



SAPIENZA
UNIVERSITÀ DI ROMA

Dipartimento di Fisica

DEPARTMENT

TEACHING

STRUCTURES

INTERNATIONALISATION

RESEARCH

PUBLIC OUTREACH

NEWS

Home / **Master's Degree in Astronomy and Astrophysics**

Degree Coordinator: prof. Paolo de Bernardis

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

... a short description of the Study Plan,
or *Percorso Formativo*, of LM-58

Academic Year 2019-2020

Marco De Petris

marco.depetris@uniroma1.it

Dept. of Physics - Marconi Building,
room n° 152, 1st floor - ☎ +39-06-49914690



SAPIENZA
UNIVERSITÀ DI ROMA

Catalogo dei Corsi di studio

Home / 2019/2020 / Astronomy and Astrophysics

Astronomy and Astrophysics

Masters

All information about LM-58
in Sapienza web page

Degree Programme

- 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

[View more](#)

Study plan

The "Manifesto" study plan:
fundamental, core and elective
exams, credits and course
language

[View more](#)

Enrolment

How, where, when. Deadlines and
procedures to enrol in the
programme

2019/2020

[View more](#)

Attendance

Syllabus and study material, lesson
and exam schedules

[View more](#)

Quality Assurance (AQ)

Organization and responsibility of
the AQ for the Course

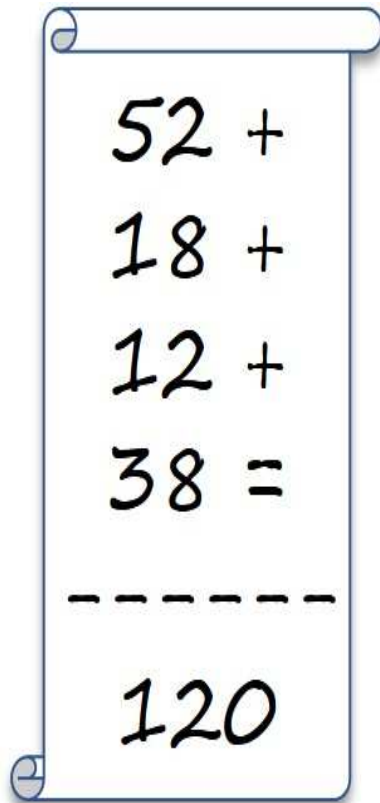
[View more](#)



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**


$$\begin{array}{r} 52 + \\ 18 + \\ 12 + \\ 38 = \\ \hline 120 \end{array}$$
















- 8 mandatory courses out of 13 (**52 CFU**, *corsi obbligatori*)
- 3 optional courses (**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 (**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*

First year – First semester
















ECTS

| COURSE | SEMESTER | CFU | SSD | LANGUAGE |
|---|---|-----|--------|---|
| 1012161 - ASTROPHYSICAL PROCESSES AND PLASMAS | First semester | 6 | FIS/05 |  |
| 1012186 - 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  | | FIS/05 | |
| GRUPPO B ASTRONOMICCO OSSERVATIVO SPERIMENTALE | Go to group  | | | |
| GRUPPO C CARATTERIZZANTE ASTRONOMICCO TECNOLOGICO | Go to group  | | | |

Master Degree in Astronomy & Astrophysics

First year – Second semester






min 0 courses/max 2 courses

| COURSE | SEMESTER | CFU | SSD | LANGUAGE |
|--|---|-----|--------|---|
| 1012161 - ASTROPHYSICAL PROCESSES AND PLASMAS | First semester | 6 | FIS/05 |  |
| 1012186 - 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  | | FIS/05 | |
| GRUPPO B ASTRONOMICCO OSSERVATIVO SPERIMENTALE | Go to group  | | | |
| GRUPPO C CARATTERIZZANTE ASTRONOMICCO TECNOLOGICO | Go to group  | | | |

Master Degree in Astronomy & Astrophysics






Second year – First semester

min 1 courses/max 3 courses

| 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  | | FIS/05 | |
| GRUPPO B ASTRONOMICO OSSERVATIVO SPERIMENTALE | Go to group  | | | |
| GRUPPO C CARATTERIZZANTE ASTRONOMICO 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  | | FIS/05 | |
| GRUPPO B ASTRONOMICO OSSERVATIVO SPERIMENTALE | Go to group  | | | |
| GRUPPO C CARATTERIZZANTE ASTRONOMICO 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, max 15 CFU]
However, they need to be approved by the Programme Area Council (*Responsabile dei Piani di Studio*)

REMEMBER !

- ✓ Differently from Master Degree in Physics, Study Plans have not to include at least 12 non-FIS* ECTS, that is, INF*, MAT*, CHIM*, BIO*.
- ✓ 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:

- 2 of the 4 courses required to be admitted to public competitions for secondary school teaching (24 CFU * for *Abilitazione all'insegnamento*) among 4 topics: *antro/psico/pedagogico/metodologico*.
- Courses in other Faculties, for example a couple of already chosen courses, Earth Observation Data Analysis from the Master in Data Science, Telerilevamento e GIS from the Master in Ecobiologia, ...

(*) 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 |
|--|-------------|-----------------|-----|--------|--|
| 1044551 - OBSERVATIONAL COSMOLOGY | First year | Second semester | 6 | FIS/05 |  |
| 1012184 - ASTRONOMICAL OPTICS | First year | Second semester | 6 | FIS/05 |  |
| 1012137 - DYNAMICS OF STAR SYSTEMS | First year | Second semester | 6 | FIS/05 |  |
| 1012136 - TEORICAL 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 ASTRONOMICO OSSERVATIVO SPERIMENTALE: The student must acquire 6 CFU from the exams below [^](#)

| COURSE | YEAR | SEMESTER | CFU | SSD | LANGUAGE |
|--|-------------|-----------------|-----|--------|---|
| 1012129 - HIGH ENERGIES ASTROPHYSICS | First year | Second semester | 6 | FIS/05 |  |
| 1012130 - EXTRAGALACTIC ASTROPHYSICS | First year | Second semester | 6 | FIS/05 |  |
| 1044551 - OBSERVATIONAL COSMOLOGY | First year | Second semester | 6 | FIS/05 |  |
| 1012184 - ASTRONOMICAL OPTICS | First year | Second semester | 6 | FIS/05 |  |
| 10589158 - PLANETS AND EXOPLANETS | First year | Second semester | 6 | FIS/05 |  |
| 1012136 - TEORICAL COSMOLOGY | Second year | First semester | 6 | FIS/05 |  |
| 1055885 - PARTICLE AND 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 ASTRONOMICO 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 | 🇮🇹 |
| 1012152 - ADVANCED LABORATORY OF COMPUTING | Second year | First semester | 6 | INF/01 | 🇮🇹 |
| 1044550 - METHODS OF SPACE ASTROPHYSICS | Second year | First semester | 6 | FIS/01 | 🇬🇧 |

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
RELATIVITA' GENERALE
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**

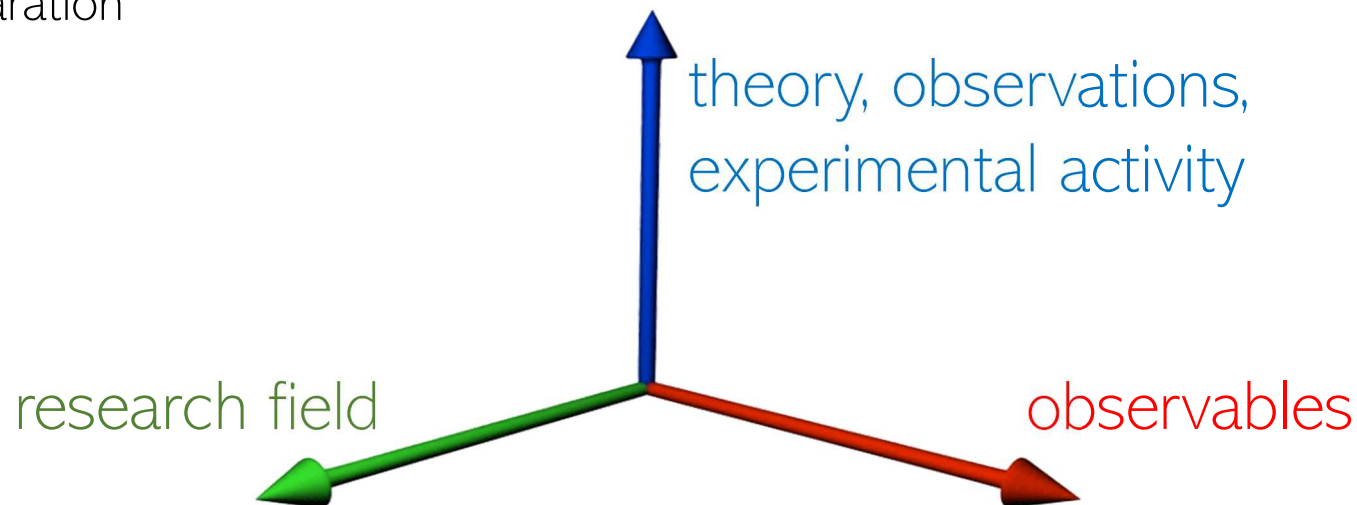
how to build solid *astro*-knowledge



<https://corsidilaurea.uniroma1.it/it/corso/2019/30060/programmazione>

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

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



OBSERVATIONAL COSMOLOGY

OTTICA ASTRONOMICA

DINAMICA DEI SISTEMI STELLARI

ASTROFISICA DELLE ALTE ENERGIE

ASTROFISICA EXTRAGALATTICA

PLANETS AND EXOPLANETS

COSMOLOGIA TEORICA

SISTEMI AUTOGRAVITANTI

EVOLUZIONE CHIMICA DELL'UNIVERSO

PARTICLE AND ASTROPARTICLE PHYSICS

EXPERIMENTAL GRAVITATION

METHODS OF SPACE ASTROPHYSICS

LABORATORIO DI CALCOLO AVANZATO

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.

October 15th – December 15th
February 1st – February 20th



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.* all the 1st year CFU (**as expected in your Study Plan!**) 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 contacting 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.phys.uniroma1.it/fisica/en-erasmus>

On your toes! ...

a meeting with the students will be 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/fac_smfn/bandi_categoria_tendina/borsa-tesi-estero

as an alternative, Fondazione Sapienza fellowships at:

<https://www.fondazionesapienza.uniroma1.it/bandi/>



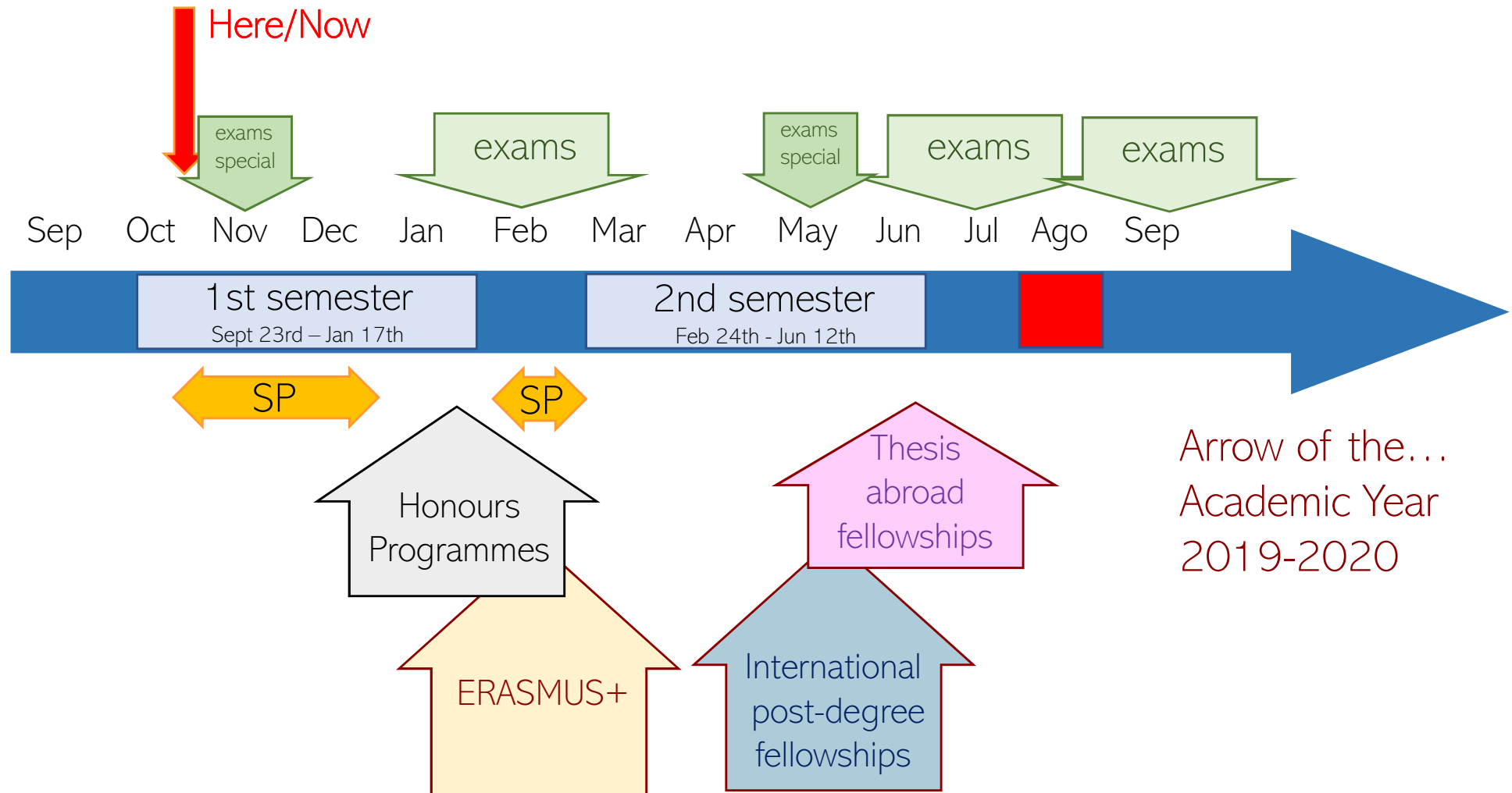
4 International Post-degree Scholarship (*Borse perfezionamento all'estero*)

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

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



Mark it on your calendar!



Astrophysics faculty members

E.S. Battistelli, A. Capone, R. Capuzzo-Dolcetta, G. D'Alessandro, P. de Bernardis, M. De Petris, L. Lamagna, P. Leaci, R. Maoli, S. Masi, A. Melchiorri, M. Merafina, P. Pani, E. Pascale, F. Piacentini, F. Ricci, 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



...waiting for the 2017-2019 Edition

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

The Nobel Prize in Physics 2019

8 October 2019

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Physics 2019 to James Peebles, Princeton University, USA, Michel Mayor, University of Geneva, Switzerland and Didier Queloz, University of Geneva, Switzerland and University of Cambridge, UK.

“for contributions to our understanding of the evolution of the universe and Earth’s place in the cosmos”



©Johan Jarnestad/The Royal Swedish Academy of Sciences”

with one half to **James Peebles**, Princeton University, USA

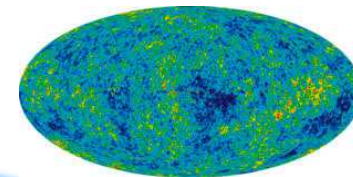
“for theoretical discoveries in physical cosmology”

and the other half jointly to **Michel Mayor**, University of Geneva, Switzerland and **Didier Queloz**, University of Geneva, Switzerland and University of Cambridge, UK

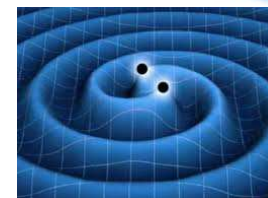
“for the discovery of an exoplanet orbiting a solar-type star”

.... but do not forget **The Nobel Prize in Physics 2017**

was divided, one half awarded to **Rainer Weiss**, the other half jointly to **Barry C. Barish** and **Kip S. Thorne** *“for decisive contributions to the LIGO detector and the observation of gravitational waves.”*



Research topics deeply investigated, theoretically and experimentally, in our Department!!



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.

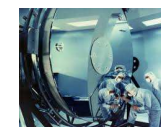
Take a look also at the Master in Scienza e Tecnologia Spaziale a TorVergata



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: Marco De Petris

marco.depetris@uniroma1.it

Dept. of Physics - Marconi Building, 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!