DESCRIPTION OF THE CURRICULUM
(TEACHING REGULATIONS OF THE COURSE)
MASTER'S DEGREE COURSE IN PHYSICS
(LM-17R)
academic year 2025/26

Outline

Art. 1 - General characteristics and organization

The Master's Degree Course in Physics, class LM-17 – Physical Sciences and Technologies – is activated according to the educational regulations of the academic year 2025/2026.

The course in brief

The Master's Degree Course in Physics is mainly aimed at graduates of the Physical Sciences and Technologies class, but also at those who have obtained a degree in other scientific disciplines (Mathematics or Engineering for instance) and wish to deepen their preparation in Basic or Applied Physics. Most of those who have completed the three-year course in Physics decide to continue their education with the master's degree to integrate the basic knowledge already acquired, approaching research topics and addressing, in the thesis work, the challenge of original research.

The student has the opportunity to deepen the fields of Physics that interest him/her most, defining his/her own curriculum, which includes both theoretical-modeling and experimental-applicative aspects in three possible areas: Medical and Experimental Physics, Astrophysics (Data science for Astrophysics), General Physics. The field of General Physics in particular allows to define different paths ranging from Matter Physics to Nuclear and Subnuclear (both experimental and theoretical) Physics, from Theoretical Physics to Photonics and Quantum Technologies.

The degree course includes an internship experience, which can be performed both in university laboratories and in research institutions or high-tech companies. The thesis work is performed under the guidance of a supervisor: the student must address a current research problem obtaining original results.

The Master's degree programme includes courses with a number of credits varying between 6 and 9, which must be combined to obtain a total number of credits equal to 120. Given the possibility of building the study plan according to one's aptitudes, the total sum of the credits can exceed this value.

The Master's Degree in Physics prepares for the employment in the research laboratories of high-tech companies, in insurance or financial centers and provides the necessary prerequisites to undertake a scientific research activity, such as the PhD, both in Italy and abroad, or the School of Specialization in Medical Physics.

Starting from the academic year 2018/2019, the courses are held in English.

The Master's Degree in Physics has an agreement with the Linnæus University of Kalmar-Vaxjo (Sweden), which allows interested students to obtain a double degree: together with the Italian title of Master's Degree in Physics, the "Master in Physics" issued by the Linnæus University is awarded. The interested student will have to stay at the Linnæus University for at least one semester and acquire 30 credits.

The expected learning outcomes are verified with written and oral exams. Some courses involve

the development of a project that deepens some of the topics covered in the course.
Link: https://www.uninsubria.it/formazione/offerta-formativa/corsi-di-laurea/fisica-0

The structure responsible for the course is the Department of Science and High Technology. The Program Coordinator is Prof. Alessia Allevi
The Didactic Secretariat receives by appointment in via Valleggio 11 (4th floor) and replies to emails through INFOSTUDENTI. More information about this can be found at the following link: https://www.uninsubria.it/servizi/tutti-i-servizi/infostudenti-servizio-informazioni-gli-studenti

Art. 2 - Teaching calendar of the course

Educational activities take place in Como. The internet address of the course is the following: https://www.uninsubria.it/formazione/offerta-formativa/corsi-di-laurea/fisica-0

The lesson calendar is published under the page **LESSON TIMETABLE:**
https://www.uninsubria.it/formazione/offerta-formativa/corsi-di-laurea/fisica

The teaching calendar is divided into semesters:
I semester from **22 September 2025 to 16 January 2025**
II semester from **23 February 2026 to 12 June 2026**

Exams

There are at least 6 sessions for each course during the period of lessons suspension. The calendar of the exams is published on the page https://uninsubria.esse3.cineca.it/ListaAppelliOfferta.do

Art. 3 - Education goals, expected learning outcomes and career opportunities

The Master's Degree in Physics features three different curricula: Experimental and Medical Physics, Astrophysics (Data Science for Astrophysics), and General Physics. Students can tailor their curriculum by selecting courses from different areas, according to their interests.

EXPERIMENTAL - APPLIED TRAINING AREA

Knowledge and understanding

This area includes courses that enable students to acquire advanced experimental techniques and familiarize themselves with recent applications of modern physics in the fields of optics, biophysics and medical and environmental physics. This training can be complemented with advanced courses in computer science and electronics. Courses are both classroom-based and involve laboratory work.

Ability to apply knowledge and understanding

The aim of the courses in this area is to provide students with the skills necessary for entering the job market (whether it be a future research career or a position in a large-scale company or in the healthcare sector). These skills involve the application of experimental techniques, the advanced use of instrumentation and the development of computational and IT skills that allow an appropriate approach to problem solving.

AREA OF THEORETICAL EDUCATION AND FOUNDATIONS OF PHYSICS

Knowledge and understanding

This area includes courses that examine the complex theoretical and mathematical models required for the advanced description of the four fundamental forms of interaction in physics and the mathematical treatment of complex systems. This area includes also advanced courses in quantum computing.

Ability to apply knowledge and understanding

The aim of the courses in this area is to provide students with advanced mathematical and formal methods for building coherent models capable of representing the observed phenomenology, and for the quantitative prediction of new physical effects.

MICROPHYSICS TRAINING AREA

Knowledge and understanding

This area includes courses that introduce students to the most relevant phenomenological and experimental aspects of optics, condensed matter physics and elementary particle physics. Furthermore, advanced microscopic models are developed for the quantitative description of these systems.

Ability to apply knowledge and understanding

The aim of the courses in this area is to enable students to apply their basic physics knowledge to complex systems that require the integration of concepts, methodologies and tools developed in various fields of physics.

ASTROPHYSICS TRAINING AREA

Knowledge and understanding

This area provides an overview, both from a phenomenological-observational and modeling perspective, of the main objects and processes of astrophysical interest: from stellar evolution to galaxy formation and the large-scale structure of the universe. Furthermore, modern observational methodologies suitable for the quantitative study of astrophysical phenomena are presented, and data science techniques applied to astrophysical problems (from time-domain astrophysics to artificial intelligence applications) are explored.

Ability to apply knowledge and understanding

The aim of the courses in this area is to develop the ability to integrate knowledge acquired in various fields (experimental, theoretical and microphysics) to formulate coherent models of systems and phenomena of

astrophysical interest, as well as the ability to analyze observational data by extracting their physically relevant content and applying data science techniques to astrophysical problems.

JOB OPPORTUNITIES

Students will receive advanced training that will enable them to perform both fundamental and applied research, also in fields not strictly related to physics but using similar methodologies. The master's degree also provides the methodological and disciplinary foundations necessary for teaching physics and mathematics at the high school level.

Potential career opportunities include:

- research in the R&D divisions of industries with a technological impact, including electronics, telecommunications, medical instrumentation, and photonics;
- research for the development of statistical models and the analysis of large amount of data at banks, financial institutions or insurance companies;
- teaching at the middle and high school levels, once completed the path indicated by the current regulation;
- further career opportunities include continuing studies with a PhD or a specialization program (for instance, in Medical Physics).

Art. 4 - Admission to the course

Graduates of the Physical Sciences and Technologies (L30) degree class and the corresponding class in the Ministerial Decree 509/99 are eligible for admission to the Master's Degree Program in Physics. Those holding a degree from another class from a national university, as well as those holding another qualification obtained abroad and recognized as equivalent, are also eligible.

The graduates' personal preparation, with particular attention to graduates from classes other than L30, is assessed with an interview on topics related to the disciplines covered in the core courses of the three-year Bachelor's Degree Program in Physics. A solid preparation in classical and quantum physics, condensed matter physics, nuclear and subnuclear physics, and mathematical methods for physics is assessed. If additional training in specific fields is needed, it must be acquired before the admission to the master's degree program.

The English language proficiency (B2 level) will be assessed during the interview, or by presenting an appropriate certification.

The commission responsible for the interviews is composed of Professors Allevi, Parola and Prati.

Non-EU students will be evaluated based on the documentation they submit via email and the outcome of an interview with several faculty members of the degree program. The interview dates will be scheduled so that interested students will have time enough to apply for a study visa if they are successful.

Art. 5 - Education Path

The program lasts two years and requires the acquisition of 120 credits (ECTS). The degree program is

structured into three curricula: Experimental and Medical Physics, Astrophysics (Data Science for Astrophysics) and General Physics. Depending on the chosen curriculum, students can build a study plan by choosing courses from four different learning areas: experimental-applied, theoretical and foundations of physics, microphysics and astrophysics. The total number of credits required in these four areas is at least 42. Additionally, at least 12 credits chosen from related/complementary exams, at least 12 elective credits, and 6 credits from a curricular internship contribute to the 120 credits. The thesis, corresponding to 48 credits, has to be an original work in a research field. Given the opportunity to tailor the study plan, the total number of credits (CFU) can exceed 120.

Laboratory-based courses contribute to the acquisition of transversal skills, such as communication and teamwork skills. During these courses, students are encouraged to collaborate with each other and discuss their findings critically. Furthermore, the final exam consists of a discussion of the student's thesis work and is therefore designed to test the student's ability to present his/her work in the framework of a research field.

At the University, the Teaching and Learning Center has been active since 2022. It periodically organizes activities aimed at developing soft skills. The participation and assessment of the acquired skills lead to the awarding of Open Badges. The training activities are organized as seminars and are aimed at both undergraduate and graduate students. Each program focuses on homogeneous groups of students.

Teaching is performed in a conventional way.

In general, the degree program does not require compulsory attendance. However, regular class attendance is strongly recommended for the full acquisition of knowledge and study methods. For laboratory courses only, attendance is mandatory for at least 75% of the course duration. Laboratory courses are organized ad hoc for students with a job.

Tutoring hours have been organized for all students experiencing difficulties in organizing their studies and/or passing exams. Moreover dedicated tutors are selected for students with learning disabilities, disabilities or workers.

CFU/hours correspondance for each type of activity

University Educational Credits (CFU) are a measurement of the amount of learning, including individual study, required to a student with an adequate initial preparation to acquire knowledge and skills in the educational activities required by the degree program.

Any educational activity (teaching, laboratory, internship, thesis, etc.) within the degree program corresponds to a specific number of educational credits (CFU).

Each CFU corresponds to 25 hours of commitment, given by the hours of lectures and laboratory and the ones of independent study necessary to complete the student's preparation.

The CFU number corresponding to each educational activity is acquired by the student upon passing the exam or any other form of assessment defined in the degree program rules.

Educational Activities / CFU:

- 8 hours of lectures with 17 hours of individual study;
- 12 hours of practical exercises with 13 hours of individual study;

- 11 hours of laboratory work with 14 hours of individual study;
- 25 hours of training activities related to the preparation for the final exam.

Lectures: This is the main and fundamental teaching activity; students attend lectures and independently process the content they have listened to.

Exercises: This activity allows to understand completely the content of lectures through the development of applications. No additional content is added to the lectures. Typically, exercises are associated with lectures and do not exist independently. In "passive" exercises, the application development is performed by the instructor; in active exercises, students develop applications under the instructor's supervision.

Laboratory: This is a supervised activity that involves the student interaction with tools, equipment, or application software packages.

Assessment Methods for Educational Activities

The assessment and evaluation methods are detailed in the course syllabi.

The teachers of the various courses identify the methods to assess the educational activities. These include written tests, oral tests, laboratory reports, and in-depth study/project activities.

You can register for exams through ESSE3 starting one month before the exam date and up to 5 days before it. To register for an exam, you must have completed the attendance to the relevant course.

Exams are held during periods when teaching is suspended, typically from mid-January to the end of February and from mid-June to the end of September. Individual students may request special exam sessions if they are graduating .

Possible Prerequisites and/or Exclusions

There are no prerequisites.

Art. 6 - Rules for submitting study plans

Students must submit their study plans in their first year according to the annual deadlines published at https://www.uninsubria.it/servizi/presentazione-piano-di-studio, using the appropriate form and submitting it through the InfoStudenti service. The completed and signed form must be sent via email from their institutional email address to the InfoStudenti service.

Students may modify their study plans in subsequent years, if they are regularly enrolled.

Student Elective Courses (letter D)

Within the "Student Elective Courses" category, students may choose from courses offered in the Master's Degree in Physics, if not already chosen, or from other courses offered by the Department or the University, provided they are consistent with their educational path and approved by the Degree Program Council or the Department Council.

Courses offered by limited number University degree programs cannot be chosen.

Further language skills, IT and interpersonal skills, internships and other (letter F)

As part of the "Further language skills, IT and interpersonal skills, internships and other" program, students are required to complete a curricular internship, corresponding to 6 credits (CFU). This activity can be performed either in university laboratories or at research institutions or high-tech companies. For internships outside the university, a specific agreement must be signed. The internship must last at least one month and must not coincide with the thesis work, but may be preparatory to it. The start and end of the internship must be approved by the Degree Program Council.

Art. 7 - Opportunities offered during the training path

The program promotes several initiatives that complement and enrich the academic experience. In particular, it is possible to participate in mobility and internationalization programs:

- **Mobility abroad – Erasmus and other opportunities**
  https://www.uninsubria.it/internazionale/mobilita-allestero/programma-erasmus

Erasmus Code	University	Country	Maximum number of places	Maximum period (in months)
LT VILNIUS01	VILNIAUS UNIVERSITETAS	LITHUANIA	3	6
PL BYDGOSZ02	POLITECHNIKA BYDGOSKA IM JANA I JEDRZEJA SNIADECKICH	POLAND	1	6
RO TIMISOA01	UNIVERSITATEA DE VEST DIN TIMISOARA	ROMANIA	2	6
SI NOVA-GO01	UNIVERZA V NOVI GORICI	SLOVENIA	2	6
E VALENCI01	UNIVERSITAT DE VALENCIA	SPAIN	1	6
CH BERN01	UNIVERSITAT BERN	SWITZERLAND	2	12
B LEUVEN01	KATHOLIEKE UNIVERSITEIT LEUVEN	BELGIUM	2	12
F CAEN05	ECOLE NATIONALE SUPERIEURE D'INGENIEURS DE CAEN	FRANCE	3	6
TR ISTANBU07	YILDIZ TECHNICAL UNIVERSITY	TURKEY	1	6

- **Erasmus with an Italian university:** Two agreements are about to be activated for the 2025/26 academic year with the University of Trieste and the University of Palermo. Further information will be available on the Master's Degree program website.
- **Double degree:** Students interested in the Double Degree Program with the Linnaeus University of Kalmar-Vaxjo (Sweden) must apply during their first year to a selection process that will typically be published at the beginning of each calendar year. The call for applications will be issued and managed by the International Relations Office and the Department of Science and High Technology. Selected students will be included in the Erasmus University rankings (they will therefore have the Erasmus

student status) and will benefit from a scholarship funded by European and University funds. To access the Double Degree Program, students must submit a study plan that includes at least 30 credits at the Linnaeus University, where they must spend at least one semester.

An international mobility committee, composed of Professors F. Prati and M. Lamperti, has been established within the Degree Program Council to assist students during their study abroad and assist them with procedures related to the recognition of their completed training. For information on the Call for Applications or for further information on participating in the program, please visit the following link: https://www.uninsubria.it/servizi/tutti-i-servizi/doppi-titoli-di-laurea

- **Tutoring service** (https://www.uninsubria.it/servizi/tutti-i-servizi/tutorato)

  The program annually identifies discipline tutors, i.e., teachers that can be contacted by students on topics regarding international mobility, information on the double degree, the compilation of the study plan, etc.

Contacting the "Diritto allo Studio" office, it is possible to apply for student collaborations: https://www.uninsubria.it/servizi/tutti-i-servizi/collaborazioni-studentesche-200-ore

Art. 8 - Graduation

The final exam is worth 48 credits (CFU), which correspond to a student commitment of 8-10 months. The thesis represents a challenging, typically original, theoretical, experimental, or applied research project performed by the student, assisted by a supervisor, who addresses topics of interest to the scientific community using cutting-edge techniques.

The thesis is presented and defended by the candidate before the degree committee, which includes an expert in the field (the reviewer) or, if unable to attend, the candidate's written opinion on the thesis. The committee, composed of at least five faculty members, evaluates the candidate's understanding of the topic, his/her framing of the problem within a research context, the ability to apply his/her expertise to the problem, and presentation skills (clarity, rigor, and coherence).

The degree grade is determined by the weighted average of the grades obtained in the individual exams, expressed in hundredths. The exam committee may increase the grade by between 0 and 15 points, depending on the quality of the work, the student's demonstrated autonomy, the level of understanding demonstrated in the thesis defense, the clarity of the presentation, and the opinion of the supervisor, co-supervisor (if applicable), and reviewer. If the score is 110 or higher and the student has achieved at least two honors in the master's degree exams or has an average of 30 and at least one exam with honors, the committee may award honors, upon recommendation of the supervisor and the unanimous approval of its members.

Upon graduation, a **Diploma Supplement** is issued. The Diploma Supplement is an informative report accompanying the official qualification awarded at the end of the study program. It describes the nature, level, context, content, and status of the studies undertaken and completed by the student. It is issued in both Italian and English. The purpose of the document is to provide independent data for the international transparency of qualifications (diplomas, degrees, certificates, etc.) and to enable equitable academic and professional recognition, promoting student mobility. The Diploma Supplement complies with the Europass standard.

Appendix 1 – Study plan

GENERAL PHYSICS CURRICULUM
FUNDAMENTAL COURSES

YEAR I			
Name	**Disciplinary area**	**CFU**	**VERIFICATION METHOD***
ELECTIVE ACTIVITIES	D/ELECTIVE	6	V
RELATED/COMPLEMENTARY COURSE	C/ RELATED/SUPPLEMENTARY TRAINING ACTIVITIES	6	V
CHARACTERIZING COURSES	B/ CHARACTERIZING TRAINING ACTIVITIES	30	V

YEAR II			
Name	**Disciplinary area**	**CFU**	**VERIFICATION METHOD***
ELECTIVE ACTIVITIES	D/ELECTIVE	6	V
AS MANY CHARACTERIZING COURSES AS NEEDED FOR A TOTAL OF 42 CHARACTERIZING CFU IN THE STUDY PLAN	B/ CHARACTERIZING TRAINING ACTIVITIES	12	V
ONE RELATED/COMPLEMENTARY COURSE	C/ RELATED/SUPPLEMENTARY TRAINING ACTIVITIES	6	V
INTERNSHIP	F/OTHER KNOWLEDGE FOR ENTERING THE JOB MARKET	6	
PREPARATION FOR THE FINAL EXAM	E/FINAL TEST	48	V

G – JUDGEMENT V – EXAM I – SUITABILITY F – ATTENDANCE

OPTIONAL COURSES
AT LEAST 6 CFU IN THE EXPERIMENTAL - APPLIED AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
II	SCIENTIFIC PYTHON	FIS/01	B/EXPERIMENTAL-APPLIED	6	LAB:66	V
II	BASICS AND APPLICATIONS OF NON-LINEAR AND QUANTUM OPTICS	FIS/01	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
I	PHYSICAL BASIS OF DIAGNOSTIC IMAGING	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V

I	BASIS OF MEDICAL PHYSICS -	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
I	OPTICS WITH LABORATORY	FIS/01	B/EXPERIMENTAL-APPLIED	6	LEZ:32 LAB:22	V
II	ADVANCED EXPERIMENTAL AND DATA ANALYSIS TECHNIQUES IN PARTICLE AND NUCLEAR PHYSICS - **year II**	FIS/07	B/EXPERIMENTAL-APPLIED	6	LAB:66	V
I	PHYSICAL METHODS FOR BIOMEDICAL INVESTIGATION	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V

AT LEAST 12 CFU IN THE THEORETICAL EDUCATION AND FOUNDATIONS OF PHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	QUANTUM PHYSICS III	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V
II	QUANTUM INFORMATION THEORY	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V
I	STATISTICAL PHYSICS I	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
II	STATISTICAL PHYSICS II - **year II**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
II	PHYSICS OF COMPLEX SYSTEMS – **year I**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
I	GENERAL RELATIVITY	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V
I	GEOMETRICAL METHODS IN PHYSICS - **year II**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	9	LEZ:72	V
I	THEORETICAL PHYSICS - **year I**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	9	LEZ:72	V
I	PHYSICS OF DYNAMICAL SYSTEMS	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V

G – JUDGEMENT V – EXAM I – SUITABILITY F – ATTENDANCE

AT LEAST 12 CFU IN THE MICROPHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	RADIATION AND DETECTORS	FIS/04	B/MICROPHYSICS	6	LEZ:48	V
II	SOLID STATE PHYSICS - **year II**	FIS/03	B/MICROPHYSICS	6	LEZ:48	V
I	LASER PHYSICS	FIS/03	B/MICROPHYSICS	6	LEZ:48	V
I	ELEMENTARY PARTICLE PHENOMENOLOGY	FIS/04	B/MICROPHYSICS	8	LEZ:64	V
I	MANY BODY PHYSICS - **year II**	FIS/03	B/MICROPHYSICS	6	LEZ:48	V
I	QUANTUM AND SEMICLASSICAL OPTICS	FIS/03	B/MICROPHYSICS	7	LEZ:56	V
II	COLLECTIVE PROPERTIES OF CONDENSED MATTER SYSTEMS - **year I**	FIS/03	B/MICROPHYSICS	6	LEZ:48	V
II	METAMATERIALS	FIS/03	B/MICROPHYSICS	6	LEZ:48	V

COURSES IN THE ASTROPHYSICS AREA ARE NOT COMPULSORY

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	ELEMENTS OF ASTROPHYSICS - **year II**	FIS/05	B/ASTROPHYSICS	7	LEZ:56	V
I	INTRODUCTION TO COSMOLOGY	FIS/05	B/ASTROPHYSICS	8	LEZ:64	V
II	COMPUTATIONAL ASTROPHYSICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
II	TIME-DOMAIN ASTROPHYSICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
I	ARTIFICIAL INTELLIGENCE FOR ASTROPHYSICAL PROBLEMS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
I	ASTROPHYSICAL FLUID DYNAMICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V

G – JUDGEMENT V – EXAM I – SUITABILITY F – ATTENDANCE

AT LEAST 12 CFU IN RELATED OR COMPLEMENTARY COURSES

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	DETECTION AND CHARACTERIZATION OF OPTICAL STATES LABORATORY	ING-INF/05	C/RELATED OR COMPLEMENTARY	6	LAB :66	V
II	OPTICAL SIGNAL ANALYSIS	ING-INF/05	C/RELATED OR COMPLEMENTARY	6	LEZ:32 LAB:22	V
II	APPLIED ELECTRONICS - **year II**	ING-INF/01	C/RELATED OR COMPLEMENTARY	6	LEZ:48	V
II	LABORATORY OF BIOPHYSICS AND PHOTOPHARMACOLOGY	FIS/07	C/RELATED OR COMPLEMENTARY	6	LAB:66	V
I	NUMERICAL SOLUTION OF PDE A - **year I**	MAT/08	C/RELATED OR COMPLEMENTARY	8	LEZ:64	V
I	NUMERICAL SOLUTION OF PDE B - **year II**	MAT/08	C/RELATED OR COMPLEMENTARY	8	LEZ:64	V
I	INTELLIGENT SYSTEMS	INF/01	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
I	MODELS FOR BIOLOGICAL SYSTEMS - **year I**	INF/01	C/RELATED OR COMPLEMENTARY	6	LEZ:48	V
I	DYNAMICAL SYSTEMS A - **year I**	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
I	DYNAMICAL SYSTEMS B - **year II**	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
II	APPLIED STATISTICS	SECS-S/01	C/RELATED OR COMPLEMENTARY	9	LEZ:56 LAB: 32	V
I	TOPICS IN ADVANCED PROBABILITY	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ 72	V
II	ADVANCED MATHEMATICAL PHYSICS A - **year I**	MAT/07	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V
II	ENVIRONMENTAL PHYSICS	ING-IND/11	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V
II	ADVANCED MATHEMATICAL PHYSICS B - **year II**	MAT/07	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V

G – JUDGEMENT V – EXAM I – SUITABILITY F – ATTENDANCE

DATA SCIENCE FOR ASTROPHYSICS
FUNDAMENTAL COURSES

YEAR I			
Name	**Disciplinary area**	**CFU**	**VERIFICATION METHOD***
ELECTIVE ACTIVITIES	D/ELECTIVE	6	V
RELATED/COMPLEMENTARY COURSE	C/ RELATED/SUPPLEMENTARY TRAINING ACTIVITIES	6	V
CHARACTERIZING COURSES	B/ CHARACTERIZING TRAINING ACTIVITIES	30	V

YEAR II			
Name	**Disciplinary area**	**CFU**	**VERIFICATION METHOD***
ELECTIVEACTIVITIES	D/ELECTIVE	6	V
AS MANY CHARACTERIZING COURSES AS NEEDED FOR A TOTAL OF 42 CHARACTERIZING CFU IN THE STUDY PLAN	B/ CHARACTERIZING TRAINING ACTIVITIES	12	V
ONE RELATED/COMPLEMENTARY COURSE	C/ RELATED/SUPPLEMENTARY TRAINING ACTIVITIES	6	V
INTERNSHIP	F/OTHER KNOWLEDGE FOR ENTERING THE JOB MARKET	6	
PREPARATION FOR THE FINAL EXAM	E/FINAL TEST	48	V

G – JUDGEMENT V – EXAM I – SUITABILITY F – ATTENDANCE

OPTIONAL COURSES

AT LEAST 6 CFU IN THE EXPERIMENTAL - APPLIED PHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
II	SCIENTIFIC PYTHON	FIS/01	B/EXPERIMENTAL-APPLIED	6	LAB:66	V
II	BASICS AND APPLICATIONS OF NON-LINEAR AND QUANTUM OPTICS	FIS/01	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
I	OPTICS WITH LABORATORY	FIS/01	B/EXPERIMENTAL-APPLIED	6	LEZ:32 LAB:22	V
II	ADVANCED EXPERIMENTAL AND DATA ANALYSIS TECHNIQUES IN PARTICLE AND NUCLEAR PHYSICS **– year II**	FIS/07	B/EXPERIMENTAL-APPLIED	6	LAB:66	V
I	PHYSICAL METHODS FOR BIOMEDICAL INVESTIGATION	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V

AT LEAST 6 CFU IN THE THEORETICAL AND FOUNDATIONS OF PHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	QUANTUM PHYSICS III	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V
I	STATISTICAL PHYSICS I	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
II	STATISTICAL PHYSICS II - **year II**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
II	PHYSICS OF COMPLEX SYSTEMS - **year I**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
I	GENERAL RELATIVITY	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V

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AT LEAST 6 CFU IN THE MICROPHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	RADIATION AND DETECTORS - **year I**	FIS/04	B/MICROPHYSICS AND STRUCTURE OF MATTER	6	LEZ:48	V
II	SOLID STATE PHYSICS - **year II**	FIS/03	B/MICROPHYSICS AND STRUCTURE OF MATTER	6	LEZ:48	V
I	LASER PHYSICS	FIS/03	B/MICROPHYSICS AND STRUCTURE OF MATTER	6	LEZ:48	V
I	ELEMENTARY PARTICLE PHENOMENOLOGY	FIS/04	B/MICROPHYSICS AND STRUCTURE OF MATTER	8	LEZ:64	V
II	COLLECTIVE PROPERTIES OF CONDENSED MATTER SYSTEMS – **year I**	FIS/03	B/MICROPHYSICS AND STRUCTURE OF MATTER	6	LEZ:48	V
II	METAMATERIALS	FIS/03	B/MICROPHYSICS AND STRUCTURE OF MATTER	6	LEZ:48	V

AT LEAST 12 CFU IN THE ASTROPHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	ELEMENTS OF ASTROPHYSICS - **year II**	FIS/05	B/ASTROPHYSICS	7	LEZ:56	V
I	INTRODUCTION TO COSMOLOGY	FIS/05	B/ASTROPHYSICS	8	LEZ:64	V
II	COMPUTATIONAL ASTROPHYSICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
II	TIME-DOMAIN ASTROPHYSICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
I	ARTIFICIAL INTELLIGENCE FOR ASTROPHYSICAL PROBLEMS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
I	ASTROPHYSICAL FLUID DYNAMICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V

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AT LEAST 12 CFU IN RELATED OR COMPLEMENTARY COURSES

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	DETECTION AND CHARACTERIZATION OF OPTICAL STATES LABORATORY	ING-INF/05	C/RELATED OR COMPLEMENTARY	6	LAB :66	V
II	OPTICAL SIGNAL ANALYSIS	ING-INF/05	C/RELATED OR COMPLEMENTARY	6	LEZ:32 LAB:22	V
II	APPLIED ELECTRONICS - **year II**	ING-INF/01	C/RELATED OR COMPLEMENTARY	6	LEZ:48	V
II	LABORATORY OF BIOPHYSICS AND PHOTOPHARMACOLOGY	FIS/07	C/RELATED OR COMPLEMENTARY	6	LAB:66	V
I	NUMERICAL SOLUTION OF PDE A - **year I**	MAT/08	C/RELATED OR COMPLEMENTARY	8	LEZ:64	V
I	NUMERICAL SOLUTION OF PDE B - **year II**	MAT/08	C/RELATED OR COMPLEMENTARY	8	LEZ:64	V
I	INTELLIGENT SYSTEMS	INF/01	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
I	MODELS FOR BIOLOGICAL SYSTEMS - **year I**	INF/01	C/RELATED OR COMPLEMENTARY	6	LEZ:48	V
I	DYNAMICAL SYSTEMS A - **year I**	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
I	DYNAMICAL SYSTEMS B - **year II**	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
II	APPLIED STATISTICS	SECS-S/01	C/RELATED OR COMPLEMENTARY	9	LEZ:56 LAB: 32	V
I	TOPICS IN ADVANCED PROBABILITY	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ 72	V
II	ADVANCED MATHEMATICAL PHYSICS A - **year I**	MAT/07	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V
II	ENVIRONMENTAL PHYSICS	ING-IND/11	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V
II	ADVANCED MATHEMATICAL PHYSICS B - **year II**	MAT/07	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V

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EXPERIMENTAL AND MEDICAL PHYSICS CURRICULUM
FUNDAMENTAL COURSES

YEAR I			
Name	**Disciplinary area**	**CFU**	**VERIFICATION METHOD***
ELECTIVE ACTIVITIES	D/ELECTIVE	6	V
RELATED/COMPLEMENTARY COURSE	C/ RELATED/SUPPLEMENTARY TRAINING ACTIVITIES	6	V
CHARACTERIZING COURSES	B/ CHARACTERIZING TRAINING ACTIVITIES	30	V

YEAR II			
Name	**Disciplinary area**	**CFU**	**VERIFICATION METHOD***
ELECTIVE ACTIVITIES	D/ELECTIVE	6	V
AS MANY CHARACTERIZING COURSES AS NEEDED FOR A TOTAL OF 42 CHARACTERIZING CFU IN THE STUDY PLAN	B/ CHARACTERIZING TRAINING ACTIVITIES	12	V
ONE RELATED/COMPLEMENTARY COURSE	C/ RELATED/SUPPLEMENTARY TRAINING ACTIVITIES	6	V
INTERNSHIP	F/OTHER KNOWLEDGE FOR ENTERING THE JOB MARKET	6	
PREPARATION FOR THE FINAL EXAM	E/FINAL TEST	48	V

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OPTIONAL COURSES

AT LEAST 18 CFU IN THE EXPERIMENTAL - APPLIED AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
II	SCIENTIFIC PYTHON	FIS/01	B/EXPERIMENTAL-APPLIED	6	LAB 66	V
II	ELEMENTS OF DOSIMETRY AND RADIOPROTECTION	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
I	PHYSICAL BASIS OF RADIOTHERAPY	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
I	PHYSICAL BASIS OF DIAGNOSTIC IMAGING	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
I	BASIS OF MEDICAL PHYSICS - **year I**	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V
II	MEDICAL PHYSICS LABORATORY	FIS/07	B/EXPERIMENTAL-APPLIED	6	LAB:66	V
I	OPTICS WITH LABORATORY	FIS/01	B/EXPERIMENTAL-APPLIED	6	LEZ:32 LAB:22	V
II	ADVANCED EXPERIMENTAL AND DATA ANALYSIS TECHNIQUES IN PARTICLE AND NUCLEAR PHYSICS – **year II**	FIS/07	B/EXPERIMENTAL-APPLIED	6	Lab:66	V
I	PHYSICAL METHODS FOR BIOMEDICAL INVESTIGATION	FIS/07	B/EXPERIMENTAL-APPLIED	6	LEZ:48	V

AT LEAST 6 CFU IN THE THEORETICAL AND FOUNDATIONS OF PHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	QUANTUM PHYSICS III	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V
II	QUANTUM INFORMATION THEORY	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	8	LEZ:64	V
I	STATISTICAL PHYSICS I	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
II	STATISTICAL PHYSICS II - **year II**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V
II	PHYSICS OF COMPLEX SYSTEMS - **year I**	FIS/02	B/THEORETICAL AND FOUNDATIONS OF PHYSICS	6	LEZ:48	V

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AT LEAST 6 CFU IN THE MICROPHYSICS AREA

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	RADIATION AND DETECTORS - **year I**	FIS/04	B/MICROPHYSICS	6	LEZ:48	V
II	SOLID STATE PHYSICS - **year II**	FIS/03	B/MICROPHYSICS	6	LEZ:48	V
I	LASER PHYSICS	FIS/03	B/MICROPHYSICS	6	LEZ:48	V
I	ELEMENTARY PARTICLE PHENOMENOLOGY	FIS/04	B/MICROPHYSICS	8	LEZ:64	V
II	METAMATERIALS	FIS/03	B/MICROPHYSICS	6	LEZ:48	V

COURSES IN THE ASTROPHYSICS AREA ARE NOT COMPULSORY

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	ELEMENTS OF ASTROPHYSICS - **year II**	FIS/05	B/ASTROPHYSICS	7	LEZ:56	V
I	INTRODUCTION TO COSMOLOGY	FIS/05	B/ASTROPHYSICS	8	LEZ:64	V
II	COMPUTATIONAL ASTROPHYSICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
II	TIME-DOMAIN ASTROPHYSICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
I	ARTIFICIAL INTELLIGENCE FOR ASTROPHYSICAL PROBLEMS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V
I	ASTROPHYSICAL FLUID DYNAMICS	FIS/05	B/ASTROPHYSICS	6	LEZ:48	V

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AT LEAST 12 CFU IN RELATED OR COMPLEMENTARY COURSES

YEAR I / II						
SEM	**Name**	**Sector**	**Disciplinary area**	**CFU**	**Hours**	**VERIFICATION METHOD***
I	DETECTION AND CHARACTERIZATION OF OPTICAL STATES LABORATORY	ING-INF/05	C/RELATED OR COMPLEMENTARY	6	LAB :66	V
II	OPTICAL SIGNAL ANALYSIS	ING-INF/05	C/RELATED OR COMPLEMENTARY	6	LEZ:32 LAB:22	V
II	APPLIED ELECTRONICS - **year II**	ING-INF/01	C/RELATED OR COMPLEMENTARY	6	LEZ:48	V
II	LABORATORY OF BIOPHYSICS AND PHOTOPHARMACOLOGY	FIS/07	C/RELATED OR COMPLEMENTARY	6	LAB:66	V
I	NUMERICAL SOLUTION OF PDE A - **year I**	MAT/08	C/RELATED OR COMPLEMENTARY	8	LEZ:64	V

I	NUMERICAL SOLUTION OF PDE B - **year II**	MAT/08	C/RELATED OR COMPLEMENTARY	8	LEZ:64	V
I	INTELLIGENT SYSTEMS	INF/01	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
I	MODELS FOR BIOLOGICAL SYSTEMS - **year I**	INF/01	C/RELATED OR COMPLEMENTARY	6	LEZ:48	V
I	DYNAMICAL SYSTEMS A - **year I**	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
I	DYNAMICAL SYSTEMS B - **year II**	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ:72	V
II	APPLIED STATISTICS	SECS-S/01	C/RELATED OR COMPLEMENTARY	9	LEZ:56 LAB: 32	V
I	TOPICS IN ADVANCED PROBABILITY	MAT/07	C/RELATED OR COMPLEMENTARY	9	LEZ 72	V
II	ADVANCED MATHEMATICAL PHYSICS A - **year I**	MAT/07	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V
II	ENVIRONMENTAL PHYSICS	ING-IND/11	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V
II	ADVANCED MATHEMATICAL PHYSICS B - **year II**	MAT/07	C/RELATED OR COMPLEMENTARY	6	LEZ 48	V

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