UNIVERSITÀ DEGLI STUDI
DELL'INSUBRIA

TEACHING REGULATIONS OF THE BACHELOR'S DEGREE IN PHYSICS

(L-30)

a.a. 2025/26

Outline

Art. 1 – General Characteristics and Organization
The Bachelor's Degree Program in Physics, Class L-30 – Physical Sciences and Technologies (Ministerial Decree of March 16, 2007, reformed under Ministerial Decree 1648/23), is activated according to the academic regulations for the academic year 2025/2026.

Brief Description of the Program
Interest, curiosity, and the desire to understand the laws governing natural phenomena—their simplicity and elegance—are the motivations for enrolling in the Physics degree program. A degree in Physics offers the possibility to directly impact society through the development of advanced technologies that originate today in fundamental research laboratories and may lead to innovative applications in the future. A physicist today is someone who actively contributes to society, often taking on leadership roles in public or private research institutions.
Due to the rapid evolution of technology, the job market continues to demand graduates with an open, versatile, and innovative mindset, with attention to detail and specific technical skills. The educational objectives of the Physics Degree Program foster this kind of mindset and prepare graduates to either pursue further studies in a specialized Master's program or to enter the professional world directly.

The degree program provides methodological, experimental, and theoretical foundations of both classical and modern physics, without requiring significant prerequisites. Students will delve into classical, relativistic, and quantum physics, addressing phenomenological and experimental aspects, theoretical perspectives, and their mathematical formalization.
By acquiring appropriate mathematical and computing tools, students will gain experience in the formulation and use of mathematical models and the application of computational techniques to solve physical problems, with accompanying laboratory activities at every step. The Bachelor's Degree in Physics opens the door to advanced studies at Master's level in Italy or abroad but also allows graduates to enter professions requiring experimental-applicative skills, knowledge of innovative methodologies, and the use of complex equipment.
Learning outcomes are assessed through written and oral exams and lab activity reports.

Website: http://www.uninsubria.it/triennale-fisica

The academic department responsible for the degree program is the *Department of Science and High Technology (DiSAT)*.
The Program Chair is Prof. Alessia Allevi: https://archivio.uninsubria.it/hpp/alessia.allevi#4

The teaching office receives students by appointment at Via Valleggio 11 (4th floor) and responds to inquiries via the *INFOSTUDENTI* platform.
More information is available at:
https://www.uninsubria.it/servizi/tutti-i-servizi/infostudenti-servizio-informazioni-gli-studenti

Art. 2 – Academic Calendar
Teaching activities take place in the classrooms located in Como.
Program website: https://www.uninsubria.it/formazione/offerta-formativa/corsi-di-laurea/fisica

Class schedules are published at:
ORARIO DELLE LEZIONI

The academic calendar is divided into semesters:

- **1st Semester**: September 22, 2025 – January 16, 2026
- **2nd Semester**: February 23, 2026 – June 12, 2026

Examinations
At least 6 exam sessions are scheduled for each course during breaks in teaching.
The exam calendar is published at:
https://uninsubria.esse3.cineca.it/ListaAppelliOfferta.do

Art. 3 – Orientation Activities
University-level orientation activities are listed here:
https://www.uninsubria.it/formazione/consigli-e-risorse-utili/orientamento-e-placement

Program-Specific Initiatives

The degree program ensures guidance and support during key phases of the student's academic journey.

Incoming Orientation
The program collaborates with the University's Orientation and Placement Office to organize a wide range of initiatives—from school-year lab activities and summer internships to PCTO (Pathways for Transversal Skills and Orientation), university-level subject lessons at schools, and dedicated lab sessions.
The program's representative on the Orientation and Placement Committee for the physics area of DiSAT is Dr. Marco Lamperti.
The degree program actively participates in the *Scientific Degrees Plan*, which includes interventions in local schools aimed at improving lab teaching and updating high school teachers.
Regular teacher training courses are organized on Modern Physics and optimal use of school lab resources. The program also offers open classes, internships during the year and in summer schools, themed days, and exhibitions.

Ongoing Orientation and Tutoring
Faculty tutors, together with the program administration and teaching office, provide continuous support and guidance to individual students or groups, especially in choosing elective courses and planning their studies to maximize credit accumulation. Course materials are uploaded to the University's e-learning platform.
Special attention is given to working students, with lab activities scheduled accordingly.

Over the years, the program has tested various tutoring methods, involving both faculty and PhD students. Tutors (PhD students and Master's students) conduct practice sessions for theoretical courses and assist lab groups during data acquisition and analysis.

Since 2022, a training phase has been implemented for tutors (initially optional but now mandatory for those funded through youth programs or Ministerial Decree 752), enhancing their skills in teaching methods and educational relationships.
The training, lasting about 10 hours, focuses on diverse teaching strategies, establishing trust and emotional support, managing educational communication, and leveraging group dynamics for learning.

There is a dedicated committee managing student records and serving as an interface between the student office and individual students seeking transfers or study plan modifications. This committee includes Professors A. Allevi, A. Parola, and F. Prati.

Art. 4 – Specific Educational Objectives, Expected Learning Outcomes, and Career Opportunities

The Bachelor's Degree in Physics aims to provide a solid foundation in classical and modern physics, while also equipping students with the necessary mathematical, statistical, and computer science tools for formalizing physical laws. A graduate in Physics will be able to address problems requiring fundamental physics knowledge, develop mathematical models to describe physical processes, identify and use appropriate statistical and computational methods for data analysis, and perform laboratory measurements to quantitatively determine physical properties.

Teaching methods and tools used to achieve the expected learning outcomes include lectures, practical exercises, and laboratory activities. Learning outcomes are assessed throughout the course through oral exams, written tests, practical tests, and the discussion of reports on the activities carried out.

The educational activities of the Physics degree course are divided into three thematic areas:

1. Basic Training Area

- **Knowledge and Understanding**
  Students are expected to acquire 77 ECTS credits, mostly in the first two years. Courses in this area aim to build a strong scientific foundation on which more advanced skills can be developed.
- **Applying Knowledge and Understanding**
  These courses provide essential mathematical and computer science tools needed for the formalization of physical laws and the analysis of experimental data.

2. Modeling and Methodological Training Area

- **Knowledge and Understanding**
  Students are expected to acquire 40 ECTS credits, primarily in the second year. This area introduces students to a higher level of abstraction through the use of advanced mathematical methods suitable for formulating the laws of quantum mechanics that govern atomic and subatomic physics.

- **Applying Knowledge and Understanding**
  The skills acquired allow students to address problems related to research or applications in various fields of modern physics.

3. Phenomenological and Experimental Training Area

- **Knowledge and Understanding**
  Students are expected to acquire 46 ECTS credits distributed throughout the three-year course. The combination of classroom and laboratory training is essential for giving physics education a unified dimension in which experimental evidence, phenomenological description, and mathematical formalization represent complementary aspects of the same discipline.
- **Applying Knowledge and Understanding**
  The goal of this area is to ensure that students acquire the ability to experimentally verify the physical laws introduced in the basic training area, using programming and advanced analytical techniques, as well as typical research laboratory equipment.

CAREER OPPORTUNITIES

This course prepares graduates for the professions of Physicist (ISTAT code 2.1.1.1.1) and Physics and Nuclear Technician (ISTAT code 3.1.1.1.2).

Possible career paths include:

- Researcher in high-tech industries;
- Operator in scientific outreach and communication;
- Operator in mathematical/statistical modeling.

Additionally, the course provides the essential academic foundation for continuing studies through a first-level Master's program or a Master's degree, particularly in Physics.

Art. 5 – Admission to the Degree Course

In accordance with current regulations, to access the degree course it is necessary to possess a high school diploma or an equivalent qualification obtained abroad and recognized as suitable.
The course has open enrollment (non-restricted admission).

Initial Knowledge Assessment

Although admission to the Bachelor's Degree in Physics is open, an initial knowledge assessment test is required. The course follows the national coordination of knowledge verification tests for scientific degree programs, organized by the National Conference of Presidents and Directors of University Science and Technology Departments (Con.Scienze), in collaboration with the National Scientific Degrees Plan of the MUR and CISIA.

- Students who have taken and passed the TOLC-S test of TOLC@Casa at the time of enrollment are admitted. The test is considered passed if the student answers at least 10 questions correctly in the Basic Mathematics module. The test can also be taken at a different university.
- Students who have taken but not passed the TOLC@Casa test are admitted but are assigned Additional Educational Obligations (OFA).
- Students who have not taken the TOLC@Casa test are also admitted but are assigned Additional Educational Obligations (OFA).

How to Fulfill the Additional Educational Obligations (OFA)

Students can fulfill the OFA in two ways:

- By taking and passing the TOLC@Casa test by the deadline of November 27, 2025. The test can be taken at another university.
- By attending the "Mathematics Tutoring" sessions and successfully completing the final test.

The mathematics tutoring:

- Consists of 5 sessions, each 2 hours long, conducted by a subject-specific tutor;
- Will be held in two editions: one between September and October, and another at the beginning of December;
- Is considered attended if the student has participated in at least 4 out of 5 sessions;
- Is considered passed if the student answers at least 10 questions correctly in the final test.

Consequences of Not Fulfilling the OFA

If none of the tests are passed, the OFA will be considered fulfilled if the student passes either the Calculus I or Linear Algebra exam by September 30 of the first academic year. Regular enrollment into the second year requires that the student has either taken the CISIA test at least once or attended one of the OFA remedial courses and passed the associated final test.

Preparatory Activities for the Initial Knowledge Assessment

In early September, students can attend preliminary mathematics lessons. All details, including dates, will be published on the following webpage:
https://www.uninsubria.it/formazione/consigli-e-risorse-utili/orientamento/orientamento-ingresso/preparati-alluniversita

Information about the Mathematics pre-course for the Scientific Area is available here:
https://www.uninsubria.it/formazione/consigli-e-risorse-utili/orientamento/orientamento-ingresso/preparati-alluniversita-5

Exemptions

Students are exempt from the test if:

- They are transferring from another degree program at the University of Insubria (internal transfer), provided they have taken and passed a similar initial knowledge assessment;
- They are transferring from another university where they have already passed a similar test;
- They are enrolling with a degree that includes a mathematics exam in its curriculum;
- They have already passed a similar test at another university.

To obtain the exemption, students must send appropriate certification to the Student Office at the time of enrollment, confirming they passed the test (at least 10 correct answers in the Basic Mathematics module).

Art. 6 – Incoming Transfers and Course Changes
Students coming from another university, another degree program within this university, or from previous academic regulations, may request a transfer or course change into the degree program. Requests for transfer or course change will be evaluated by a dedicated committee composed of Professors Allevi and Parola, which will assess the recognition of academic credits based on the following criteria:

- Analysis of the course syllabus previously completed;
- Assessment of the compatibility between the scientific-disciplinary sectors and the content of the academic activities passed by the student in their previous studies, with the specific educational objectives of the degree program and the individual learning activities included in the curriculum.

Such recognition is carried out according to Article 3, paragraphs 8 and 9 of the Ministerial Decree redefining Degree Classes (March 16, 2007). Recognition is granted up to the maximum number of credits required by the program. However, the transfer or course change is only permitted for students who have participated in an initial knowledge assessment similar to that required by the degree program.

Art. 7 – Simultaneous Enrollment in Two Degree Programs
Starting from the academic year 2022–2023, students are allowed to enroll in two degree programs at the same time, in accordance with Law No. 33 of April 12, 2022 (Provisions on Simultaneous Enrollment in Two Higher Education Programs) and subsequent ministerial decrees (DM 930/2022 and DM 933/2022). Requests for dual enrollment will be evaluated by a specific committee of the degree program, after verifying admission requirements.

Art. 8 – The Academic Pathway
The program lasts 3 years and requires the acquisition of 180 ECTS credits (CFU), of which 12 are electives. There are no specific curricula tracks or internships.

Moreover, starting from the 2025/26 academic year, in collaboration with the Bachelor's program in Mathematics, a cross-disciplinary honors track (extra-curricular) will be introduced for students enrolled

in the Physics Bachelor's degree, including short modules focusing on innovative topics aimed at engaging the most capable students.

Transversal skills such as communication and teamwork are developed through laboratory courses, where students are encouraged to collaborate and critically discuss their results. Additionally, the final exam consists of a thesis defense, which is intended to assess the student's ability to reorganize content and their clarity in presentation.

At the university level, since 2022, the **Teaching and Learning Center** has been active, periodically organizing activities aimed at developing soft skills and, in particular, transversal competencies and entrepreneurship. Participation and verification of skill acquisition result in the awarding of **Open Badges** that enhance the student's resume. These educational activities are offered as seminars and are open to students from both undergraduate and graduate programs. Each seminar targets homogeneous student groups based on program type and level. These activities are generally unrelated to disciplinary content but contribute to students' overall education.

Teaching is delivered in a traditional (in-person) format.
In general, attendance is not mandatory, but consistent attendance, which allows for ongoing dialogue with instructors, is strongly recommended for full mastery of content and study methods.

For laboratory courses only, attendance of at least 75% of activities is mandatory. Special schedules are organized for working students.

Thanks to Ministerial Decree 752/2021, free tutoring hours are available for all students experiencing difficulties in organizing their studies and/or passing exams. Specifically, subject tutors and support tutors have been appointed for students with learning disabilities (DSA), disabilities, or those who are working.

ECTS/Hours Correspondence by Activity Type
The **University Educational Credit (CFU)** measures the workload, including individual study, required for a student with adequate prior preparation to acquire knowledge and skills in the learning activities provided in the academic programs, as defined in Article 5 of Ministerial Decree 270/04. Each learning activity (lecture, lab, internship, thesis, etc.) corresponds to a specific number of ECTS credits.

Each **1 CFU** equals **25 hours** of student work, including both time spent with the instructor and time spent in individual study and personal processing.

ECTS for each learning activity are granted after passing an exam or other form of assessment as defined in the academic program regulations.

Learning Activities / CFU Breakdown:

- 8 hours of lectures with 17 hours of individual study;

- 12 hours of exercises with 13 hours of personal processing;
- 11 hours of lab work with 14 hours of personal processing;
- 25 hours of activities related to the preparation of the final exam.

Lectures: These are the core educational activities. Students attend the lecture and then independently process the material presented.
Exercises: These clarify lecture content through application-based tasks. They do not introduce new material. Exercises are typically linked to lectures and are not independent. In passive exercises, the instructor leads; in active ones, students perform tasks under supervision.
Laboratories: These are assisted activities involving student interaction with tools, equipment, or software applications.

Assessment Methods for Learning Activities
Assessment and evaluation methods are detailed in each course syllabus.
Instructors decide on the types of assessments for their courses, which may include written exams, oral exams, lab reports, and project work. These may be mid-term or final exams. Some instructors offer ongoing assessments (in itinere) that may reduce the weight of the final exam.

Students may register for exams via the ESSE3 platform starting one month before the exam date and up to five days prior. To register, students must have completed the course attendance requirement (where applicable).

Final exams (excluding mid-term assessments) take place during teaching breaks: typically mid-January to late February and mid-June to late September. Additional exam sessions may be introduced during other breaks upon decision of the Course Council (CCS).

Prerequisites
There are no prerequisites required.

Art. 9 – Rules for Submitting Study Plans and Individual Study Plans

Students are required to submit their **Study Plan** during the third year of the program, with the possibility of modifying it in subsequent years, in accordance with the annual deadlines published on the Student Services web pages:
https://www.uninsubria.it/servizi/presentazione-piano-di-studio

Students must complete the study plan online by accessing their personal ESSE3 area, and must indicate:

- the elective course between *Physics Laboratory IIIA* and *Physics Laboratory IIIB*;
- the courses under the "electives" category (*TAF D*), for which 12 ECTS credits are reserved;
- To assist with this choice, the Course Council includes, within the online study plan submission procedure, a list of recommended electives (TAF D) that are consistent with the educational path (see the next article).

Elective Courses (Category D)

As part of the "Elective Courses", students may choose from the third year onwards among:

- courses offered in the Master's Degree in Physics;
- courses offered in other degree programs provided by the Department or University, **provided they are consistent with the student's educational path and have been approved by the Course Council**. In such cases, the study plan must be submitted **in paper format**, by requesting the form from the student office via the INFOSTUDENTI system;
- Courses offered by nationally "restricted admission" programs at the university **cannot** be selected.

Additional Language Skills, IT and Interpersonal Skills, Internships, and More (Category F)

As part of the "Additional language skills, IT and interpersonal skills, internships, and more":

- In the first year, an **English language course** worth 3 ECTS is included. These credits can be automatically recognized upon submission of a certificate attesting to **B2-level English** to the Student Office.
- As for IT skills, a **Computer Laboratory** course worth 6 ECTS is included in the first year and requires mandatory attendance.
- In the third year, students may also select further computer science-related courses under the elective category.

Courses offered by nationally "restricted admission" programs at the university **cannot** be selected.

Students can modify their elective choices from the third year onwards in future years, provided they are regularly enrolled.

Art. 10 – Opportunities Offered During the Academic Program

The degree program promotes several initiatives aimed at enriching the academic experience. Notably, students can participate in **mobility and internationalization programs** such as:

- **International Mobility – Erasmus and Other Programs**
  https://www.uninsubria.it/internazionale/mobilita-allestero/programma-erasmus

Erasmus Code	University Name	Country	Max. Spots	Max. Duration (months)
LT VILNIUS01	Vilnius University	Lithuania	3	6
PL BYDGOSZ02	Politechnika Bydgoska	Poland	1	6

Erasmus Code	University Name	Country	Max. Spots	Max. Duration (months)
RO TIMISOA01	West University of Timişoara	Romania	2	6
SI NOVA-GO01	University of Nova Gorica	Slovenia	2	6
E CORDOBA01	University of Córdoba	Spain	1	6
E VALENCI01	University of Valencia	Spain	2	6
CH BERN01	University of Bern	Switzerland	2	12

- **Tutoring Service**
  https://www.uninsubria.it/servizi/tutti-i-servizi/tutorato
  This service includes a variety of activities aimed at guiding, assisting, advising, and informing students. Alongside the general university tutoring service (informational), the degree program annually appoints **disciplinary tutors**—selected through a specific call—from among Master's or Ph.D. students in Physics or Astrophysics to support specific courses in the bachelor's program.
- As part of **student support services**, students may apply for **student collaborations** (200 hours) and tutoring services:
  https://www.uninsubria.it/servizi/tutti-i-servizi/collaborazioni-studentesche-200-ore

Art. 11 – Graduation Requirements

The **final examination** consists of a short research project lasting approximately two weeks, on a topic selected by a committee from a set of three proposals submitted by the student's supervisor. The committee ensures that the complexity of the projects is comparable. The thesis is worth **3 ECTS credits**.

The thesis is presented and discussed before a **degree committee composed of 5 faculty members**, who evaluate the student's competencies in terms of understanding the problem, application of acquired knowledge, and clarity of presentation.

The **final grade** is calculated as follows:

- The **weighted average** of the grades obtained in all exams, scaled to a 110-point system;
- Additional points are assigned based on:
  - **0–3 points** for the mastery of the thesis topic as demonstrated during the presentation and discussion;
  - **0–2 points** for honors received in exams (1 point for each);
  - A **career bonus** for graduating within the standard three-year timeframe:
    - 3 points for graduation by December,
    - 2 points by February,
    - 1 point by March;
  - **1 additional point** for participation in the Erasmus program.

If the total score is **110 or above**, the committee may award **honors (cum laude)** unanimously.

Upon graduation, students receive the **Diploma Supplement**. This is an accompanying document to the official degree certificate that provides a detailed description of the nature, level, context, content, and status of the studies completed by the student. It is issued in both Italian and English. The purpose of this document is to enhance international transparency and fair academic and professional recognition of qualifications, supporting student mobility. The Diploma Supplement follows the **Europass standard**.

Art. 12 – Quality Assurance of the Degree Program

With regard to Quality Assurance (QA), the course follows the procedures, methodological approach, and timelines established by the University's **Quality Assurance Office**, taking into account the regulations set forth by the **Ministry of University and Research (MUR)** and **ANVUR**, especially concerning the preparation of materials required for the **SUA-CdS** (Single Annual Form for Degree Programs).

The organization and responsibilities for QA at the degree program level are as follows:

- The **AiQUA Committee** is composed of the Program Director, four faculty members, one or two students, and an administrative officer. It receives and analyzes input from the **Joint Committee for Teaching and Student Representation (CPDS)**, drafts the SUA-CdS and the Annual Monitoring Report, analyzes all data related to the degree program (AlmaLaurea data, consultations with stakeholders, student and graduate feedback), and presents its findings to the Program Council.
- The **CPDS Committee** consists of five faculty members and five students representing all degree programs within the Department. It monitors the achievement of educational objectives, proposes improvements in the quality and effectiveness of teaching and learning environments, and provides a mandatory opinion on the planned course offerings. The committee's conclusions are sent to the **Departmental Quality Manager (MDQ)**, who forwards them—depending on the subject matter—to the **Teaching Structure Council (SAD)**, the Department Director, the AiQUA Committees, or the Program Council.
- The **Program Council**, in accordance with the University Statute, is responsible for the educational and organizational coordination of the degree program. It is chaired by an elected President who is responsible for designing the educational offer, conducting consultations with the job market, managing and monitoring the degree program, and ensuring continuous improvement and self-evaluation activities. The President is supported by the AiQUA Committee. The Program Council reviews and, when required, approves the preparatory work of the various committees and submits proposals and opinions to the Department Council according to its competencies.

Student Involvement

Students elect their representatives to the **Department Council**, the **Program Council**, and the **CPDS Committee**, and nominate their representatives to the **AiQUA Committees**.

Teaching Evaluation Questionnaires and Opinion Week

Teaching evaluation by students is conducted through an **online questionnaire**, differentiated for "attending" and "non-attending" students. The questionnaire is available to all students within a specific timeframe—between two-thirds into the semester and the end of classes—via the **ESSE3 system**, which students use to register for exams. The system ensures full anonymity for respondents.

The evaluation reports show average ratings for the degree program and student opinions for each course (when publication has been authorized by the course instructor). The university uses a **4-point evaluation scale**:

- 1 = Definitely no
- 2 = More no than yes
- 3 = More yes than no
- 4 = Definitely yes

Since the reporting system uses a 10-point scale, these responses are converted to scores of **2, 5, 7, and 10**, respectively. The threshold for "satisfactory" is set at **7**.

Each year, the Program Council implements various actions to improve areas of difficulty identified in evaluations, also based on ongoing dialogue with students.

- **Link to the student opinion page**: https://www.uninsubria.it/ateneo/la-nostra-qualita/opinioni-degli-studenti

For feedback from **graduating students and alumni**, the degree program refers to the **AlmaLaurea Interuniversity Consortium surveys**, which are also available on the degree program's website under *Student and Graduate Opinions*.

In line with the directives of the University Quality Office, the degree program participates in the **Opinion Week**, a dedicated week for completing course evaluation questionnaires.

Art. 13 – Final and Transitional Provisions

ANNEXES

- **Annex 1** – Study Plan

- **Annex 2** – Summary of the Learning Objectives of Mandatory Courses

FUNDAMENTAL COURSES

YEAR I									
SEMESTER	**INTEGRATED COURSE Name**	**MODULES / COURSE Names**	**Scientific Sector SSD**	**SUBJECT AREA/ TAF**	**CFUs**	**Hours**	**Assessment Methods***	**Reference Teachers**	**SEMESTER**
I	CALCULUS I WITH EXERCISES		MAT/05		BASIC / MATHEMATICAL AND COMPUTER SCIENCE DISCIPLINES	9	LEZ: 56 ESE: 24	V	
I	KINEMATICS AND POINT MECHANICS		FIS/02		BASIC / PHYSICAL DISCIPLINES	7	LEZ: 56	V	
I	COMPUTER LAB		INF/01		OTHER / COMPUTER SKILLS	6	LAB: 66	V	
I	PROBABILITY AND STATISTICS		FIS/01		CHARACTERIZING/EXPERIMENTAL APPLICATION	7	LEZ: 56	V	
II	SYSTEM MECHANICS AND THERMODYNAMICS		FIS/02		BASIC / PHYSICAL DISCIPLINES	9	LEZ: 72	V	
II	LINEAR ALGEBRA WITH EXERCISES		MAT/03		RELATED/INTEGRATIVE / RELATED OR SUPPLEMENTARY TRAINING ACTIVITIES	8	LEZ: 56 ESE: 12	V	
II	CHEMISTRY WITH EXERCISES		CHIM/03		RELATED/INTEGRATIVE / RELATED OR SUPPLEMENTARY TRAINING ACTIVITIES	2	ESE: 24	V	
			CHIM/03		BASICS / CHEMICAL DISCIPLINES	6	LEZ: 48	V	
II	PHYSICS LABORATORY I		FIS/01		BASIC / PHYSICAL DISCIPLINES	6	LAB: 66	V	
II	ENGLISH LANGUAGE		L-LIN/12		LANGUAGE/FINAL EXAM / FOR THE KNOWLEDGE OF AT LEAST ONE FOREIGN LANGUAGE	3	LEZ: 48	V	
YEAR II									
SEMESTER	**INTEGRATED COURSE Name**	**MODULES / COURSE Names**	**Scientific Sector SSD**	**SUBJECT AREA/ TAF**	**CFUs**	**Hours**	**Assessment Methods***	**Reference Teachers**	**SEMESTER**
I	CALCULUS II WITH EXERCISES		MAT/05		BASIC / MATHEMATICAL AND COMPUTER SCIENCE DISCIPLINES	8	LEZ: 56 ESE 24	V	
I	OSCILLATIONS AND WAVES		FIS/02		CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	9	LEZ: 72	V	
I	ANALYTICAL MECHANICS WITH EXERCISES		MAT/07		RELATED/INTEGRATIVE / RELATED OR SUPPLEMENTARY TRAINING ACTIVITIES	8	LEZ: 48 ES: 24	V	
I	ELECTROMAGNETISM	ELECTROSTATICS AND MAGNETOSTATICS	FIS/01		CHARACTERIZING / EXPERIMENTAL AND APPLICATIVE	6	LEZ: 48	V	

II		CLASSICAL ELECTRODYNAMICS AND SPECIAL RELATIVITY	FIS/01		CHARACTERIZING / EXPERIMENTAL AND APPLICATIVE	8	LEZ: 64	V	
II	QUANTUM PHYSICS I		FIS/03		CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	8	LEZ: 64	V	
II	PHYSICS LABORATORY II		FIS/03		CHARACTERIZING / EXPERIMENTAL AND APPLICATIVE	6	LAB: 66	V	
II	MATHEMATICAL METHODS FOR PHYSICS		FIS/02		CHARACTERIZING / THEORETICAL AND FUNDAMENTALS OF PHYSICS	11	LEZ: 88	V	
					YEAR III				
SEMESTER	**INTEGRATED COURSE Name**	**MODULES / COURSE Names**	**Scientific Sector SSD**	**SUBJECT AREA/ TAF**	**CFUs**	**Hours**	**Assessment Methods***	**Reference Teachers**	**SEMESTER**
I	QUANTUM PHYSICS II		FIS/03		CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	8	LEZ: 64	V	
I	PHYSICS OF MATTER WITH EXERCISES	ATOMIC PHYSICS	FIS/03		CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	5	LEZ: 40	V	
II		MOLECULAR AND SOLID PHYSICS	FIS/03		CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	5	LEZ: 40	V	
II	NUCLEAR AND SUBNUCLEAR PHYSICS WITH EXERCISES		FIS/04		CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	8	LEZ: 64	V	
ND	FREE CHOICE ACTIVITIES		NN		STUDENT'S CHOICE	6		V	
ND	FREE CHOICE ACTIVITIES		NN		STUDENT'S CHOICE	6		V	
ND	FINAL EXAM		PROFIN_S		Final Exam	3		V	

* GRADE, V – EXAM, I – SUITABILITY, F – ATTENDANCE

OPTIONAL COURSES (CHOICE OF A PHYSICS LABORATORY III)

YEAR III								
SEMESTER	**INTEGRATED COURSE Name**	**MODULES / COURSE Names**	**Scientific Sector SSD**	**SUBJECT AREA/ TAF**	**CFU**	**Hours**	**Assessment Methods ***	**Reference Teachers**

II	PHYSICS LABORATORY III A	SUBNUCLEAR PHYSICS LABORATORY	FIS/04	CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	6	LAB: 66	V	
I		LABORATORY OF MODERN PHYSICS	FIS/01	BASIC / PHYSICAL DISCIPLINES	6	LEZ: 66	V	
II	PHYSICS LABORATORY III B	PHYSICS OF MATTER LABORATORY	FIS/03	CHARACTERIZING / MICROPHYSICS AND THE STRUCTURE OF MATTER	6	LAB: 66	V	
I		LABORATORY OF MODERN PHYSICS	FIS/01	BASIC / PHYSICAL DISCIPLINES	6	LEZ: 66	V	

Annex 2 – Summary of the Learning Objectives of Mandatory Courses (Common Curriculum)

Course Title	Year	Summary of Learning Objectives (based on syllabus)
Calculus I with Exercises	I	• Provide students with fundamental methods and techniques of Mathematical Analysis, focusing on sequences, numerical series, and differential and integral calculus for functions of one real variable • Prepare students to apply analytical techniques to other scientific disciplines • Train students to independently assess the validity of mathematical reasoning, prove simple theorems similar to those taught in class, and express themselves using correct mathematical language
Kinematics and Point Mechanics	I	• Introduce motion description in quantitative terms • Formulate and apply the fundamental laws of classical dynamics to model systems
Chemistry with Exercises	I	• Understand fundamental chemical concepts concerning atomic structure, periodic properties, chemical bonding, and intermolecular forces • Comprehend the principles governing homogeneous and heterogeneous chemical equilibrium • Understand chemical reactions in terms of material and energy balance
Physics Laboratory I	I	• Acquire basic elements of the experimental method • Develop the ability to conduct simple experiments and analyze collected data • Learn to organize and summarize activities related to planning, conducting experiments, and data analysis
System Mechanics and Thermodynamics	I	• Introduce mechanics of systems, rigid body motion, and rotations • Introduce classical thermodynamics and basics of kinetic theory of gases and statistical mechanics • Provide basic knowledge on fluid dynamics and deformable bodies
Probability and Statistics	I	• Acquire basic elements of probability and statistics for elementary analysis of experimental data • Develop a data-driven approach to problem-solving
Linear Algebra with Exercises	I	• Provide a formal context for developing the theory of linear systems • Introduce concepts of vector spaces and linear transformations, with applications to geometry of planes, lines, and conics
English Language	I	• Communicate in English appropriately in professional and everyday contexts • Analyze English texts, including academic and scientific material • Understand spoken content on daily and professional topics • Use English flexibly and effectively, recognizing different language registers
Computer Laboratory	I	• Implement basic numerical computation algorithms • Write simple Monte Carlo simulations • Choose optimal methods to visualize results • Compare analysis and simulation results with expected physical models
Calculus II with Exercises	II	• Understand methods of mathematical analysis • State and prove major theorems • Solve exercises, including theoretical ones, on the covered topics • Independently derive results related to those presented in the course
Electromagnetism	II	• Provide fundamental knowledge of static and dynamic electromagnetism, and special relativity • Prepare students to apply basic concepts to real physical problems
Oscillations and Waves	II	• Introduce fundamental aspects of oscillatory phenomena and wave optics • Enable students to provide precise mathematical descriptions and understand the physical meaning of such phenomena
Quantum Physics I	II	• Provide foundational knowledge of quantum theory and the phenomena it describes

Physics Laboratory II	II	• Train students to apply learned concepts to basic problems in quantum mechanics • Teach the design and execution of experiments in electromagnetism and optics aimed at obtaining quantitative measurements • Develop and critically assess theoretical models to interpret experimental results within an assigned error margin
Mathematical Methods for Physics	II	• Understand properties of complex functions and integration techniques in the complex plane relevant to physics • Apply Fourier series and transforms to solve differential equations
Analytical Mechanics with Exercises	II	• Provide foundations of the Lagrangian and Hamiltonian approaches to classical mechanics • Prepare students to apply these methods to problems of physical interest
Physics Laboratory IIIA	III	• Teach fundamental concepts of radiation-matter interaction and how detection systems interpret such interactions • Describe the operation of basic analog electronic circuits • Critically analyze data from radiation detectors and carry out particle physics measurements using various experimental setups
Physics Laboratory IIIB	III	• Teach the complete realization of a basic statistical optics experiment, including: – Assembling optical, mechanical, and electronic components as per a given setup – Interfacing an image detector with a PC and managing data acquisition using custom LABVIEW code – Analyzing data and validating the analysis method with numerical simulations – Interpreting results based on suitable theory – Writing a scientific report on the experiment
Condensed Matter Physics with Exercises	III	• Introduce the statistical description of macroscopic material properties • Describe atomic and molecular electronic structure and their interaction with electromagnetic radiation • Introduce the description of the crystalline state of matter
Quantum Physics II	III	• Introduce the general theory of angular momentum • Provide the knowledge needed to study single-particle systems in exactly solvable force fields • Introduce approximation methods for studying unsolvable systems • Prepare students to use the learned concepts in solving specific physics problems
Nuclear and Subnuclear Physics	III	• Teach the fundamentals of nuclear structure and nuclear/subnuclear interactions, along with related theoretical and experimental techniques • Understand nuclear and subnuclear structure and interactions using quantum and relativistic mechanics • Present basic physics behind nuclear energy production (fission and fusion) and solar processes