



GRAN SASSO SCIENCE INSTITUTE PHD PROGRAMMES – CALL FOR APPLICATIONS 2022 (AY 2022/2023)

The Gran Sasso Science Institute (GSSI), based in L'Aquila, Italy, offers post-graduate training to obtain “**Philosophiae Doctor**” (**Ph.D.**) degrees in the following fields:

- **Astroparticle Physics:**

- 8 scholarships;
- 1 scholarship co-funded by GSSI and INAF-OAAb for the following research project: “Multi Messenger astronomy: dense stellar systems and compact object mergers observed by the current and next-generation of electromagnetic and gravitational-wave observatories”. The selected candidate will work on the funded research project under the supervision of two advisors: Dr. Michele Cantiello (external), Prof. Marica Branchesi (internal).

The research and PhD in physics at the GSSI is focused on astroparticle physics. Astroparticle physics is an interdisciplinary and young research field, grown at the intersection of particle physics, nuclear physics, astrophysics and cosmology. It addresses some of the most pressing and fundamental questions in science today: the origin and the evolution of our universe, the nature of dark matter and dark energy, the study of neutrinos and of the ultimate constituents of matter, the search for gravitational waves, the investigation and explanation of the cosmic rays.

Within the PhD Programme in Astroparticle Physics, it is possible to apply both for INAF-OAAb Project and for GSSI scholarships, by submitting two different applications.

- **Mathematics in Natural, Social and Life Sciences:**

- 8 scholarships;
- 1 scholarship funded by Leonardo S.p.A. for the following research project: “Development of methods to evaluate the capabilities of quantum hardware of the Quantum Annealer type in solving combinatorial optimization problems in various areas of interest for Leonardo; examples of possible areas of investigation are linear algebra, logistics, computer vision”.

Within the PhD course in Mathematics in Natural, Social and Life Sciences a priority has been established on mathematical modeling, both towards the traditional areas of application, such as Physics or Engineering, and towards emerging issues in Biology and Social Sciences. An emphasis will be given also to: partial differential equations and their applications, in particular mathematical models in fluid dynamics and in the study of nonlinear waves; statistical mechanics, hydrodynamic limits and derivation of effective equations in classical and quantum mechanics, phase transitions, disordered systems; methods of statistical physics in data science; numerical linear algebra and its applications, numerical methods for differential equations, high-performance computational techniques; network analysis problems; continuum mechanics, fluid dynamics models for cardiovascular circulation, computational fluid dynamics; mathematical models in biology and social sciences.

Within the PhD Programme in Mathematics in Natural, Social and Life Sciences, it is possible to apply both for the Project funded by Leonardo S.p.A and for GSSI scholarships, by submitting two different applications.

- **Computer Science:**

- 8 scholarships;
- 1 scholarship funded by Leonardo S.p.A. for the following research project: “Development of a framework for managing and coordinating a swarm of autonomous or semi-autonomous drones in critical scenarios, with demanding embedded computing requirements (high computing capacity on board)”.

The PhD Programme in Computer Science of the GSSI aims to provide students with the main results, theories, techniques and methodologies regarding algorithms, models, languages, software and services to cope successfully with the challenges of the present and future Information and Communication Technology.

Within the PhD Programme in Computer Science, it is possible to apply both for the Project funded by Leonardo S.p.A and for GSSI scholarships, by submitting two different applications.

- **Regional Science and Economic Geography:**

- 8 scholarships;
- 1 scholarship co-funded by GSSI and REDI consortium for the following research project: “Socio-economic resilience in areas affected by natural disasters, with particular reference to inner areas”

The aim of the PhD in Regional Science and Economic Geography is to address issues related to local and regional development. The methodological perspective of research and teaching is multidisciplinary, combining regional and urban economics, economic and human geography, spatial planning and sociology.

Within the PhD Programme in Regional Science and Economic Geography, it is possible to apply both for REDI Project and for GSSI scholarships, by submitting two different applications.

The PhD Programmes will be activated after approval by the MUR (Italian Ministry of University and Research).

Activities and Duration

The PhD Programmes last **four years**. Nevertheless, it is possible to be awarded the Ph.D. degree after the completion of the third year.

The Academic Year will start on November 1st 2022.

Scholarships

GSSI awards scholarships until the dissertation defense and for a maximum of four years.

The yearly gross amount of the scholarship is € 16.159,91. An additional 50% on a monthly basis may be awarded for research periods abroad if approved by the GSSI.

Official language of the PhD Programmes: English.

Facilities and benefits

- all PhD students will have free accommodation at the guest house during the first year, then will be provided with a financial substitute of 350,00 Euros gross/month (the contribution will be paid upon the presentation of a rental agreement in L'Aquila);
- all PhD students will have free luncheon vouchers (1 per day, working days, except school closures, missions, and other situations contemplated by the GSSI rules);
- all PhD students will have tuition fees waived;
- all PhD students will be covered by insurance against any accident and/or injury that may occur while carrying out their PhD activities;
- all PhD students are entitled to a contribution of up to 1.200,00 euro (net) for the purchase of a laptop for study and research purposes. The contribution will be paid upon the presentation of the fiscal receipt headed to the applicant.

Requirements

English knowledge is compulsory. Applications are open to candidates in possession of one of the following degrees:

- “Laurea Magistrale” or “Laurea Specialistica” or a four or five years degree.
- a foreign University degree (minimum legal duration of the University course: **four years**). The eligibility of foreign degrees is assessed by the Selection Committee.

Applicants obtaining their degree by no later than **October 31, 2022** may apply (both Italian or foreign degree according to the previous description). Applicants will have to send a copy of their degree certificate at phd.secretariat@gssi.it within **November 20, 2022** (for Italian degrees a “self declaration” can also be accepted).

Application

Applicants must fill out the **online application form** (www.gssi.it/phd/), where it is possible to find all the necessary information for the submission, and attach the required documents by **June 01, 2022, 3 pm (Italian time zone)**. **No other application method will be accepted.**

Candidates willing to apply for a second position need to submit two different applications. It is necessary to register again and upload all the required documents independently for each submission.

Data and documents entered into the application form are the sole responsibility of the applicant. In the event of false declarations, the applicant will be excluded from the selection procedure.

In order to successfully submit the application form, applicants must insert all the data/information and upload the attachments as listed below. We strongly recommend applicants to review the inserted information and uploaded attachments before submitting the application. **No changes are allowed to submitted data.** Erroneous data and/or attachments will be evaluated as they are submitted.

Please note that applicants are responsible for ensuring that their completed application arrives on time. Applicants are strongly advised to submit their application well in advance of the deadline in order to avoid last-minute congestion in the online application procedure.

Candidates should upload the following documents in pdf format:

- a valid id document, signed and dated;
- curriculum vitae et studiorum;
- a final degree certificate (for EU citizens or NON EU citizens residing in Italy: a copy of the certificate or a self-declaration declaring the possession of a degree indicating: conferral date, issuing University and final grade; for other applicants: certificate declaring the possession of a degree indicating: conferral date, issuing University and final grade). For applicants who expect to complete their degree by October 31 2022: certificate or self-declaration (only for EU citizens and NON EU citizens residing in Italy) indicating the single examinations taken and grades obtained. If the official document released by the University is not available in Italian or English, candidates should also attach a translation of the document under their responsibility;
- academic transcript or diploma supplement (the academic transcript is an official document released by the University detailing the courses/classes taken or subjects studied and related grades).

Applicants can provide the names and contact information of up to **two referees**. The information provided by the applicants in the online form will be used to send the referees an email with a link to a page where they can upload the reference letter: referees should submit the reference letters in English or Italian through the online application system within **June 5th, 2022**. No reference letter uploaded by the candidates will be admitted.

Candidates are required to upload additional documents or give additional information depending on the PhD Programme chosen:

- **Astroparticle Physics:**
 - motivational letter describing research interests and reasons for having chosen to apply to the GSSI PhD;
 - extended abstract of the Master's Degree thesis (max 2000 words).

- **Mathematics in Natural, Social and Life Sciences:**
 - a synthetic report of the core courses followed on the following topics:
 - 1- Partial Differential Equations
 - 2- Probability/stochastic processes
 - 3- Functional Analysis
 - 4- Numerical Analysis
 - 5- Physics/continuum mechanics/fluid dynamics

For each course in this area, students should provide a short syllabus (no more than 10 lines) containing main textbooks, name of the instructors and possibly the link to the courses' home page.

- **Computer Science:**
 - motivational letter describing expertise and main research interests, a research project indicating the main subjects the candidate would like to approach during the PhD Programme, the reasons for having chosen GSSI for PhD studies.

- Regional Science and Economic Geography:
 - motivational letter, structured as follows: i) acquired expertise; ii) main research fields of interest; iii) prospected research project to develop during the PhD Programme; iv) reasons for having chosen to apply to the GSSI for a PhD Programme in Regional Science and Economic Geography;
 - extended abstract of the Master's Degree thesis or of thesis of the last obtained title (max 2000 words);
 - GRE scores (Verbal and Quantitative) are preferred but optional (please include them in the application package).

In the event that any of the documents downloaded during the application procedure do not correspond to those submitted during the enrolment, due to deliberate false declaration, the applicant will automatically forfeit his/her place in the Programme.

Selection Procedure

Candidates will be evaluated by the Selection Committee on the basis of their academic background, skills and scientific value. The Selection Committee will also assess the relevance of any publication, the suitability of the candidates' CV, the reference letters and any additional special qualification, educational activities and/or participation in research groups or projects.

There will be one Selection Committee for each Scientific Area (Physics, Mathematics, Computer Science, Social Sciences).

The selection procedure will be carried out in two phases:

- **assessment of all the applications admitted through the online procedure**, ending with the publication on the GSSI website of the shortlist of candidates admitted to the interview.
- **interview**: once shortlisted, the applicants will be required to participate in a comprehensive in-person or remote interview in English, in order to assess their aptitude for research in the curriculum for which they have applied, as well as their English proficiency.

It is possible to choose a method of interviewing. Please note that GSSI reserves the right to hold the interviews only through video conference in case of particular organizational needs.

The shortlist and the interviews will be organized according to the following schedule:

| PhD Programme | Shortlist | Interviews |
|--|------------------|-------------------|
| Astroparticle Physics | Within June 20th | June 27th to 30th |
| Mathematics in Natural, Social and Life Sciences | Within June 20th | June 22nd to 30th |
| Computer Science | Within June 20th | June 27th to 30th |
| Regional Science and Economic Geography | Within June 20th | June 27th to 30th |

The list of the candidates admitted to the interview will be published on GSSI website (www.gssi.it). The admitted candidates will soon be informed about the calendar of the interviews.

Admission

The general ranking lists and evaluation results will be published on the GSSI website: www.gssi.it. The list will indicate the names of the admitted applicants to the different PhD Programmes.

In the event of forfeiture or exclusion of a candidate within 45 days from the date of beginning of the Programme, the candidate shall be replaced by the next eligible candidate according to the ranking.

Contact and info

www.gssi.it; applications@gssi.it; +39 0862 4280 431

L'Aquila, March 8, 2022