UNIVERSITA' DEGLI STUDI DI MILANO
PROGRAMME DESCRIPTION - ACADEMIC YEAR 2019/20
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
Access procedures:	Open, subject to entry requirements
Course code:	F95

PERSONS/ROLES

Head of Study Programme
Prof. Alberto Pullia

Degree Course Coordinator
Prof. Alberto Pullia

Tutors - Faculty
Prof.ssa Daniela BETTEGA
Prof. Fabio CRESPI
Prof. Mauro GIUDICI
Prof.ssa Silvia LEONI
Prof. Valentino LIBERALI
Prof. Davide MAINO
Prof. Luca Guido MOLINARI
Prof. Stefano OLIVARES
Prof. Nicola PIOVELLA
Prof. Guido TIANA
Prof. Bassano VACCHINI
Prof.ssa Roberta VECCHI

Tutors - Students
Francesca ASTORI
Caterina BERTI
Jacopo CICCOIANNI
Giorgio FRANGI
Fabiana LAURO
Matteo MILANI
Davide ROTA
Martino ZANETTI
Davide BASILICO (dottorando)
Elisabetta SPADARO NORELLA (dottorando)

Degree Course website
www.ccdfis.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.

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.

EXPERIENCE OF STUDY ABROAD AS PART OF THE TRAINING PROGRAM

The University of Milan supports the international mobility of its students, offering them the opportunity to spend periods of study and training abroad, a unique opportunity to enrich their curriculum in an international context.

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

To gain access to mobility programs for study purposes, lasting 3-12 months, the enrolled students of the University of Milan must attend a public selection that starts usually around the month of February each year through the presentation of specific competition announcements, which contain information on available destinations, respective duration of the mobility, requirements and deadlines for submitting the online application.

The selection, aimed at evaluating the proposed study abroad program of the candidate, knowledge of a foreign language, especially when this is a preferential requirement, and the motivations behind the request, is performed by specially constituted commissions.

Each year, before the expiry of the competition announcements, the University organises information sessions for the specific study course or groups of study courses, in order to illustrate to students the opportunities and participation rules.

To finance stays abroad under the Erasmus + program, the European Union assigns to the selected students a scholarship that - while not covering the full cost of living abroad - is a useful contribution for additional costs as travel costs or greater cost of living in the country of destination.

The monthly amount of the communitarian scholarship is established annually at national level; additional contributions may be provided to students with disabilities.

In order to enable students in economic disadvantaged conditions to participate in Erasmus+ program, the University of Milan assigns further additional contributions; amount of this contributions and criteria for assigning them are established from year to year.

The University of Milan promotes the linguistic preparation of students selected for mobility programs, organising every year intensive courses in the following languages: English, French, German and Spanish.

The University in order to facilitate the organisation of the stay abroad and to guide students in choosing their destination offers a specific support service.

More information in Italian are available on www.unimi.it > Studenti > Studiare all¿estero > Erasmus+

For assistance please contact:
Ufficio Accordi e relazioni internazionali
via Festa del Perdono 7 (ground floor)
Tel. 02 503 13501-13502-13495-12589
E-mail: mobility.out@unimi.it
Desk opening hour: Monday-friday 9 - 12

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	L-LIN/12
INFORMATICS ABILITY		3	NA
	Total compulsory credits	12	

2nd COURSE YEAR (available as of academic year 2020/21) 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
Multi-Sector Curriculum Course years currently available: 1st

CURRICULUM: [F95-A] Specialist Curriculum

Qualifying Training Objectives

General and specific learning objectives

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Skills acquired

Acquired skills and competences

In order to get their degree, students are required to certify their knowledge of the English language at the B2 level. This level can be certified in one of the following ways:

* by submitting their language certificate, taken no more than 3 years before its submittal and attesting a B2 o higher level (for the list of the language certificates which are accepted by the University of Milan, please refer to the website: http://www.unimi.it/studenti/100312.htm).

Students can submit their language certificate during the immatriculation procedure or send it to the Language Centre of the University of Milan (SLAM) via the Infostudente service.

* by sitting the placement test run by SLAM, during the first year exclusively, from September to February of the following year. Should they not pass the Placement Test, students will have to attend the English language course organized by SLAM.

All students who do not have a valid language certificate must sit the Placement Test. Those students who do not sit the Placement test by February or do not pass the end of course test in one of the 6 attempts granted will have to get a language certificate outside the University of Milan within their degree.

Professional profile and employment possibilities

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.

Further elective courses Curriculum-specific features Specialist Curriculum

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
RADIOLOGICAL PROTECTION OF UMANS AND THE ENVIRONMENT	6	FIS/07
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
QUANTUM FIELD THEORY 1	6	FIS/02
QUANTUM FIELD THEORY 2	6	FIS/02
STATISTICAL MECHANICS 1	6	FIS/02
STATISTICAL MECHANICS 2	6	FIS/02
THEORY OF FUNDAMENTAL INTERACTIONS 1	6	FIS/02
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 SOLIDS 1	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
ASTRONOMY 1	6	FIS/05
ASTRONOMY 2	6	FIS/05
ATMOSPHERIC PHYSICS	6	FIS/06
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
TECTONOPHYSICS	6	FIS/06, GEO/10
THEORETICAL ASTROPHYSICS 1	6	FIS/05
ALGEBRAIC TOPOLOGY	6	MAT/03
ATOMIC PHYSICS	6	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
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 ENERGY PRODUCTION	6	ING-IND/10
FOUNDATIONS OF PHYSICS	6	FIS/02
GEOMETRY 2	6	MAT/03
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
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 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
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

CURRICULUM: [F95-B] Multi-Sector Curriculum

Qualifying Training Objectives

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Further elective courses Curriculum-specific features Multi-Sector Curriculum		
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
RADIOLOGICAL PROTECTION OF UMANS AND THE ENVIRONMENT	6	FIS/07
HISTORY OF PHYSICS	6	FIS/08
PREPARATION OF DIDACTICAL EXPERIENCES 1	6	FIS/08

PREPARATION OF DIDACTICAL EXPERIENCES 2	6	FIS/08
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 SOLIDS 1	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
ASTRONOMY 1	6	FIS/05
ASTRONOMY 2	6	FIS/05
ATMOSPHERIC PHYSICS	6	FIS/06
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
TECTONOPHYSICS	6	FIS/06, GEO/10
THEORETICAL ASTROPHYSICS 1	6	FIS/05
ALGEBRAIC TOPOLOGY	6	MAT/03
ATOMIC PHYSICS	6	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
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 ENERGY PRODUCTION	6	ING-IND/10
FOUNDATIONS OF PHYSICS	6	FIS/02
GEOMETRY 2	6	MAT/03
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 SPACE INSTRUMENTATION (1)	6	FIS/05
LIQUID-STATE AND SOFT-MATTER PHYSICS	6	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
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
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 OF MEDICAL IMAGING	6	FIS/07
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 MECHANICS 2	6	FIS/02
STATISTICAL QUANTUM FIELD THEORY 2	6	FIS/02
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