Ph.D course in Astrophysics and Cosmology

Head of the Ph.D course: Prof. Andrea Lapi
Web site: Astrophysics and Cosmology

Research lines:
- Early Universe Physics and CMB Data Analysis
- Galaxy Formation and Evolution
- Stellar Structure and Evolution
- Dark Matter and Dark Energy
- Gravitation Theory and Gravitational Waves
- High Energy and Multimessenger Astrophysics
- Galaxy Clusters and Large Scale Structures
- Astrochemistry and Astrobiology
- Computational Astrophysics
- Data Science specific topic - Machine Learning Methods for Supernova Type Ia Cosmology

Fellowships available: Astrophysics and Cosmology: 5
Data Science specific topic - Machine Learning Methods for Supernova Type Ia Cosmology: 1

Candidates can apply to only one activity

Admission: Academic and scientific qualifications + oral exam
Beginning of the Courses: 1 October, 2020

| Evaluation of academic and scientific qualifications: | 30 points |
| Access to Oral Exam: | minimum mark of 21/30 in the academic and scientific qualifications evaluation up to a maximum of 15 admitted candidates. |
| Evaluation of Oral Exam: | 70 points |
| Total Evaluation: | 100 points |
| Eligibility: | 70 points |

First Session

Astrophysics and Cosmology

Deadline for online submission of applications: 3 March, 2020
Oral Exam: 24 and 25 March, 2020

Machine Learning Methods for Supernova Type Ia Cosmology

Deadline for online submission of applications: 3 March, 2020
Oral Exam: 23 March, 2020

Second Session (only if there should still be places available after the first one)

Astrophysics and Cosmology

Deadline for online submission of applications: 31 August, 2020
Oral Exam: 15 and 16 September, 2020
Machine Learning Methods for Supernova Type Ia Cosmology

Deadline for online submission of applications: 31 August, 2020
Oral Exam: 15 and 16 September, 2020

Admission to the oral exam and results of all evaluations will be notified by email.
Ph.D course in Astroparticle Physics

Head of the Ph.D course: Prof. Matteo Viel
Web site: Astroparticle Physics

Research lines:
- Classical and Quantum Gravity
- Early Universe Cosmology
- The Dark Universe
- Cosmic Rays and Particle Physics
- Gravitational Waves

Fellowships available: 5
Admission: Academic and scientific qualifications + written exam + oral exam
Beginning of the Courses: 1 October, 2020

<table>
<thead>
<tr>
<th>Evaluation of academic and scientific qualifications:</th>
<th>10 points</th>
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<tbody>
<tr>
<td>Access to Written Exam:</td>
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<tr>
<td>Evaluation of Written Exam:</td>
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<tr>
<td>Access to Oral Exam:</td>
<td>minimum mark of 28/40 in the written exam evaluation</td>
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<td>Evaluation of Oral Exam:</td>
<td>50 points</td>
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<td>Total Evaluation:</td>
<td>100 points</td>
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<tr>
<td>Eligibility:</td>
<td>70 points</td>
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</table>

Single Session

Deadline for online submission of applications: 3 March, 2020

Written Exam: 25 March, 2020
Oral Exam: 26 March, 2020

Admission to the written exam and results of all evaluations will be notified by email.
Ph.D course in Cognitive Neuroscience

Head of the Ph.D course: Prof. Davide Crepaldi
Web site: Cognitive Neuroscience

Research lines:
- Intelligence, personality and creativity
- Neuronal bases of Visual perception
- Neuronal bases of Time perception
- Neuronal bases of Tactile perception
- Language, reading, and statistical learning
- Neural computation approaches to memory and brain organization

Fellowships available: 6
Admission: Academic and scientific qualifications + written exam + oral exam

Beginning of the Courses: 1 October, 2020

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<table>
<thead>
<tr>
<th>Eligibility: 70 points</th>
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</table>

First Session

Deadline for online submission of applications: 17 March, 2020

Written Exam: 4 May, 2020
Oral Exam: 5 May, 2020

Admission to the written exam and results of all evaluations will be notified by email.

Second Session (only if there should still be places available after the first one)

Deadline for online submission of applications: 31 August, 2020

Written Exam: 14 September, 2020
Oral Exam: 15 September, 2020

Admission to the written exam and results of all evaluations will be notified by email.
Head of the Ph.D course: Prof. Remo Sanges
Web site: Functional and Structural Genomics

Research lines:
- Neurogenomics
- Cerebral Cortex Development
- Prion Biology
- Functional Genomics (including Scalable engineering of gene expression)
- Neurodegeneration
- Parkinson's Disease
- Structural Biology
- Drug Discovery
- Bioinformatics (including Molecular dynamics and simulation)
- Evolutionary Genomics
- Comparative Genomics
- Population Genomics

Fellowships available: 3
Admission: Academic and scientific qualifications + written exam + oral exam
Beginning of the Courses: 4 November, 2020

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</table>

First Session
Deadline for online submission of applications: 21 April, 2020

Written Exam: 25 May, 2020
Oral Exam: 26 May, 2020

Admission to the written exam and results of all evaluations will be notified by email.

Second Session (only if there should still be places available after the first one)
Deadline for online submission of applications: 4 August, 2020

Written Exam: 7 September, 2020
Oral Exam: 8 September, 2020

Admission to the written exam and results of all evaluations will be notified by email.
### Ph.D course in Geometry and Mathematical Physics

**Head of the Ph.D course:** Prof. Jacopo Stoppa  
**Web site:** [Geometry and Mathematical Physics](#)

**Research lines:**
- Integrable systems, random matrices, nonlinear waves, Frobenius manifolds
- Deformation theory, virtual classes, derived geometry, moduli spaces
- Quantum groups, noncommutative geometry
- Mathematical methods of quantum mechanics
- Mathematical aspects of quantum field theory and string theory
- Symplectic geometry, sub-riemannian geometry
- Complex differential geometry, generalized geometry

**Fellowships available:** 8  
**Admission:** Academic and scientific qualifications + written exam + oral exam  
**Beginning of the Courses:** 1 October, 2020

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### First Session

**Deadline for online submission of applications:** 3 March, 2020  
**Written Exam:** 25 March, 2020  
**Oral Exam:** 26 March, 2020

### Second Session (only if there should still be places available after the first one)

**Deadline for online submission of applications:** 15 July, 2020  
**Written Exam:** 8 September, 2020  
**Oral Exam:** 9 September, 2020

**Admission to the written exam and results of all evaluations will be notified by email.**
Ph.D course in Mathematical Analysis, Modelling, and Applications

Head of the Ph.D course: Prof. Gianluigi Rozza
Web site: Mathematical Analysis, Modelling, and Applications

Research lines:
• Conservation Laws
• Transport Problems
• Geometric PDEs
• Numerical Analysis of PDEs
• Nonlinear Analysis
• Dynamical Systems
• Calculus of Variations
• Gamma-Convergence and Multiscale Analysis
• Rate independent evolution problems
• Geometric Control Theory
• Sub-Riemannian Geometry
• Inelastic behavior of solids: plasticity, damage, fracture
• Mechanobiology of the cell and cell motility
• Mechanics of soft and active materials
• Reduced basis methods
• Boundary integral methods and isogeometric analysis
• Fluid-structure interaction problems
• Computational Fluid and Solid Mechanics
• Machine learning
• Uncertainty quantification
• Shape optimization
• Flow control

Fellowships available: 8
Admission: Academic and scientific qualifications + written exam + oral exam
Beginning of the Courses: 1 October, 2020

Evaluation of academic and scientific qualifications: 10 points
Access to Written Exam: minimum mark of 7/10 on academic and scientific qualifications
Evaluation of Written Exam: 40 points
Access to Oral Exam: minimum mark of 28/40 in the written exam evaluation
Evaluation of Oral Exam: 50 points
Total Evaluation: 100 points
Eligibility: 70 points

First Session
Deadline for online submission of applications: 3 March, 2020
Written Exam: 18 March, 2020
Oral Exam: 19 March, 2020

Second Session (only if there should still be places available after the first one)
Deadline for online submission of applications: 15 July, 2020
Written Exam: 10 September, 2020
Oral Exam: 11 September, 2020

Admission to the written exam and results of all evaluations will be notified by email.
Ph.D course in Neurobiology

Head of the Ph.D course: Prof. Anna Menini
Web site: Neurobiology

Research lines:
- Somatosensation
- Peripheral Nervous System
- Olfactory Systems and Ion Channels
- Synaptic Neurophysiology and Neuronal Networks
- Cell excitability and cortical information processing
- Optogenetic and electrophysiological approaches to Neuronal Networks
- Computational Neuroscience and Modelling
- Bionanotechnology
- Neurotoxicity and calcium signaling
- New Materials and Neurons
- Neurophysiology of Motor control
- Spinal networks patho-physiology and locomotion
- Interfaces to simultaneously stimulate and record signals from the spinal cord

Fellowships available: 5

Admission: Academic and scientific qualifications + oral exam (also by videoconference)

Beginning of the Courses: 4 November, 2020

Evaluation of academic and scientific qualifications: 30 points
Besides the documents mentioned in the general part of the announcement, all applicants must provide a written essay in English, describing their previous academic background and scientific motivations to pursue a SISSA PhD and including a short list of theses projects among those listed above.

The essay (about 3 pages long – 800 words) will be used for an initial screening of suitable candidates to be invited to the oral exam.

Access to Oral Exam: minimum mark of 21/30 on academic and scientific qualifications

Evaluation of Oral Exam: 70 points

Total Evaluation: 100 points

Eligibility: 70 points

First Session
Deadline for online submission of applications: 3 April, 2020
Interviews: 25 – 26 May, 2020

Second Session (only if there should still be places available after the first one)
Deadline for online submission of applications: 15 July, 2020
Interviews: 7 - 8 September, 2020

The results of the academic and scientific qualifications evaluation will be notified by email. Selected candidates will be informed about day and time of the oral exam that, on demand, could be taken by videoconference, preferably through “Skype” (see general announcement).
Ph.D course in Physics and Chemistry of the Biological Systems

Head of the Ph.D course: Prof. Giovanni Bussi
Web site: Physics and Chemistry of the Biological Systems

Research lines:
- Structural bioinformatics
- Statistical mechanics of complex molecular systems
- Self-assembly
- Biomolecular simulations
- Simulations of rare events
- Data science of complex and biomolecular systems
- Polymer physics
- Bayesian statistical models applied to high-dimensional biomedicine (data science fellowship)

Fellowships available:
- Physics and Chemistry of the Biological Systems: 4
- Bayesian statistical models applied to high-dimensional biomedicine: 1

Admission: Academic and scientific qualifications + written exam + oral exam

Beginning of the Courses: 1 October, 2020

Evaluation of academic and scientific qualifications: 10 points

Access to Written Exam: minimum mark of 7/10 in the academic and scientific qualifications evaluation up to a maximum of 12 admitted candidates

Evaluation of Written Exam: 40 points

Access to Oral Exam: minimum mark of 28/40 in the written exam evaluation

Evaluation of Oral Exam: 50 points

Total Evaluation: 100 points

Eligibility: 70 points

First Session

Deadline for online submission of applications: 3 March, 2020

Written Exam: 25 March, 2020
Oral Exam: 26 March, 2020

For the “Bayesian statistical models applied to high-dimensional biomedicine” fellowship the oral exam will take place on 27 March, 2020

Second Session (only if there should still be places available after the first one)

Deadline for online submission of applications: 25 August, 2020

Written Exam: 7 September, 2020
Oral Exam: 8 September, 2020

Admission to the written exam and results of all evaluations will be notified by email.
## Ph.D course in Statistical Physics

**Head of the Ph.D course:** Prof. Pasquale Calabrese  
**Web site:** [Statistical Physics](#)

### Research lines:
- Statistical Field Theories and Applications  
- Exactly Solved Models of Statistical Mechanics  
- Classical and Quantum Statistical Physics out of Equilibrium  
- Cold Atoms  
- Quantum Quenches  
- Entanglement in many-body systems  
- Quantum Integrable Models  
- Quantum Systems with Disorder  
- Complex Systems  
- Critical phenomena and renormalization group  
- Two-dimensional conformal field theories

### Fellowships available: 5

**Admission:** Academic and scientific qualifications + oral exam (also by videoconference)

**Beginning of the Courses:** 1 October, 2020

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**First Session**

**Deadline for online submission of applications:** 3 March, 2020  
**Oral Exam:** 23 to 27 March, 2020

The results of the academic and scientific qualifications evaluation will be notified by email. Selected candidates will be informed about day and time of the oral exam that, on demand, could be taken by videoconference, preferably through “Skype” (see general announcement).

The results of the oral exams and the final ranking will be notified by email.
Ph.D course in Theoretical Particle Physics

Head of the Ph.D course: Prof. Giulio Bonelli
Web site: [Theoretical Particle Physics](#)

Research lines:
- String Theory, AdS/CFT duality and applications
- Supersymmetric Field Theories
- Conformal Field Theories
- Quantum Gravity
- Physics beyond the Standard Model
- Physics at the LHC
- Neutrino and Flavour Physics

Fellowships available: 5

Admission: Academic and scientific qualifications + written exam + oral exam

Beginning of the Courses: 1 October, 2020

| Evaluation of academic and scientific qualifications: 10 points |
| Access to Written Exam: minimum mark of 7/10 on academic and scientific qualifications |
| Evaluation of Written Exam: 40 points |
| Access to Oral Exam: minimum mark of 28/40 in the written exam evaluation |
| Evaluation of Oral Exam: 50 points |
| Total Evaluation: 100 points |
| Eligibility: 70 points |

Single Session

Deadline for online submission of applications: 3 March, 2020

Written Exam: 23 March, 2020
Oral Exam: 24 March, 2020

Admission to the written exam and results of all evaluations will be notified by email.
Ph.D course in Theory and Numerical Simulation on the Condensed Matter

Head of the Ph.D course: Prof. Massimo Capone
Web site: Theory and Numerical Simulation on the Condensed Matter

Research lines:

- Non-equilibrium dynamics of correlated systems
- Theoretical Quantum Technologies
- Quantum Monte-Carlo methods
- Methods for many-body quantum systems: Tensor Networks, DMFT
- Mott Physics and topology from solids to heterostructures
- High-temperature superconductivity and strong correlations
- Optical and excited-state properties of complex molecular systems
- Theory and simulation of thermal transport in liquid and amorphous systems
- Relativistic effects in materials
- Validation of pseudopotentials for high throughput applications
- Beyond DFT: RPA and WdWDF
- Electronic simulation of realistic systems by advanced many-body techniques
- Software engineering and the Quantum ESPRESSO project

Fellowships available: 7

Admission: Academic and scientific qualifications + oral exam (also by videoconference)

Beginning of the Courses: 1 October, 2020

| Evaluation of academic and scientific qualifications: 30 points |
| Access to Oral Exam: minimum mark of 21/30 on academic and scientific qualifications |
| Evaluation of Oral Exam: 70 points |
| Total Evaluation: 100 points |
| Eligibility: 70 points |

First Session

Deadline for online submission of applications: 3 March, 2020

Oral Exam: from 25 to 27 March, 2020

The results of the academic and scientific qualifications evaluation will be notified by email. Selected candidates will be informed about day and time of the oral exam that, upon request, could be taken by videoconference, preferably through "Skype" (see general announcement).

The results of the oral exams and the final ranking will be notified by email.