UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2021/22
MASTER DEGREE
Physics (Classe LM-17)
Enrolled from academic year 2019/2020

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 entry requirements
Course code:	F95

PERSONS/ROLES

Head of Study Programme
Prof. Alessandra Guglielmetti

Degree Course Coordinator
Prof. Nicola Manini

Tutors - Faculty
Tutor per l'orientamento (Academic guidance tutor)
D. Bettega, F. Camera, S. Cialdi, G. Colò, L. Gariboldi, M. Giudici, A. Guglielmetti, G. Lodato, N. Manini, L.G. Molinari, S. Olivares, M. Paris, P. Piseri, P.M. Pizzochero, M. Sorbi, G. Tiana, A. Vicini

Tutor per i piani di studio (Study plan tutor)
A. Guglielmetti, N. Manini

Tutor per la mobilità internazionale e l'Erasmus (Erasmus and International mobility)
N. Piovella

Tutor per stage e tirocini (Internship tutor)
A. Guglielmetti, N. Piovella

Tutor per laboratori e altre attività (Laboratory Classes)
R. Vecchi

Tutors - Students
Davide ABRIOLA
Damiano ALIVERTI PIURI
Clara IAQUINTA
Matteo MARTINELLI
Andrea SALA

Degree Course website
https://www.unimi.it/it/corsi/corsi-di-laurea/fisica-magistrale
Contatti: https://www.unimi.it/it/node/359 Phone 0250325032
Sedi e orari: https://www.unimi.it/it/node/360

Admission
G. Bertin, M. Di Vece, M. Fanti, G. Maero Email: commissione.ammissione@fisica.unimi.it

Dissertation and Final Exam
I. Veronese (Presidente), C. Benedetti, S. Carrazza, F. Crespi, V. Liberali, D. Maino,

Enrollment

https://www.unimi.it/it/node/183

Laboratory Security

M. Potenza

PLS Program Chair

M. Giliberti

Program Transfer

G. Bertin, M. Di Vece, M. Fanti, G. Maero Email: commissione.ammissione@fisica.unimi.it

Reference Office

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

Schedule of Classes

M. Gherardi, A. Guglielmetti, M. Zaro, F. Cordani

Specific Learning Disabilities

L. Carminati

Statistical Dats

G. Colò, A. Guglielmetti, F. Ragusa

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

Graduates will typically work in industry and in public or private institutions, in structures such as:

- research centers and laboratories
- hospitals and health facilities that use techniques for diagnostics, therapy and radiation protection
- astronomical observatories
- museums and other centers dedicated to scientific dissemination
- banks and insurance companies
- divisions dedicated to the development of mathematical-statistical models of phenomena
- divisions dedicated to the use and development of systems and instruments
- structures active in the restoration of artistic heritage and in the protection of environmental assets
- power plants (including for example nuclear power plants)
- structures for data acquisition and processing

Campus

Academic offices for the Bachelor's degree programme in Physics: Department of Physics, Via Celoria 16

Course venue: courses are held in the classrooms of the Physics Department, via Celoria 16, or in the teaching facilities, Via Celoria 20

Laboratories

The degree programme mainly uses the laboratories at the Physics Department.

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 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.

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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, 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 for Erasmus+ mobility for study generally begins around February each year with the publication of a call for applications specifying destinations and requirements. Regarding the Erasmus+ Mobility for Traineeship, the University of Milan usually publishes two calls a year enabling students to choose a destination defined by an inter-institutional agreement or to find a traineeship position on their own.

The University organizes informative meetings to illustrate mobility opportunities and rules for participation.

Erasmus+ scholarship
The European Union grants the winners of the Erasmus+ programme selection a scholarship to contribute to their mobility costs, which may be supplemented by the University funding for disadvantaged students.

Language courses
Students who pass the selections for mobility programmes can benefit from intensive foreign language courses offered each year by the University Language Centre (SLAM).
https://www.unimi.it/en/node/8/

Learn more at https://www.unimi.it/en/node/274/

For assistance, please contact:
International Mobility Office
Via Santa Sofia 9 (second floor)

Tel. 02 503 13501-12589-13495-13502
Contacts: InformaStudenti; mobility.out@unimi.it
Student Desk booking through InformaStudenti

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	ND
INFORMATICS ABILITY		3	NA
	Total compulsory credits	12	

2nd COURSE YEAR Core/compulsory courses/activities common to all curricula			
Learning activity		**Ects**	**Sector**
FINAL EXAM		36	NA
	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.

Further elective courses Curriculum-specific features 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
ELECTRONICS LABORATORY	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		
GRAVITY AND SUPERSTRINGS 1	6	FIS/02
MANY BODY THEORY 1	6	FIS/02
MANY BODY THEORY 2	6	FIS/02
MATHEMATICAL METHODS IN PHYSICS: DIFFERENTIAL EQUATIONS 1	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
THEORY OF FUNDAMENTAL INTERACTIONS 1	6	FIS/02
Microphysics and Structure of Matter Field		

ADVANCED STATISTICAL PHYSICS	6	FIS/03
APPLIED SUPERCONDUCTIVITY LABORATORY	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 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
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
COSMOLOGY	6	FIS/05
EARTH PHYSICS	6	GEO/12
EXTRAGALACTIC ASTROPHYSICS	6	FIS/05
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
TECTONOPHYSICS	6	FIS/06, GEO/10
THEORETICAL ASTROPHYSICS 1	6	FIS/05
The student must also complete 18 credits by choosing from the following courses of type "AFFINI E INTEGRATIVI"		
ACCELERATOR PHYSICS 1	6	FIS/01
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
COSMIC PHYSICS 2	6	FIS/05
COSMOLOGY 2	6	FIS/05
DEEP LEARNING WITH APPLICATIONS	6	FIS/02
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 IN ELECTRON MICROSCOPY (EM) AND ITS RELATED SPECTROSCOPIES	6	FIS/03
FOUNDATIONS OF ENERGY PRODUCTION	6	ING-IND/10
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 TECNIQUES 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
PHYSICS OF MOLECULAR AGGREGATES	6	FIS/03
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
QUANTUM WALKS	6	FIS/03
RADIO ASTRONOMY 2	6	FIS/05
SOLID STATE PHYSICS: FINITE SYSTEMS, ATOMIC AGGREGATES, FULLERENES, PROTEINS	6	FIS/03
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
THIN FILM AND NANOSTRUCTURES CHARACTERIZATION	6	FIS/03

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 anthropo-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 anthropo-psycho-pedagogical area so as to achieve the requirements for access to public competitions for teaching.

Further elective courses Curriculum-specific features 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
ELECTRONICS LABORATORY	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		
ADVANCED STATISTICAL PHYSICS	6	FIS/03
APPLIED SUPERCONDUCTIVITY LABORATORY	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 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

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
COSMOLOGY	6	FIS/05
EARTH PHYSICS	6	GEO/12
EXTRAGALACTIC ASTROPHYSICS	6	FIS/05
INTRODUCTION TO CONTINUUM PHYSICS	6	FIS/06
NUCLEAR RELATIVISTIC ASTROPHYSICS 1	6	FIS/05
RADIO ASTRONOMY 1	6	FIS/05
TECTONOPHYSICS	6	FIS/06, GEO/10
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
COSMIC PHYSICS 2	6	FIS/05
COSMOLOGY 2	6	FIS/05
DATA STRUCTURES AND ALGORITHMS OF PHYSICS OF DATA	6	FIS/07, FIS/01
DEEP LEARNING WITH APPLICATIONS	6	FIS/02
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 IN ELECTRON MICROSCOPY (EM) AND ITS RELATED SPECTROSCOPIES	6	FIS/03
FOUNDATIONS OF ENERGY PRODUCTION	6	ING-IND/10
FOUNDATIONS OF PHYSICS	6	FIS/02
GEOMETRY 2	6	MAT/03
GEOPHYSICAL AND ENVIRONMENTAL MODELING	6	GEO/12
GRAVITY AND SUPERSTRINGS 1	6	FIS/02
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: DIFFERENTIAL EQUATIONS 1	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
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 TECNIQUES 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
PHYSICS OF MOLECULAR AGGREGATES	6	FIS/03
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
QUANTUM WALKS	6	FIS/03
RADIO ASTRONOMY 2	6	FIS/05
SOLID STATE PHYSICS: FINITE SYSTEMS, ATOMIC AGGREGATES, FULLERENES, PROTEINS	6	FIS/03
STATISTICAL MECHANICS 1	6	FIS/02
STATISTICAL PHYSICS OF COMPLEX SYSTEMS	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 anthropo-psycho-pedagogical area is strongly recommended as required, based on current legislation, for access to public competitions for teaching.