORATORY	6	FIS/03, FIS/02
NUMERICAL TECHNIQUES FOR PHOTOREALISTIC IMAGE GENERATION	6	FIS/06, FIS/05
PARTICLE DETECTORS LABORATORY INSTRUMENTATION	6	FIS/01
PARTICLE PHYSICS LABORATORY 1	6	FIS/01
PERTURBATION THEORY OF HAMILTONIAN SYSTEMS	6	MAT/07
PHENOMENOLOGY OF THE STANDARD MODEL OF PARTICLE PHYSICS	6	FIS/04
PHYSICAL APPLICATIONS OF GROUP THEORY	6	FIS/02
PHYSICS LABORATORY OF CLIMATOLOGY AND ATMOSPHERIC PHYSICS	6	FIS/07, FIS/06
PHYSICS OF MEDICAL IMAGING	6	FIS/07
PREPARATION OF DIDACTICAL EXPERIENCES 1	6	FIS/08
PREPARATION OF DIDACTICAL EXPERIENCES 2	6	FIS/08
QUANTUM COMPUTING	6	FIS/03
QUANTUM INFORMATION THEORY	6	FIS/03
RADIO ASTRONOMY 2	6	FIS/05
STATISTICAL QUANTUM FIELD THEORY 2	6	FIS/02
STOCHASTIC PROCESSES	6	FIS/04, FIS/03
THEORETICAL ASTROPHYSICS 2	6	FIS/05
THEORY OF FUNDAMENTAL INTERACTIONS 2	6	FIS/02
THEORY OF QUANTUM OPEN SYSTEMS	6	FIS/02

The student must also complete another 12 credits freely choosing from all the courses activated by the University, provided that they are culturally coherent with his/her educational path and cannot be superimposed, in content, to the fundamental and optional teachings already used in the Study Plan. All the teachings shown in this "Manifesto" that meet these criteria may be included in the selection.

The student must also complete another 6 credits related to training and orientation internships possibly in the context of the thesis work. In this case the tutor teacher for the activity may be the thesis supervisor.

CURRICULUM: [F95-B] Multi-Sector Curriculum

Qualifying Training Objectives

The Multi-Sector curriculum program provides a broad spectrum of transversal knowledge covering the various areas of Physics. The provided skills match job requirements related to teaching and science dissemination. Graduates in this curriculum will have sufficient credits in appropriate groups of sectors to participate, as required by current legislation, in the public competitions for teaching in High Schools. From a didactic point of view, the multi-sector curriculum offers both in-depth courses distributed evenly on the main areas of Physics, and courses in the anthro-psycho-pedagogical area and in teaching methodologies and technologies. Specifically, 12 credits of type "caratterizzanti" are focused on teaching methodologies and technologies, while the "free choice" 18 credits cover the anthro-psycho-pedagogical area so as to achieve the requirements for access to public competitions for teaching.

Other learning activities chosen by the student specific to the curriculum Multi-Sector Curriculum	
Courses of type "CARATTERIZZANTI" (48 credits)	
The student must complete 48 credits of this type by choosing 12 credits in each of the groups below. The Classical Electrodynamics course belongs to the "Experimental Application" group and therefore covers 6 credits for this group.	
Experimental Application	
ACCELERATOR PHYSICS 1	6 FIS/01
APPLIED SUPERCONDUCTIVITY	6 FIS/01
ELECTRONICS 1	6 FIS/01
ELECTRONICS 2	6 FIS/01
ENVIRONMENTAL PHYSICS	6 FIS/07
HEALTH PHYSICS	6 FIS/07
OPTICAL ANALYSIS FOR CULTURAL HERITAGES	6 FIS/07
RADIOBIOLOGY	6 FIS/07
Theory and Fundamentals of Physics	
HISTORY OF PHYSICS	6 FIS/08
PREPARATION OF DIDACTICAL EXPERIENCES 1	6 FIS/08
PREPARATION OF DIDACTICAL EXPERIENCES 2	6 FIS/08
Microphysics and Structure of Matter	
ACCELERATOR PHYSICS LABORATORY	6 FIS/04
ADVANCED STATISTICAL PHYSICS	6 FIS/03
ASTROPARTICLE PHYSICS	6 FIS/04
COHERENCE AND CONTROL OF QUANTUM SYSTEM	6 FIS/03
ELECTROWEAK INTERACTIONS	6 FIS/04
INTERACTION AND DETECTION OF NUCLEAR RADIATION	6 FIS/04
LASER PHYSICS LABORATORY 1	6 FIS/03
MAGNETIC PROPERTIES AND FINE ANALYSIS OF LOW DIMENSIONAL MATTER	6 FIS/03
NUCLEAR ELECTRONICS	6 FIS/04
NUCLEAR PHYSICS	6 FIS/04
NUCLEAR SPECTROSCOPY LABORATORY	6 FIS/04
OPTICS 1	6 FIS/03
OPTICS LABORATORY AND APPLICATION	6 FIS/03
PARTICLE DETECTORS	6 FIS/04
PARTICLE PHYSICS	6 FIS/04
PHYSICS OF ELECTRONIC DEVICES	6 FIS/03
PHYSICS OF SOLIDS 1	6 FIS/03
PHYSICS OF SOLIDS 2	6 FIS/03
PHYSICS PROTEIN 1	6 FIS/03
PLASMA PHYSICS AND CONTROLLED FUSION	6 FIS/03
PLASMA PHYSICS LABORATORY 1	6 FIS/03
QUANTUM OPTICS	6 FIS/03
QUANTUM OPTICS LABORATORY	6 FIS/03
QUANTUM THEORY OF MATTER 2	6 FIS/03
RADIOACTIVITY	6 FIS/04
SEMICONDUCTOR PHYSICS	6 FIS/03
SURFACE PHYSICS 1	6 FIS/03
Astrophysics, Geophysics and Space Science	
ASTRONOMY 1	6 FIS/05
ASTRONOMY 2	6 FIS/05
ATMOSPHERIC PHYSICS	6 FIS/06
COSMIC PHYSICS 1	6 FIS/05
COSMOLOGY	6 FIS/05
EARTH PHYSICS	6 GEO/12
INTRODUCTION TO CONTINUUM PHYSICS	6 FIS/06
NUCLEAR RELATIVISTIC ASTROPHYSICS 1	6 FIS/05
RADIO ASTRONOMY 1	6 FIS/05

THEORETICAL ASTROPHYSICS 1	6	FIS/05
The student must also complete 12 credits by choosing from the following courses of type "AFFINI E INTEGRATIVI".		
ALGEBRAIC TOPOLOGY	6	MAT/03
ATOMIC PHYSICS	6	FIS/03
BIOPHYSICS	6	FIS/07, FIS/03
CLASSICAL MECHANICS 2	6	MAT/07
COMPUTATIONAL BIOPHYSICS	6	BIO/10, INF/01, FIS/03
COMPUTATIONAL PHYSICS LABORATORY	6	FIS/02
CONDENSED MATTER PHYSICS LABORATORY 2	6	FIS/03
COSMOLOGY 2	6	FIS/05
DATA STRUCTURES AND ALGORITHMS OF PHYSICS OF DATA	6	FIS/07, FIS/01
DIFFERENTIAL GEOMETRY	6	MAT/03
DIGITAL ELECTRONICS	6	ING-INF/01
DOSIMETRY	6	FIS/07
DYNAMICAL SYSTEMS 1	6	MAT/07
EARTH PHYSICS LABORATORY	6	GEO/12
ENVIRONMENTAL PHYSICS LABORATORY	6	FIS/07
FOUNDATIONS OF PHYSICS	6	FIS/02
GEOMETRY 2	6	MAT/03
GEOPHYSICAL AND ENVIRONMENTAL MODELING	6	GEO/12
GRAVITY AND SUPERSTRINGS 2	6	FIS/02
HEALTH PHYSICS LABORATORY	6	FIS/07
IMAGING TECHNIQUES FOR BIOMEDICAL APPLICATIONS	6	FIS/07, FIS/01
INSTRUMENTATION APPLIED TO MEDICINE	6	FIS/07
INTRODUCTION TO ASTROPHYSICS	6	FIS/05
INTRODUCTION TO GENERAL RELATIVITY	6	FIS/02
INTRODUCTION TO HEALTH AND MEDICAL PHYSICS	6	FIS/07
LABORATORY OF DATA MODELLING	6	FIS/06, FIS/05
LABORATORY OF SPACE INSTRUMENTATION (1)	6	FIS/05
LIQUID-STATE AND SOFT-MATTER PHYSICS	6	FIS/03
MACHINE LEARNING	6	FIS/04, FIS/03
MANY BODY THEORY 1	6	FIS/02
MANY BODY THEORY 2	6	FIS/02
MATHEMATICAL ANALYSIS 4	6	MAT/05
MATHEMATICAL METHODS IN PHYSICS: GEOMETRY AND GROUP THEORY 1	6	FIS/02
MATHEMATICAL METHODS IN PHYSICS: GEOMETRY AND GROUP THEORY 2	6	FIS/02
METHODS OF DATA ANALYSIS	6	FIS/01
NUCLEAR RELATIVISTIC ASTROPHYSICS 2	6	FIS/05
NUCLEAR WEAPONS, DISARMAMENT AND NUCLEAR PROLIFERATION	6	CHIM/03, FIS/04
NUMERICAL SIMULATION LABORATORY	6	FIS/03, FIS/02
NUMERICAL TECHNIQUES FOR PHOTOREALISTIC IMAGE GENERATION	6	FIS/06, FIS/05
PARTICLE DETECTORS LABORATORY INSTRUMENTATION	6	FIS/01
PARTICLE PHYSICS LABORATORY 1	6	FIS/01
PERTURBATION THEORY OF HAMILTONIAN SYSTEMS	6	MAT/07
PHENOMENOLOGY OF THE STANDARD MODEL OF PARTICLE PHYSICS	6	FIS/04
PHYSICAL APPLICATIONS OF GROUP THEORY	6	FIS/02
PHYSICS LABORATORY OF CLIMATOLOGY AND ATMOSPHERIC PHYSICS	6	FIS/07, FIS/06
PHYSICS OF MEDICAL IMAGING	6	FIS/07
PROBABILITY AND STATISTICS	6	FIS/04, FIS/03
QUANTUM COMPUTING	6	FIS/03
QUANTUM FIELD THEORY 1	6	FIS/02
QUANTUM FIELD THEORY 2	6	FIS/02
QUANTUM INFORMATION THEORY	6	FIS/03
RADIO ASTRONOMY 2	6	FIS/05
STATISTICAL MECHANICS 1	6	FIS/02
STATISTICAL PHYSICS OF COMPLEX SYSTEMS	6	FIS/02
STATISTICAL QUANTUM FIELD THEORY 1	6	FIS/02
STATISTICAL QUANTUM FIELD THEORY 2	6	FIS/02
STOCHASTIC PROCESSES	6	FIS/04, FIS/03
THEORETICAL ASTROPHYSICS 2	6	FIS/05
THEORY OF FUNDAMENTAL INTERACTIONS 1	6	FIS/02
THEORY OF FUNDAMENTAL INTERACTIONS 2	6	FIS/02
THEORY OF QUANTUM OPEN SYSTEMS	6	FIS/02
THIN FILM AND NANOSTRUCTURES CHARACTERIZATION	6	FIS/03
The student must also complete another 18 credits freely choosing from all the courses activated by the University, provided that they are culturally coherent with his/her educational path and cannot be superimposed, in content, to the fundamental and optional teachings already used in the Study Plan. The insertion of courses in the anthro-psycho-pedagogical area is strongly recommended as required, based on current legislation, for access to public competitions for teaching.		