



SAPIENZA
UNIVERSITÀ DI ROMA

Dipartimento di Fisica

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MASTER'S DEGREE IN ASTRONOMY AND ASTROPHYSICS (aka LM-58)

... a short description of the Training Programme
(Study Plan), or *Percorso Formativo*, of LM-58
Academic Year 2023-2024

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M. De Petris – PF – LM-58 AA 2023-2024



All information about LM-58
in Sapienza web page

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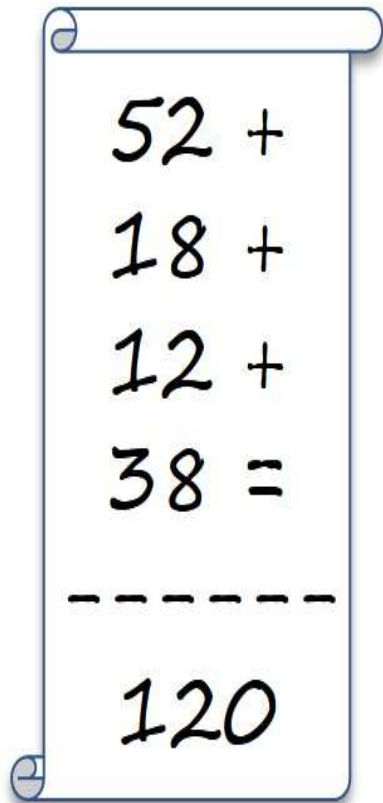
Astronomy and Astrophysics

Masters

<h3>Degree Programme</h3> <ul style="list-style-type: none"> • Programme Code: 30060 • Test Code: 30060 • Faculty: Scienze Matematiche, Fisiche e Naturali • Department: FISICA • Duration: 2 years • Degree Code: LM-58 • Degree: Masters • Admission Procedure: Requirements and personal knowledge assessment <p>View more</p>	<h3>Study plan</h3> <p>The "Manifesto" study plan: fundamental, core and elective exams, credits and course language</p> <p>View more</p>	<h3>Apply</h3> <p>How, where, when. Deadlines and procedures to enrol in the programme</p> <p>2023/2024 View more</p>	
<h3>Attendance</h3> <p>Syllabus and study material, lesson and exam schedules</p> <p>View more</p>	<h3>Quality Assurance (AQ)</h3> <p>Organization and responsibility of the AQ for the Course</p> <p>View more</p>	<h3>Sapienza Open Days 2023</h3> <p>Sapienza Open Days are back. Find out all about our 2023-2024 courses and programmes!</p> <p>On July 11, 12 and 23, on the Main Campus, you will meet lecturers and students, get all the necessary information, attend degree programme presentations (also online) and register for the admission tests.</p> <p>During the event, you can also visit the Sapienza museums, attend theatre rehearsals, listen to our orchestras and much more.</p>	
<p>Contacts, services,</p>	<p>Organization,</p>	<p>Learning Outcomes</p>	<p>Professional</p>

LM-58 Generalities

The nominal duration of the Master's Degree Programme is **4 semesters***, in total **two years**, during which students have to acquire **120 ECTS****, equal to 3,000-hour overall workload.



- **Single curriculum**

- 8 mandatory courses out of 13 (52 CFU, *corsi obbligatori*)
- 3 optional courses (Group Course, 18 CFU, *corsi a scelta vincolata*) to choose one among each of the 3 groups (A, B and C) spanning several topics ranging from fundamental physics, mathematics, calculus, instrumental / observational / theoretical astrophysics, astroparticle, gravitation, cosmology, etc.
- 2 elective courses (Free Choice Course, 12 CFU, *corsi a scelta libera*) to choose from among all Sapienza courses (with approval of Programme Director)
- Final thesis (38 CFU)
- A few courses are delivered in English (3 mandatory and 4 elective courses)

(*) 1 semester = less than 4 months

(**) ECTS = European Credit Transfer System \Rightarrow CFU = *Credito Formativo Universitario*

Master Degree in Astronomy & Astrophysics

First year – First semester

ECTS

COURSE	SEMESTER	CFU	SSD	LANGUAGE
1012161 - ASTROPHYSICAL PROCESSES AND PLASMAS	First semester	6	FIS/05	🇮🇹
10606101 - GENERAL RELATIVITY	First semester	6	FIS/02	🇮🇹
1012178 - SUPERIOR PHYSICS	First semester	6	FIS/02	🇮🇹
1051847 - Astrophysics Laboratory 1/2	First semester	6		🇮🇹
1044601 - PHYSICAL COSMOLOGY	Second semester	6	FIS/05	🇮🇹
1012131 - STELLAR ASTROPHYSICS	Second semester	6	FIS/05	🇮🇹
1044553 - THEORETICAL ASTROPHYSICS	Second semester	6	FIS/05	🇮🇹
1051847 - Astrophysics Laboratory	Second semester	6		🇮🇹
- A SCELTA DELLO STUDENTE	Second semester	6		🇮🇹
AAF1901 - English Language	Second semester	4		🇮🇹
GRUPPO A AFFINI INTEGRATIVI	Go to group			
GRUPPO B ASTRONOMICICO OSSERVATIVO SPERIMENTALE	Go to group			
GRUPPO C CARATTERIZZANTE ASTRONOMICICO TECNOLOGICO	Go to group			

Master Degree in Astronomy & Astrophysics

First year – Second semester

Free Choice Course: 1
Group Course: min 0 /max 2

COURSE	SEMESTER	CFU	SSD	LANGUAGE
1012161 - ASTROPHYSICAL PROCESSES AND PLASMAS	First semester	6	FIS/05	🇮🇹
10606101 - GENERAL RELATIVITY	First semester	6	FIS/02	🇮🇹
1012178 - SUPERIOR PHYSICS	First semester	6	FIS/02	🇮🇹
1051847 - Astrophysics Laboratory	First semester	6		🇮🇹
1044601 - PHYSICAL COSMOLOGY	Second semester	6	FIS/05	🇮🇹
1012131 - STELLAR ASTROPHYSICS	Second semester	6	FIS/05	🇮🇹
1044553 - THEORETICAL ASTROPHYSICS	Second semester	6	FIS/05	🇮🇹
1051847 - Astrophysics Laboratory 2/2	Second semester	6		🇮🇹
- A SCELTA DELLO STUDENTE	Second semester	6		🇮🇹
AAF1901 - English Language	Second semester	4		🇮🇹
GRUPPO A AFFINI INTEGRATIVI	Go to group			
GRUPPO B ASTRONOMICHO OSSERVATIVO SPERIMENTALE	Go to group			
GRUPPO C CARATTERIZZANTE ASTRONOMICHO TECNOLOGICO	Go to group			

Second year – First semester

Free Choice Course: 1
Group Course: min 0 /max 2

COURSE	SEMESTER	CFU	SSD	LANGUAGE
- A SCELTA DELLO STUDENTE	First semester	6		🇮🇹
AAF1036 - FINAL EXAM	Second semester	38		🇮🇹
GRUPPO A AFFINI INTEGRATIVI	Go to group ⚓			
GRUPPO B ASTRONOMICICO OSSERVATIVO SPERIMENTALE	Go to group ⚓			
GRUPPO C CARATTERIZZANTE ASTRONOMICICO TECNOLOGICO	Go to group ⚓			

Second year – Second semester

full semester devoted to Thesis

COURSE	SEMESTER	CFU	SSD	LANGUAGE
- A SCELTA DELLO STUDENTE	First semester	6		🇮🇹
AAF1036 - FINAL EXAM	Second semester	38		🇮🇹
GRUPPO A AFFINI INTEGRATIVI	Go to group ⚓			
GRUPPO B ASTRONOMICICO OSSERVATIVO SPERIMENTALE	Go to group ⚓			
GRUPPO C CARATTERIZZANTE ASTRONOMICICO TECNOLOGICO	Go to group ⚓			

2 Elective Courses

Ideally to be allocated at
1st year/2nd sem and 2nd year/1st sem

You can choose them from **ALL** Sapienza courses (**except** the ones delivered at *Laurea Triennale in Fisica*) *compatible* with your Study Plan [NB 12 CFU (2x6), max allowed 15 CFU]
However, they need to be approved by the Programme Area Council (*Responsabile dei Piani di Studio*)

REMEMBER !

- ✓ LM-58 Study Plans **have not to include at least 12 non-FIS* ECTS**, that is, other disciplinary sectors such as INF*, MAT*, CHIM*, BIO*.
- ✓ Warning! if the course is delivered in another Master, **choose it in the same year of the presentation of the Study Plan**. The course could be no more activated in other years.

Possible choices (just a few examples):

- Other courses from the Groups
- Courses required to be admitted to public competitions for secondary school teaching (*ex* 24 CFU, **now 60 CFU** * for *Abilitazione all'insegnamento*) among 4 topics: *antro/psico/pedagogico*.
- Courses in other Masters, LM-17 or others LMs, see Earth Observation Data Analysis (Master in Data Science) or Telerilevamento e GIS (Master in Ecobiologia) or Machine Learning (Master in Computer Science).















(*) **Art. 42** - ESAMI DI PROFITTO EXTRACURRICULARI EX ART. 6 DEL R.D. N. 1269/38- students may enrol, in each academic year, up to maximum two courses of other Sapienza University degree programmes

See <https://www.uniroma1.it/it/content/esami-di-profitto-extracurriculari-ex-art-6-del-rd-n-126938>

Optional Courses: 3 Groups

N.B. All courses delivered at
1st year/2nd sem or 2nd year/1st sem

GRUPPO A AFFINI INTEGRATIVI: The student must acquire 6 CFU from the exams below 











COURSE		YEAR	SEMESTER	CFU	SSD	LANGUAGE
1012184 - ASTRONOMICAL OPTICS		First year	Second semester	6	FIS/05	
1012137 - DYNAMICS OF STAR SYSTEMS		First year	Second semester	6	FIS/05	
10606102 - GRAVITATIONAL WAVES COMPACT STARS AND BLACK HOLES		First year	Second semester	6	FIS/02	
1044551 - OBSERVATIONAL COSMOLOGY		Second year	First semester	6	FIS/05	
1012136 - THEORETICAL COSMOLOGY		Second year	First semester	6	FIS/05	
1012165 - SELF-GRAVITATING SYSTEMS		Second year	First semester	6	FIS/05	
1056018 - Chemical Evolution of the Universe		Second year	First semester	6	FIS/05	

Master Degree in Astronomy & Astrophysics

Optional Courses: 3 Groups

N.B. All courses delivered at
1st year/2nd sem or 2nd year/1st sem

GRUPPO B ASTRONOMICCO OSSERVATIVO SPERIMENTALE: The student must acquire 6 CFU from the exams below ^

COURSE	YEAR	SEMESTER	CFU	SSD	LANGUAGE
10606347 - High Energy Astrophysics	First year	Second semester	6	FIS/05	
10589158 - PLANETS AND EXOPLANETS	First year	Second semester	6	FIS/05	
1012130 - EXTRAGALACTIC ASTROPHYSICS	First year	Second semester	6	FIS/05	
1012184 - ASTRONOMICAL OPTICS	First year	Second semester	6	FIS/05	
1044551 - OBSERVATIONAL COSMOLOGY	Second year	First semester	6	FIS/05	
1012136 - THEORETICAL COSMOLOGY	Second year	First semester	6	FIS/05	
1055362 - ASTROPARTICLE PHYSICS	Second year	First semester	6	FIS/01	
1055363 - EXPERIMENTAL GRAVITATION	Second year	First semester	6	FIS/01	
1044550 - METHODS OF SPACE ASTROPHYSICS	Second year	First semester	6	FIS/01	
1012165 - SELF-GRAVITATING SYSTEMS	Second year	First semester	6	FIS/05	
1056018 - Chemical Evolution of the Universe	Second year	First semester	6	FIS/05	

Optional Courses: 3 Groups

N.B. All courses delivered at
1st year/2nd sem or 2nd year/1st sem

GRUPPO CARATTERIZZANTE ASTRONOMICAMENTE TECNOLOGICO: The student must acquire 6 CFU from the exams below ^

COURSE	YEAR	SEMESTER	CFU	SSD	LANGUAGE
1012184 - ASTRONOMICAL OPTICS	First year	Second semester	6	FIS/05	🇮🇹
1012137 - DYNAMICS OF STAR SYSTEMS	First year	Second semester	6	FIS/05	🇮🇹
1044550 - METHODS OF SPACE ASTROPHYSICS	Second year	First semester	6	FIS/01	🇬🇧
10611919 - COMPUTING METHODS FOR ASTROPHYSICS	Second year	First semester	6	FIS/05	🇬🇧

A few optional courses are present in more than one Group:

.... try to optimize the distribution of the courses among the two AYs in the Study Plan.

An **unbalanced distribution** of courses, *i.e.* CFU, during the two years **is not acceptable**.



1st year: $58 < \text{CFU} < 70$
2nd year: $50 < \text{CFU} < 62$

7 mandatory courses

PROCESSI E PLASMI ASTROFISICI

GENERAL RELATIVITY

FISICA SUPERIORE

ASTROPHYSICS LABORATORY (les+lab)

PHYSICAL COSMOLOGY

ASTROFISICA STELLARE

THEORETICAL ASTROPHYSICS



Courses in English

- ✓ Regular attendance to all courses is highly recommended.
- ✓ Attendance to lab activities provided for the Astrophysics Laboratory course is mandatory.

+ English language (4 CFU)

to be independent users of the language, fluent knowledge of both written and oral English, equivalent to **B2 English Level**

how to build solid *astro*-knowledge

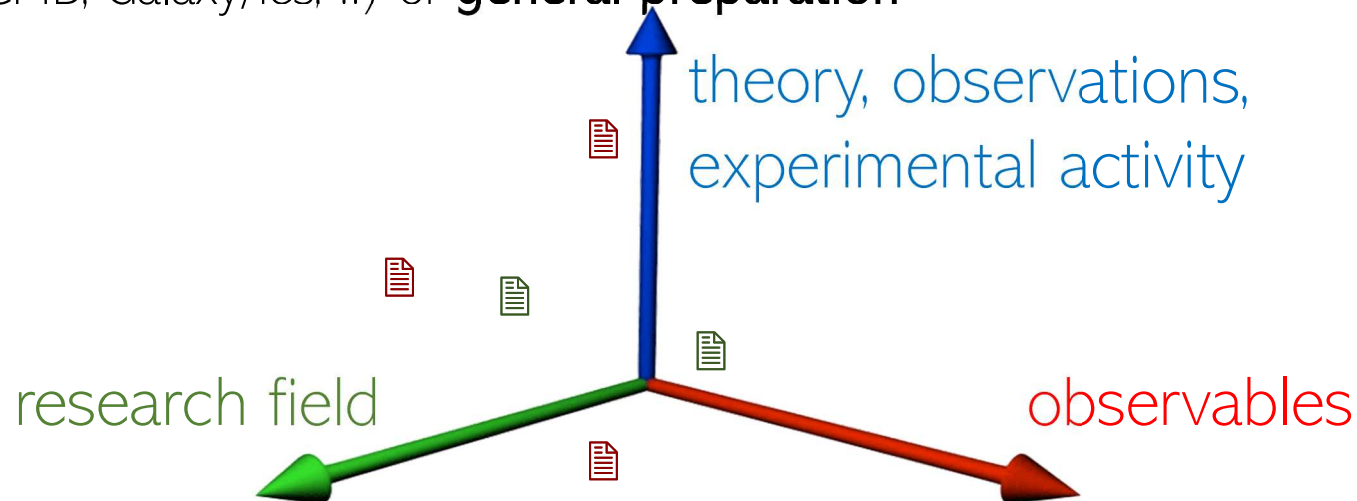


Master Degree in Astronomy & Astrophysics

<https://corsidilaurea.uniroma1.it/it/corso/2023/30060/programmazione>

+ 5 elective courses (3 in Groups + 2 free choice)

to make the Study Plan more **theoretical/numerical** or **observational/experimental oriented** or focused on a preferred **research field** (e.g. gravitation) or an **observational target** (e.g. CMB, Galaxy/ies, ..) or **general preparation**



OBSERVATIONAL COSMOLOGY

OTTICA ASTRONOMICA

DINAMICA DEI SISTEMI STELLARI

GRAVITATIONAL WAVES, COMPACT STARS, BH

HIGH ENERGY ASTROPHYSICS

ASTROFISICA EXTRAGALATTICA

PLANETS AND EXOPLANETS

COSMOLOGIA TEORICA

SISTEMI AUTOGRAVITANTI

EVOLUZIONE CHIMICA DELL'UNIVERSO

ASTROPARTICLE PHYSICS

EXPERIMENTAL GRAVITATION

METHODS OF SPACE ASTROPHYSICS

COMPUTING METHODS FOR ASTROPHYSICS



When?

The Master's Degree students submit their Study Plan at the beginning of the first year (in one of 2 available periods), by choosing the 3 optional exams in a provided group and the 2 elective exams.

2023 October 16th – December 7th
2024 February 1st – February 20th



https://www.phys.uniroma1.it/fisica/sites/default/files/pianinformativi2324/IndicazioniPercorsiFormativiLM58_23-24.pdf

N.B. Only **one** Study Plan can be approved per Academic Year.

The exams already registered cannot be changed in a new proposal of Study Plan.

Curricular or Individual Study Plans?

- 1) Curricular study plans are established every year by the Programme Area Council.
- 2) Individual study plans have to be assessed by the Programme Area Council for approval.

Thesis

Do you remember the Dissertation for the *Laurea Triennale*?
.... Forget it!



The second semester of the second AY is fully dedicated to Thesis work (38 CFU).

An **original research work**, the students go deeply on a project agreed with a tutor (*Relatore*), one of the faculty members in the Dept, and possibly an external tutor (*Secondo Relatore*), one of our colleagues in external institutions (Italian or abroad).

The well known “problem solving” capability is applied to enter in the world of research.

It is common to write the Thesis in English for an easy distribution in the market.

Sometimes the Thesis work is worthy of being published in a scientific paper or it is the first step for that.

For all the information about Thesis and Final Exam:

<https://www.phys.uniroma1.it/fisica/en/node/10212>



Take-home messages

During the Master Degree Programme do not forget the following opportunities:

1 Honours Programmes (*Percorsi di Eccellenza*)

EXCELLENCE



The Programme Area Council in Sciences of the Universe has established an Honours Programme aimed at enhancing the skills of the most deserving students.

They will be assigned to a tutor who will support and will cooperate with them in the organisation of the agreed upon activities.

Requisites: ... in good standing with the exams, *i.e.* 58 CFU (all mandatory courses + English language) by **31st October** + average mark > **27/30!**

Official acknowledgement by the Faculty president and 2nd year tax refunded!

See <https://www.phys.uniroma1.it/fisica/corsilauree/percorsi-di-eccellenza>

Take-home messages

During the Master Degree Programme do not forget the following opportunities:

2 ERASMUS+ Programme



It is a European funding programme offering university students a possibility of studying or doing an internship abroad in another country for a period of at least 3 months and maximum 12 months per cycle of studies.

Erasmus+ now offers the possibility to go way beyond the European borders as well.

Important! To identify the courses you wish to attend at the partner university, please contact the professor promoter of the Agreement. **This choice could impact the SP!**

Choose the international Institution and courses and apply! Call around every Jan/Feb

Info at

<https://www.uniroma1.it/it/pagina/erasmus-studenti-sapienza-studio>

<https://www.uniroma1.it/it/pagina/bandi-erasmus-2022-2023-studio>

<https://www.phys.uniroma1.it/fisica/en-erasmus>

On your toes! ...

a meeting with the students will be usually organized around January/February.

Take-home messages

During the Master Degree Programme do not forget the following opportunities:

3 Thesis work abroad (*Borse di studio per Tesi all'estero*)

If you are working on a Thesis topic, formally shared with an international co-tutor (*secondo relatore*), you could apply to fellowships devoted to financially support your staying at the foreign institution for a period longer than 2 months.

SMFN Faculty fellowships (the Call around every June) at:

https://web.uniroma1.it/trasparenza/bandi_trasparenza?field_tipologia_bando_tid=All&field_data_publicazione_value%5Bvalue%5D%5Byear%5D=&field_bis_nome_struttura_tid=1439

as an alternative, **Fondazione Sapienza fellowships** at:

<https://www.fondazione-sapienza.uniroma1.it/bandi/>

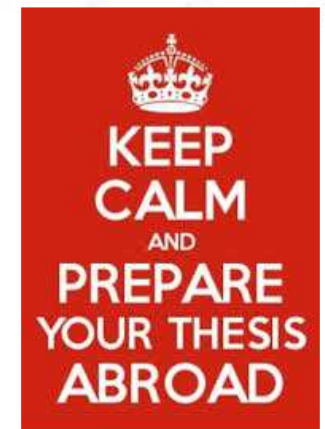
(...nel 2022 solo Scienze Mediche)

4 International Post-degree Scholarship (*Borse perfezionamento all'estero*)

.... and after graduating? Apply to scholarships to attend courses and traineeships at foreign and international university organizations.

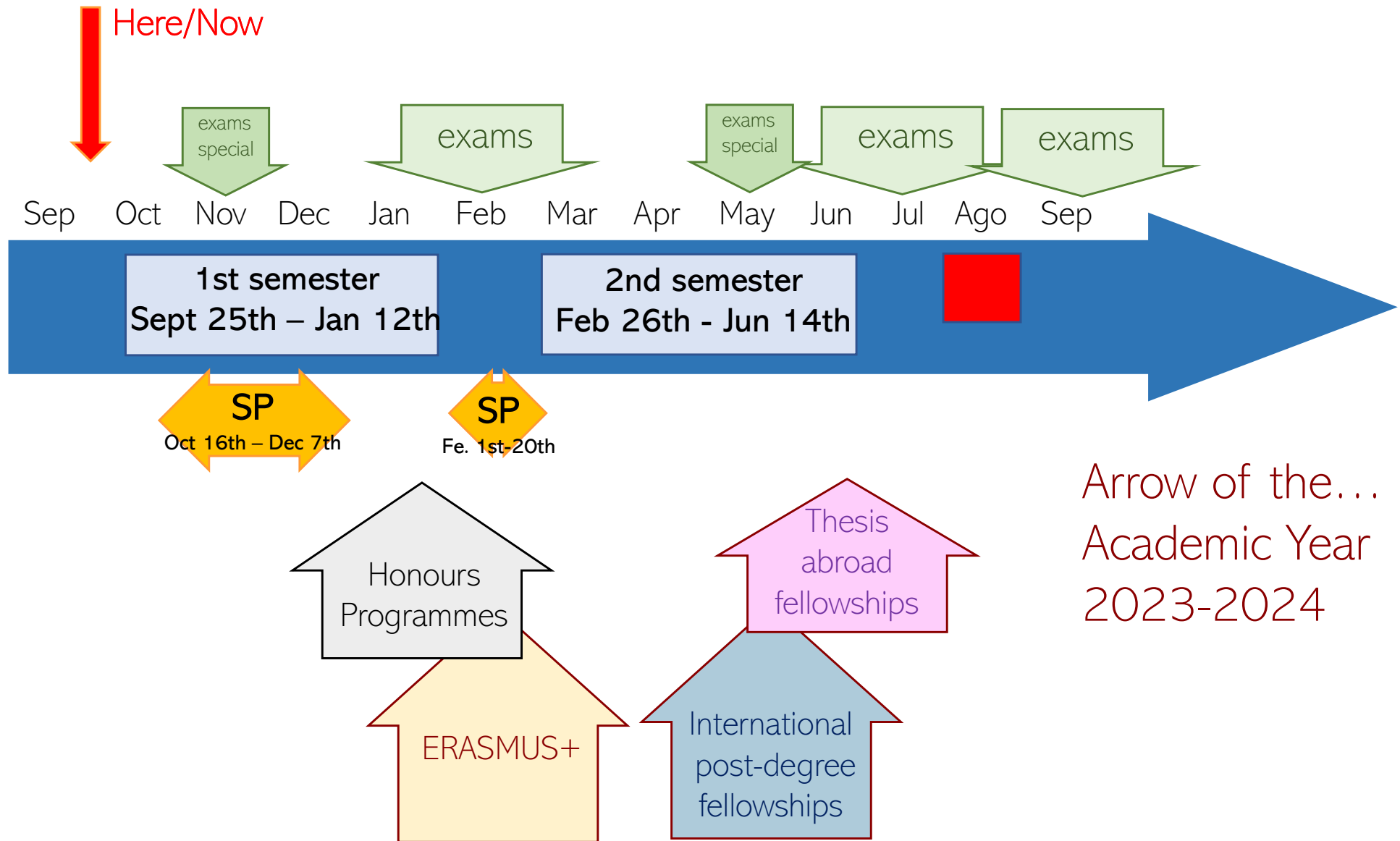
The scholarships last from 6 to 12 months, see:

<https://www.uniroma1.it/it/pagina/borse-di-perfezionamento-allestero>



Master Degree in Astronomy & Astrophysics

Mark it on your calendar!



Arrow of the...
Academic Year
2023-2024

Astrophysics faculty members

E.S. Battistelli, R. Capuzzo-Dolcetta, F. Columbro, A. Coppolecchia, G. D'Alessandro, P. de Bernardis, G. De Gasperis, M. De Petris, L. Graziani, L. Lamagna, P. Leaci, R. Maoli, S. Masi, A. Melchiorri, M. Merafina, A. Paiella, P. Pani, E. Pascale, F. Piacentini, G. Pisano, R. Schneider

INAF, INFN and ENEA members

C. Bianco, A. Cruciani, F. Fiore, A. Fontana, M. Limongi, E. Majorana, G. Montani, L. Pentericci, P. Puppo, R. Scaramella, L. Stella, O. Straniero,

you find their coordinates on:

<https://www.phys.uniroma1.it/fisica/node/6843>

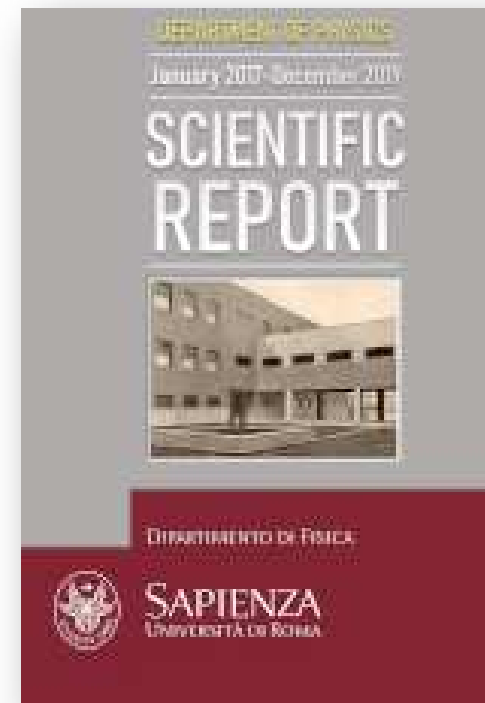
Research activities @ Dept. of Physics

THEORY – OBSERVATIONS – INSTRUMENTATION – DATA ANALYSIS

<https://www.phys.uniroma1.it/fisica/ricerca/aree-tematiche-e-gruppi-di-ricerca/astronomia-astrofisica-e-geofisica>

- Planetary Astrophysics including exoplanets
- Stellar Astronomy and Astrophysics
- Galaxy Astronomy and Astrophysics
- Fundamental Physics
- General Relativity
- Large Scale Structures
- Experimental and observational cosmology
- Advanced technology
- Detectors
- Data analysis techniques
- Image reconstruction
- Numerical simulations
- Data analysis and interpretations
- Astronomical Observations
- Experimental and theoretical gravitation

All the activities reported in
three-year SCIENTIFIC REPORTs



2017-2019 Edition

<https://www.phys.uniroma1.it/fisica/ricerca/scientific-report>

What next?

Continue the educational training and/or
look for a job in public institutions and/or private companies

Here, **PhD in Astrophysics, Astronomy and Space Science** (Sapienza+Torvegata Universities) or **PhDs in Physics** or **Accelerator Physics**.

In Italy, PhD in Astrophysics in Bologna, in Astronomy in Padua, in Physics and Astronomy in Milan (Bicocca)

abroad with several PhDs in Astrophysics/Astronomy.

Take a look also at the **Master in Scienza e Tecnologia Spaziale** a TorVergata



Several astrophysics institutions, *e.g.* Italian Space Agency (ASI), National Institute for AstroPhysics (INAF), European Space Agency (ESA) and European Space Research Institute (ESRIN)



Aerospace Companies, electronics, IT or optics industries
High school teachers



Do you need more information?



Contact: prof. Marco De Petris

marco.depetris@uniroma1.it

Dept. of Physics - Marconi Building (CU013)

room n° 152, 1st floor - ☎ +39-06-49914690

... do not forget to join the **Astroseminars** mailing list!

<https://lists2.roma1.infn.it/mailman/listinfo/astroseminar>

Grazie!