University of Milano-Bicocca

Academic Regulations

Degree Name	F5803Q - ASTROPHYSICS AND SPACE PHYSICS
Programme type	Master Degree
Degree Class	Sciences of the Universe (LM-58 R)
Academic System Year	2026/2027
Regulation Yera (Cohort)	2026/2027

Overview

Responsible Academic Structure	DIPARTIMENTO DI FISICA "GIUSEPPE OCCHIALINI"
Docenti di Riferimento	- MATTEO BONETTI - MONICA COLPI - MASSIMO DOTTI - MATTEO FOSSATI - MICHELE FUMAGALLI - DAVIDE GEROSA - MASSIMO GERVASI - FEDERICO NATI - ALBERTO SESANA
Tutor	- SEBASTIANO CANTALUPO - MONICA COLPI - MASSIMO DOTTI - MATTEO FOSSATI - MICHELE FUMAGALLI - MASSIMO GERVASI - ALBERTO SESANA - MARIO ZANNONI

Duration	2 Years
ECTS	120
Degree awarded	Master's Degree in ASTROPHYSICS AND SPACE PHYSICS
Joint Degree	No
Double Degree	
Teaching method	Traditional
Language of Instruction	English
Course website	https://www.fisica.unimib.it/it/didattica/corsi-studio#main-content
Maximum recognizable credits	24
Course location	MILANO (Academic responsability)

Art.1 Il The Degree Programme in Brief

The Master's Degree Programme in *Astrophysics and Space Physics* belongs to the class of Master's Degrees in **Sciences of the Universe (LM-58)** and has a duration of two years. To obtain the Master's Degree, students must acquire **120 University Educational Credits (CFU)**, of which **72** are obtained through examinations, **3** through additional training activities, and **45** through the final thesis, which is characterized by a high degree of research content and originality.

The Master's Degree Programme has **open admission**; for admission procedures see **Art. 5** of the Academic Regulations.

The official language of the programme is **English**. All courses are taught in English.

Upon completion of the programme, students are awarded the **Master's Degree in Astrophysics and Space Physics**.

Starting from the academic year 2026/2027, a new educational program jointly developed with Stockholm University has been introduced, leading to the acquisition of a double Master's degree at both institutions.

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The degree provides access to **PhD programmes (Dottorato di Ricerca)** or **Second-Level Master's programmes**offered by the **University of Milano-Bicocca** or by other universities, according to the procedures established in their respective regulations.

The Master's Degree Programme aims to provide a solid cultural and methodological background in the fields of **Astrophysics, Cosmology, Gravitational Physics, and Space Physics**. The curriculum includes a variety of educational activities, including lectures covering observational, theoretical–interpretative, and experimental aspects, complemented by practical sessions, hands-on computational applications, and a specialized laboratory, with the objective of providing advanced and interdisciplinary training.

Graduates acquire the skills necessary for the profession of **astrophysicist**, with in-depth preparation in physical-mathematical and computational methods, as well as in the analysis and management of large datasets derived from astronomical observations, space missions, and numerical simulations. In this

context, the programme integrates tools and methodologies from **advanced statistics, data mining, artificial intelligence, and machine learning**, which are now central to astrophysical data analysis. Particular attention is devoted to the development of skills in **computational astrophysics** and **data science applied to astrophysics**, including the use of **big-data techniques and AI-driven data analysis**, enabling students to address complex scientific problems.

Thanks to the close integration between foundational, core, and related learning activities—culminating in the thesis work—graduates in *Astrophysics and Space Physics* are able to apply their knowledge, understanding, and critical analytical skills in professional contexts, in **scientific research at both the national and international levels**, in **secondary-school teaching**, and in **science communication and outreach**.

Art. 2 – Specific Educational Objectives and Description of the Study Programme

The Master's Degree Programme in *Astrophysics and Space Physics*, taught in English, is part of the framework of second-cycle degree programmes in the field of **Sciences of the Universe**. In addition to offering students advanced topics that expand and consolidate the knowledge acquired during the first cycle of studies in the physical sciences, the programme provides a solid education in the areas that characterize the **LM-58 degree class**.

In particular, graduates acquire competencies in the **modelling of complex systems** in astrophysics, as well as in the use of **technologically advanced instrumentation** and **high-performance computing methods**. The programme also integrates methodologies for **scientific data analysis**, including tools from **statistics, data mining, artificial intelligence, and machine learning**, which are increasingly relevant in the interpretation of data obtained from astronomical observations, space missions, and numerical simulations produced by modern observational infrastructures and linked to major international projects. These skills enable graduates to collaborate in and assume responsibility for the **design and execution of scientific research activities**. Proficiency in the **English language** further allows graduates to operate effectively in international and multidisciplinary professional environments.

The programme is structured so that students may choose a study path in which **observational, theoretical/interpretative, or experimental aspects** can be emphasized, while maintaining a strong shared foundational training in **Astrophysics and Space Physics**. The curriculum includes **compulsory courses** designed to provide common fundamental knowledge across the various areas of astrophysics and cosmology, as well as **elective courses**, both **core** and **related**, allowing students to gain further specialization in specific research areas and to develop the skills required for the Master's thesis. The programme is completed with **Additional Educational Activities** and the **Final Examination**.

More specifically, the courses offered are organized into **three areas**:

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1. Common Core Training Area
This area includes courses aimed at deepening knowledge considered fundamental in astrophysics, ensuring a broad common foundation for all students. These courses cover the fundamentals of **stellar and extragalactic astrophysics, cosmology, relativistic astrophysics, and compact objects**.

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2. Specialized Training Area
This area includes courses designed to deepen **observational, theoretical/interpretative, and experimental aspects of contemporary astrophysics**. In particular, the courses provide:

- in-depth knowledge of **data acquisition instruments** used to detect the various signals—**electromagnetic waves, cosmic rays, and gravitational waves**—that contribute to the new **multi-messenger astrophysics**;
- advanced knowledge of **sources of gravitational waves**, which are of major current importance for both existing ground-based experiments and future **space-based interferometry experiments**;
- advanced study of key topics in **contemporary cosmology**, including the frontiers of research on the **cosmic microwave background** and the **formation and evolution of large-scale structures**.

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3. Complementary Training Area

This area includes additional courses in astrophysics and related fields, aimed at providing **transversal competencies**useful for the thesis work and for potential career paths. In particular, it expands cross-disciplinary knowledge in **Bayesian statistics**, the study of **numerical algorithms for sampling parameter spaces**, and **numerical simulations and high-performance parallel computing**. Courses in this area cover topics at the intersection of **astrophysics, gravitational physics, and particle physics**.

The teaching methods and tools used to achieve the expected learning outcomes include **lectures, problem-solving sessions, laboratory activities, hands-on experiences**, and the preparation of the **Master's thesis**. Assessment takes place through **oral examinations, written and practical tests, reports on completed activities**, and, finally, the **writing and defense of the Master's thesis**.

The **expected learning outcomes** are expressed in accordance with the **Dublin Descriptors**:

"Knowledge and Understanding" and "Applying Knowledge and Understanding": Summary

Knowledge and Understanding

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* acquire solid knowledge of **advanced topics in astrophysics, cosmology, and space and astronomical technologies**. They also develop competencies in **methods of investigation in physics and astrophysics**, as well as in **experimental methodologies and mathematical, statistical, and computational tools** applied in these fields. Knowledge and understanding are developed through **lectures, exercises, and laboratory activities**, and are assessed through **examinations**.

Ability to Apply Knowledge and Understanding

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* are able to apply the **scientific method**to modelling and investigation in the fields of **physics and astrophysics**, as well as in **multidisciplinary contexts**. They are also capable of using **advanced techniques and knowledge** to formulate and solve complex problems both in the areas of **astrophysics and space physics** and in related fields.

The ability to apply knowledge is developed through **problem-solving sessions, laboratory activities, and the preparation of the Master's thesis**, and is assessed through **examinations**, as well as through the **writing and defense of the Master's thesis**.

"Knowledge and Understanding" and "Applying Knowledge and Understanding": Detailed Description

1. Common Core Training Area

Knowledge and Understanding

Through the Common Core Training Area, graduates of the Master's Degree Programme in *Astrophysics and Space Physics*:
i. acquire broad knowledge of advanced topics in **astrophysics and cosmology**;
ii. gain knowledge of **methods of investigation in physics and astrophysics**;
iii. acquire **mathematical, computational, statistical, and numerical tools** used in physics and astrophysics and in their applications.

Ability to Apply Knowledge and Understanding

Through the Common Core Training Area, graduates of the Master's Degree Programme in *Astrophysics and Space Physics* are able to apply the **scientific method** to the modelling and investigation of phenomena in the above-mentioned fields, as well as in **multidisciplinary contexts**.
Knowledge and skills are developed and assessed through the following courses:

- *Introduction to Cosmology*
- *Introduction to Galaxies*
- *Relativistic Astrophysics*
- *Stellar Astrophysics*

2. Specialized Training Area

Knowledge and Understanding

Through attendance in the courses included in this area, graduates of the Master's Degree Programme in *Astrophysics and Space Physics* acquire **in-depth knowledge of the observational, theoretical/interpretative, and experimental aspects of contemporary astrophysics**.

Ability to Apply Knowledge and Understanding

Through the courses in this area, graduates are able to apply **advanced techniques and knowledge** to the formulation and solution of complex problems in contemporary astrophysics, providing the necessary preparation for the **Master's thesis work**.
Knowledge and skills are developed and assessed through the following courses:

- *Astronomical Instrumentation*
- *Astrophysics of Gravitational Waves*
- *Cosmic Structure Formation*
- *Dynamics of Stellar Systems*
- *Experimental Cosmology*
- *Laboratory of Data Acquisition*

3. Complementary Training Area

Knowledge and Understanding

Through the courses included in this area, graduates of the Master's Degree Programme in *Astrophysics and Space Physics* acquire **cross-disciplinary knowledge in fields related to astrophysics**.

Ability to Apply Knowledge and Understanding

Through these courses, graduates achieve a **good level of understanding and cross-disciplinary competencies** in astrophysics and related fields.
Knowledge and skills are developed and assessed through the following courses:

- *Astrostatistics and Machine Learning*
- *Cosmic Rays*

- *General Relativity*
- *Modern Cosmology and Galaxy Formation*
- *Numerical Astrophysics*
- *Radiative Processes*

Making Judgements

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* acquire:

- the ability to **expand and integrate their knowledge independently** in order to formulate appropriate judgments;
- the ability to **apply acquired knowledge and methodologies to independently formulate critical judgments** on scientific problems and on systems that can be analysed using the scientific method;
- the ability to **reflect on the ethics of science and the social relevance of astrophysics and space physics**.

The ability to independently integrate knowledge is developed through courses that encourage **individual in-depth study of specific topics**, including the consultation of **articles published in major scientific journals**. This ability is further strengthened during the **preparation of the Master's thesis**, when students are encouraged to work independently on a topic of particular interest in astrophysics or space physics.

Achievement of these competencies, together with **independent judgment** and the ability to reflect on **ethical and social responsibilities**, is assessed through examinations and through the **final thesis defense**.

Communication Skills

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* possess:

- the ability to **communicate clearly and unambiguously** their knowledge, judgments, and results, both in **written and oral form**, also with the support of **audiovisual tools**;
- the ability to **adapt the level of communication to different audiences**;
- the ability to **communicate, interact, and develop synergies within a working group**;
- the ability to **discuss scientific topics in correct scientific English**, enabling graduates to operate effectively in the **international scientific community**.

The ability to communicate, interact, and develop synergies within a working group is fostered in **laboratory courses** and in the course *Cosmic Structure Formation*, during which students work in **small teams** assigned specific tasks and objectives.

The ability to communicate acquired knowledge, results, conclusions, and the reasoning behind them is encouraged and assessed in all courses. It is further developed during the **preparation of the Master's thesis** and evaluated in the **final examination**.

Learning Skills

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* acquire:

- the ability to **consult scientific texts and publications in a targeted and effective manner**;
- the ability to **independently expand and update their education and knowledge**, according to their needs, by consulting **advanced scientific literature**;
- the ability to **pursue further studies**, such as **PhD programmes, second-level Master's programmes, or specialized training schools**.

These abilities are developed through courses that encourage **independent in-depth study of specific topics**, including the search for and study of **original bibliographic references**. The progressive acquisition of these competencies is verified through **oral examinations and assessments associated with course examinations**.

These skills are further developed during the **preparation of the Master's thesis**, during which students are required to **independently and purposefully expand their knowledge**. The **final examination** also serves to verify the acquisition of these competencies.

Art. 3 – Professional Profiles and Career Opportunities

Astrophysicists – Astronomers – Physicists

3.1 Functions

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* are able to perform functions such as **data collection and analysis**, the **design, development, and characterization of technological instrumentation**, and the **development of theoretical models**, both analytical and numerical, for the simulation of complex systems. These skills enable graduates to work within **public and private research institutions** and/or in **companies requiring such expertise**.

3.2 Competencies

The educational activities provided within the Master's Degree Programme in *Astrophysics and Space Physics* offer adequate **theoretical and experimental competencies**, enabling graduates to:

- conduct **high-level scientific research**, including activities involving initiative and coordination responsibilities;
- promote and develop **scientific and technological innovation**, as well as design and manage technologies in sectors related to **physics and astrophysics**, particularly within industry;
- facilitate the **transfer of knowledge and technological know-how** developed within fundamental research to the **economic and productive sectors**;
- develop and apply **models of complex systems** in contexts beyond purely scientific applications.

3.3 Career Opportunities

Graduates of the Master's Degree Programme in *Astrophysics and Space Physics* will possess the competencies required to work:

- as **coordinators or members of research groups** at universities and public or private research institutions;
- in **high-technology industries**, particularly in the **space, optics, microelectronics, telecommunications, and information technology sectors**;
- as **developers and analysts of financial models** in banks, financial institutions, and consulting firms;
- as **science communicators**, promoting advanced scientific culture with particular reference to the theoretical, experimental, and applied aspects of **classical and modern physics, astrophysics, and cosmology**.

The programme prepares graduates for the following professions (according to **ISTAT occupational classifications**):

1. **Physicists** – (2.1.1.1.1)
2. **Researchers and graduate technicians in the physical sciences** – (2.6.2.1.2)
3. **Astronomers and astrophysicists** – (2.1.1.1.2)

Art. 4 – Access Requirements

To be admitted to the Master's Degree Programme in *Astrophysics and Space Physics*, candidates must hold a **Bachelor's degree or a three-year university diploma**, or an **equivalent foreign qualification recognized as suitable**.

Basic knowledge is required in the fields of **Mathematics** (differential calculus, analytical mechanics, and geometry), **Classical Physics** (both theoretical and experimental), and **Quantum Mechanics**. Holding a degree in **class L-30** satisfies the curricular requirement.
For students coming from other degree classes, it is required to have at least **18 CFU** in the **Mathematics Scientific-Disciplinary Sectors (MATH-01 to MATH-09)** and at least **18 CFU** in the **Physics Scientific-Disciplinary Sectors (PHYS-01/A to PHYS-08/A)**. Admission also requires a minimum **English language proficiency level of B2**.

Art. 5 – Admission Procedures

Once the **curricular requirements** are verified (a degree in class L-30 or at least 18 CFU in MATH-01–MATH-09 and at least 18 CFU in PHYS-01/A–PHYS-08/A, or equivalent for students with foreign qualifications), admission to the Master's Degree Programme in *Astrophysics and Space Physics* is **subject to assessment of individual preparation**, conducted through an **interview before a designated Admission Committee**. The Committee will evaluate the candidate's knowledge and suggest a suitable study path to ensure successful progress in the programme. If the candidate's curriculum does not demonstrate sufficient preparation in **Quantum Mechanics and Atomic Physics**, including through individual course attendance and successful exams, this will be assessed during the interview.

Candidates holding a degree in **Physics, Astrophysics, or Astronomy (class L-30)** with a **final grade of 90/110 or higher** are **exempt from the admission interview**.

The deadlines and procedures for submitting the application for qualification evaluation, as well as the dates and modalities of the interviews, will be published on the programme website: https://elearning.unimib.it/course/view.php?id=39343&lang=en

Admission to the programme requires a **minimum English proficiency of level B2**. Language competence will be verified according to the procedures established by the University.

As an alternative to **full-time enrollment**, students may choose **part-time enrollment**, according to the modalities defined in **Art. 12 of the Student Regulations**.

Art. 6 – Organization of the Programme

The Master's Degree Programme in *Astrophysics and Space Physics* is structured with a **first year focused on coursework** and a **second year mainly dedicated to the Master's thesis**.
The programme offers **a single curriculum**, organized as follows:

- **Core training activities**: 48 CFU
- **Related or integrative activities**: 12 CFU
- **Other activities**: 60 CFU

All courses are taught in **English**.

6.1 – Structure of the Training Activities
First Year – 60 CFU total
Mandatory core courses (30 CFU):

- *Introduction to Cosmology*, PHYS-05/A – 6 CFU (theoretical-astronomical)
- *Introduction to Galaxies*, PHYS-05/A – 8 CFU (observational-experimental)
- *Relativistic Astrophysics*, PHYS-05/A – 8 CFU (theoretical-astronomical)
- *Stellar Astrophysics*, PHYS-05/A – 8 CFU (observational-experimental)

Three mandatory elective core courses (choose 3 for 18 CFU):

- *Astronomical Instrumentation*, PHYS-05/A – 6 CFU (technological-astronomical)

- *Astrophysics of Gravitational Waves*, PHYS-05/A – 6 CFU (technological-astronomical)
- *Cosmic Structure Formation*, PHYS-05/A – 6 CFU (technological-astronomical)
- *Dynamics of Stellar Systems*, PHYS-05/A – 6 CFU (technological-astronomical)
- *Experimental Cosmology*, PHYS-05/A – 6 CFU (technological-astronomical)
- *Laboratory of Data Acquisition*, PHYS-05/A – 6 CFU (technological-astronomical)

Related or integrative courses (12 CFU, choose):
- *Astrostatistics and Machine Learning*, PHYS-05/A – 6 CFU
- *Cosmic Rays*, PHYS-01/A – 6 CFU
- *General Relativity*, PHYS-02/A – 6 CFU
- *Modern Cosmology and Galaxy Formation*, PHYS-05/A – 6 CFU
- *Numerical Astrophysics*, PHYS-05/A – 6 CFU
- *Radiative Processes*, PHYS-05/A – 6 CFU

Second Year – 60 CFU total
Mandatory activities:
- Elective courses chosen by the student – 12 CFU
- Additional training activities – 3 CFU (see Art. 6.5)
- Master's thesis – 45 CFU

6.2 – Core Training Activities
Core courses provide **fundamental astrophysical knowledge** and deepen **observational, theoretical, and experimental aspects** of contemporary astrophysics. Topics range from **stellar and galactic astrophysics**, **cosmology**, **compact objects**, to **data acquisition and analysis**.

6.3 – Related or Integrative Activities
These optional activities allow students to gain **in-depth knowledge in astrophysics, theoretical and experimental physics**, or to ensure a **broad, interdisciplinary, and up-to-date training**.

6.4 – Elective Activities
Students are allocated **12 CFU for elective courses** (D.M. 270/04 – Art. 10, paragraph 5, letter a). Courses can be chosen from all Master's Degree courses offered by the University, provided they are **coherent with the study path**. Coherence is evaluated by the **Study Plan Commission**. According to current regulations, elective courses count as **one exam** for total exam computation.

6.5 – Additional Training Activities
3 CFU of "Additional Training Activities" are acquired as follows:
For Italian students:
- 3 CFU in **skills useful for the labor market**, through participation in **I-Bicocca projects** (Silver 1 CFU, Gold 2 CFU, Platinum 3 CFU) or other activities listed on the course e-learning site, **or**
- 3 CFU in **additional language skills**, by passing a University test in a foreign language other than English (**B1 level**) – French, Spanish, or German – or a test in English at **C1 level**.

Students holding **certifications** recognized by the University or accredited institutions at the required level are **exempt from the test** and receive the credits.
For international students:
- 3 CFU in **Italian language skills**, verified by a University test at **A2 level**. Students with recognized certifications at this level or higher are exempt and receive the credits.

Details on testing and credit acquisition are available on the University website: https://www.unimib.it/didattica/lingue-unimib

6.6 – Internships / Training Periods
Internships are **included in activities preparing for the final thesis**.

6.7 – Teaching Methods
Courses include **lectures, classroom exercises, laboratory activities, and integrative seminars**.
Student workload is measured in **CFU**: 1 CFU = 25 hours, including both **course activities** and **independent study**.
Typical hours per 1 CFU:

- 7 hours of lectures, or
- 8–12 hours of exercises, or
- 8–12 hours of laboratory.

Credits are awarded **after passing exams or other forms of assessment**.

6.8 – Assessment Methods
Exams may be **written and/or oral**. Laboratory courses may include **practical tests**. All assessments include a **final interview**. Stage/internship evaluation requires a **short written report and presentation** to a faculty committee.
Course-specific assessment details are available at:
https://elearning.unimib.it/course/index.php?categoryid=7449

6.9 – Attendance
Attendance is **mandatory for laboratory activities (≥75%)** and **strongly recommended** for other courses.

6.10 – Study Plan
Upon enrollment, students are automatically assigned a **"statutory study plan"** including all mandatory courses. They must later submit a **personal study plan** indicating optional and elective activities.
Submission periods: https://www.unimib.it/servizi/studenti-e-laureati/segreterie/piani-degli-studi/area-scienze
Study plans are approved by the **Didactic Coordination Council**. Exams can only be taken if included in the plan.
Students may propose an **individual study plan**, including courses not in the official curriculum, provided it is coherent with the **educational objectives** and approved by the Council.
For matters not specified, refer to the **University Student Regulations**.

6.11 – Prerequisites / Barriers
No formal prerequisites are required. However, students should **ensure they meet the prerequisites** for each course, as specified in the **syllabus**, available at: https://elearning.unimib.it/course/index.php?categoryid=7450

6.12 – Course Scheduling and Exam Sessions
Core, related, and integrative courses are scheduled in the **first year**, divided into two semesters. The second year is dedicated to remaining courses and the **final thesis**.
Exams generally take place during **teaching breaks**, respecting University regulations.

6.13 – International Mobility Agreements
The programme encourages **study periods abroad** through international mobility programmes and bilateral agreements with prestigious foreign universities.

- **Erasmus+ Study**: study abroad for 3 months to 1 year; exams are recognized in the study plan.
- **Erasmus+ Traineeship**: training and internships, including thesis preparation, in EU private/public companies or university laboratories.

- **Exchange Extra-EU**: training and internships outside the EU, thesis preparation in co-tutelle arrangements with foreign higher education institutions, research centres, and NGOs.

The programme has a **dedicated Internationalisation Committee** to support students in international mobility.
During thesis/internship abroad, students are supervised by an **internal advisor**, who monitors progress and provides guidance.
Partner universities: https://www.unimib.it/internazionalizzazione/erasmus-studio/selezioni-erasmus-studio
Participation rules and deadlines are published on the University website: https://www.unimib.it/internazionalizzazione/mobilita-internazionale

6.14 - Internationalization: Double Master's Degree Program

The University of Milano-Bicocca, in line with its internationalization strategy, offers integrated programs under bilateral agreements that allow students to earn double degrees with partner universities.
Starting in the 2026/2027 academic year, a joint Master's program in Astronomy and Astrophysics will be launched in collaboration with Stockholm University.
The two-year program comprises 120 CFU/ECTS, based on a study plan jointly defined by the partner institutions. Students admitted from the first year at Milano-Bicocca must complete the second year at Stockholm University, following approved equivalence tables and program requirements.
All courses and assessments are conducted in English, and credits earned at the partner university are fully recognized. Completion of the program requires a final thesis in English, defended before a joint committee of faculty from both institutions, including remotely if necessary.
Graduates who fulfill all program requirements will receive Master's degrees from both Milano-Bicocca and Stockholm University, in accordance with applicable regulations.

6.15 – Part-time Enrollment

The Master's Degree program allows **part-time enrollment** according to the procedures defined in Article 12 of the Student Regulations of the University of Milano-Bicocca (link). This option is intended to provide students who **cannot attend full-time** the possibility of extending their study program for a number of years equal to **twice the normal duration** of the course.
According to these regulations, the number of credits that can be earned each year **cannot exceed the annual limit**, even in the presence of validations, recognitions, or exams not taken in previous years.

Part-time program structure (4 years)

1st Year – 30 CFU total

- Introduction to Cosmology – 6 CFU
- Introduction to Galaxies – 8 CFU
- Relativistic Astrophysics – 8 CFU
- Stellar Astrophysics – 8 CFU

1st Year BIS – 24 CFU total

- **Two elective courses (12 CFU – astronomical-technological area)**: Laboratory of Data Acquisition, Cosmic Structure Formation, Astrophysics of Gravitational Waves, Experimental Cosmology, Astronomical Instrumentation, Dynamics of Stellar Systems
- **Two elective courses (12 CFU – related/integrative area)**: Radiative Processes, Modern Cosmology and Galaxy Formation, Cosmic Rays, Astrostatistics and Machine Learning, Numerical Astrophysics, General Relativity

2nd Year – 21 CFU total

- One additional elective course (6 CFU) from the technological-characterizing courses: Laboratory of Data Acquisition, Cosmic Structure Formation, Astrophysics of Gravitational Waves, Experimental Cosmology, Astronomical Instrumentation, Dynamics of Stellar Systems
- Free-choice courses – 12 CFU

- Further learning activities – 3 CFU (see Art. 6.5)

2nd Year BIS – 45 CFU total

- Master's Thesis – 45 CFU

Note: Details on assessment and evaluation for each course are available on the course e-learning platform under the **COURSES** section: https://elearning.unimib.it

Art. 7 – Final Examination

Master's Thesis in Astrophysics and Space Physics (45 CFU)

The preparation of the Master's thesis represents a **key stage** of the study program. During this period, the student completes their training by applying the skills acquired and is guided by a faculty supervisor in a research project on a topic of particular interest and relevance to astrophysics and cosmology, including theoretical, interpretative, or technological aspects, or on a topic related to the history or teaching of astrophysics.

Thesis preparation may include a **research period at companies or research institutions**, in Italy or abroad. Each student is assigned **mentors**, including a supervisor and a co-supervisor, who follow and guide the student throughout the research.

The thesis activity concludes with the preparation of an **original manuscript in English** and its discussion in a **public defense**.

Art. 8 – Final Examination Procedures

To be admitted to the final examination, the student must have **earned at least 75 CFU**.

The final examination consists of a **thesis elaborated independently by the student** under the guidance of a supervisor. The thesis defense is conducted in front of a **Commission appointed by the President of the School of Sciences**. The thesis must be **written in English**, and the discussion will be conducted **in English**.

The **final Master's degree grade**, expressed in 110th (centesimi), will consider the student's academic record and the evaluation of the supervisor and the Commission, according to criteria approved by the **Didactic Coordination Council (CCD) of Physics and Astrophysics**.

Art. 9 – Recognition of CFU and Transfer Procedures

In the case of a **transfer from another university**, recognition of previously earned exams is performed by a **Commission appointed by the Didactic Coordination Council**, based on the equivalence of the content of the previous course and the course the student wishes to enter. **Partial recognition** of a course is allowed.

Recognition of professional activities:

Universities, within the limits established by current regulations (D.M. 931 of 04/07/2024), may recognize as **university credits (CFU)** individually certified professional knowledge and skills, as well as other skills acquired in post-secondary educational activities in which the university participated, **up to a maximum of 24 CFU**. Activities already recognized as CFU within other degree programs **cannot be recognized again** in a Master's degree program. Recognition is based exclusively on the **competences demonstrated by each student**. Collective recognition is **not allowed**.

Recognition is subject to **approval by the CCD of Physics and Astrophysics**, on the proposal of the **Study Plan Commission** appointed by it.

Art. 10 – Research Activities Supporting the Core Educational Profile

At the **Departments of Physics "G. Occhialini" and Materials Science**, research activities are carried out to support the educational activities in the following areas:

- Theoretical physics
- Fundamental interactions physics
- Biophysics
- Solid-state physics and matter structure
- Plasma physics
- Electronics
- Physics applied to environment and medicine
- Quantum technologies
- Astrophysics and space physics

Specifically, the **astrophysics group** conducts leading-edge research in:

- Cosmic formation and evolution of galaxies and large-scale structures
- Dynamical evolution and accretion processes on compact objects
- Modeling of gravitational wave sources
- Study of cosmic microwave background and the primordial universe
- Observation of cosmic rays and their propagation in space

Art. 11 – Faculty of the Degree Program
Faculty teaching in the program:

Matteo BONETTI, PHYS-05/A
Sebastiano CANTALUPO, PHYS-05/A
Monica COLPI, PHYS-05/A
Massimo DOTTI, PHYS-05/A
Matteo FOSSATI, PHYS-05/A
Michele FUMAGALLI, PHYS-05/A
Davide GEROSA, PHYS-05/A
Massimo GERVASI, PHYS-01/A
Piergiovanni MADAU, PHYS-05/A
Federico NATI, PHYS-05/A
Alberto SESANA, PHYS-05/A
Alessandro TOMASIELLO, PHYS-02/A
Mario ZANNONI, PHYS-05/A

Art. 12 – Other Information

Course Location: Department of Physics, Piazza della Scienza 3, 20126 Milan, Italy
President of the Coordinating Teaching Council for Physics and Astrophysics: Prof. Alessio Ghezzi
Academic Coordinator of the Program: Prof. Monica Colpi
Chair of the Teaching Commission: Prof. Maddalena Collini
Academic Office: Phone: +39 02 6448 4080 – Email: didattica.fisica@unimib.it
Course Website: https://elearning.unimib.it/course/index.php?categoryid=7449
For deadlines and procedures regarding enrollment, registration, transfers, and submission of study plans, consult the University website: www.unimib.it.
Non-substantial changes to this Academic Regulation may occur. In particular, the activation of optional courses will depend on the number of enrolled students.
The tables of educational activities follow, organized by type of activity, field, and scientific-disciplinary sector, as well as by year of study