Ph.D course in Astrophysics and Cosmology

Head of the Ph.D course: **Prof. Carlo Baccigalupi**

Web site: **[Astrophysics and Cosmology](#)**

Research lines:

- Analysis of Astrophysical & Cosmological Datasets,
- Physical Cosmology, Early Universe & Cosmic Microwave Background,
- Dark Matter, Energy & Cosmological Large Scale Structure,
- Galaxy Formation & Evolution,
- High Energy Astrophysics,
- Stellar Physics,
- Compact Objects & Gravitational Waves
- AstroChemistry

Fellowships available: 4

Admission: **Academic and scientific qualifications + oral exam (remotely/presence)**

Beginning of the Courses: 1 October, 2024

Evaluation of academic and scientific qualifications: 30 points
Access to Oral Exam: minimum mark of 21/30 on academic and scientific qualifications (max. 15 candidates)
Evaluation of Oral Exam: 70 points
Total Evaluation: 100 points

To be considered eligible, candidates must pass all the phases (academic qualifications, and interview) with a minimum mark of 7/10 or equivalent.

First Session

Deadline for online submission of applications: 14th March, 2024
Oral Exam: 9th and 10th April, 2024

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

Deadline for online submission of applications: 25th August, 2024
Oral Exam: 10th and 11th September, 2024

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. Enrico Barausse**

Web site: **Astroparticle Physics**

Research lines:

- Classical and Quantum Gravity
- Early Universe Cosmology
- Dark Matter and Dark Energy
- Cosmic Rays and Particle Physics
- Gravitational Waves
- Structures in the Universe
- Astrophysics of Massive Black Holes

Fellowships available: **5**

Admission: Academic and scientific qualifications + oral exam (remotely)

Beginning of the Courses: 1st October, 2024

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

To be considered eligible, candidates must pass all the phases (academic qualifications, and interview) with a minimum mark of 7/10 or equivalent.

Deadline for online submission of applications: 25th February, 2024

Oral Exam: 18th – 21st March, 2024

Results of all evaluations and the final ranking will be notified by email.

Ph.D course in Cognitive Neuroscience

Head of the Ph.D course: **Prof. Mathew E. Diamond**

Web site: **Cognitive Neuroscience**

Research lines:

- Intelligence, personality & cognitive reserve
- Neuronal bases of Visual perception
- Neuronal bases of Time perception
- SISSA Explorations into the Neuronal foundations of Sensory Experience Lab (SENSEx)
- Language, reading, and statistical learning
- Neural computation approaches to memory and brain organization
- Computational bases of perception and cognition"

Fellowships available: **6**

Admission: **Academic and scientific qualifications + written exam + oral exam (remote)**

Beginning of the Courses: 1 October, 2024

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

Eligibility: minimum mark of 35/50 in the oral exam evaluation

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First Session

Deadline for online submission of applications: 28 March, 2024

Written Exam: 8-9 April, 2024
Oral Exam: 18 April, 2024

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

Deadline for online submission of applications: 22 August, 2024

Written Exam: 5-6 September, 2024
Oral Exam: 16 September, 2024

Results of all evaluations and the final ranking will be notified by email.

Ph.D course in Functional and Structural Genomics

Head of the Ph.D course: **Prof. Remo Sanges**

Web site: **Functional and Structural Genomics**

Research lines:

Functional genomics
Cerebral cortex development
Prion biology
Computational genomics
Neurodevelopmental and neurodegenerative disorders
Bioinformatics
Neurogenomics
Structural biology
Molecular and cellular biology
Evolutionary and comparative genomics
Drug discovery
Invertebrates neurogenetics
Epitranscriptomic modulation of CNS development and function
Aging

Fellowships available: 4

Admission: **Academic and scientific qualifications + oral exam (remotely/presence)**

Beginning of the Courses: 4th November, 2024

Evaluation of academic and scientific qualifications: 30 points
Access to Oral Exam: minimum mark of 21/30 on academic and scientific qualifications (max. 15 candidates)
Evaluation of Oral Exam: 70 points
Total Evaluation: 100 points

To be considered eligible, candidates must pass all the phases (academic qualifications, and interview) with a minimum mark of 7/10 or equivalent.

First Session

Deadline for online submission of applications: 22nd April, 2024
Oral Exam: 20th and 21st May, 2024

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

Deadline for online submission of applications: 19th August, 2024
Oral Exam: 16th and 17th September, 2024

Admission to the oral 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. Ugo Bruzzo

Web site: [**Geometry and Mathematical Physics**](#)

Research lines:

- Integrable systems in relation with differential, algebraic and symplectic geometry, as well as with the theory of random matrices, special functions and nonlinear waves, Frobenius manifolds.
- Geometry of moduli spaces of sheaves and of curves, their deformation theory and virtual classes also in relation with supersymmetric gauge theories, strings, Gromov-Witten invariants, orbifolds and automorphisms.
- Quantum groups, noncommutative Riemannian and spin geometry, applications to models in mathematical physics.
- Mathematical methods of quantum mechanics.
- Mathematical aspects of quantum Field Theory and String Theory.
- Symplectic geometry, sub-riemannian geometry, stochastic geometry, real algebraic geometry.
- Geometry of quantum fields and strings.
- Complex differential geometry.
- Generalized complex geometry.

Fellowships available: 8

Admission: Academic and scientific qualifications + oral exam (remotely)

Beginning of the Courses: 1st October, 2024

Evaluation of academic and scientific qualifications: 30 points
Access to Oral Exam: minimum mark of 21/30 in the academic and scientific qualifications evaluation.
Evaluation of Oral Exam: 70 points

To be considered eligible, candidates must pass all the phases (academic qualifications, and interview) with a minimum mark of 7/10 or equivalent.

Single Session

Deadline for online submission of applications: 5th February, 2024

Oral Exam: 19th – 22nd February, 2024

Admission to the oral 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. Massimiliano Berti**
Web site: **Mathematical Analysis, Modelling, and Applications**
Research lines:

- Conservation Laws
- Transport Problems
- Geometric PDEs
- Numerical Analysis of PDEs
- Nonlinear Analysis
- Dynamical Systems
- Hamiltonian and dispersive PDEs
- 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
- Uncertainty quantification
- Shape optimization
- Flow control
- Machine Learning

Fellowships available: **8**

Admission: **Academic and scientific qualifications + written exam + oral exam (in presence – upon Committee discretion candidates domiciled beyond 200 km from Trieste will be allowed to attend remotely contemporaneously to the other candidates)**
Beginning of the Courses: **1st October, 2024**

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

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent.

Deadline for online submission of applications: 5th February, 2024

Written Exam: **5th March, 2024**
Oral Exam: **6th March, 2024**

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. Paul Heppenstall**

Web site: **[Neurobiology](#)**

Research lines:

- Peripheral Nervous System
- Pain, touch and itch
- Synaptic Neurophysiology and Neuronal Networks
- Cell excitability and cortical information processing
- Optogenetic and electrophysiological approaches to Neuronal Networks
- Computational Neuroscience and Modelling
- Neurotoxicity and calcium signaling
- New Materials and Neurons
- Neurophysiology of Motor control
- Spinal networks patho-physiology and locomotion
- Respiratory physiology
- Neurophysiology and neuropharmacology of spinal motoneurons
- Visual systems and feature detection
- Simultaneous acquisition of neural activity and behavior
- Innate behaviors and their underlying circuits
- Functional imaging approaches to neural circuits
- Neuroecology

Fellowships available: **4**

Admission: **Academic and scientific qualifications + oral exam (remotely/presence)**

Beginning of the Courses: **4 November, 2024**

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 on written exam
Evaluation of Oral Exam: 50 points

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent

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First Session

Deadline for online submission of applications: **12th April, 2024**
Written Exam: **14th May, 2024**
Oral Exam: **15th May, 2024**

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

Deadline for online submission of applications: **20th August, 2024**
Written Exam: **25th September, 2024**
Oral Exam: **26th September, 2024**

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

Ph.D course in Physics and Chemistry of the Biological Systems

Head of the Ph.D course: **Prof. Cristian Micheletti**

Web site: **[Physics and Chemistry of the Biological Systems](#)**

Research lines:

- Statistical mechanics of complex molecular systems
- Biomolecular simulations
- Simulations of rare events
- Soft Matter Physics
- Polymer Physics

Fellowships available: **4**

Admission: **Academic and scientific qualifications + written exam + oral exam (remote)**

Beginning of the Courses: 1st October, 2024

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 on written exam
Evaluation of Oral Exam: 50 points

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent

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Deadline for online submission of applications: 25th March, 2024

Written Exam: **8th April, 2024**
Oral Exam: **10th April, 2024**

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. Gesualdo Delfino**

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
Stochastic processes and applications

Fellowships available: **5**

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

Beginning of the Courses: 1st October, 2024

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

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent

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Single Session

Deadline for online submission of applications: 27th February, 2024

Oral Exam: **11th to 15th March, 2024**

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. Francesco Benini**

Web site: **Theoretical Particle Physics**

Research lines:

- Formal aspects of Quantum Field Theories
- Conformal Field Theories
- String Theory, AdS/CFT duality and applications
- Supersymmetric Field Theories
- Quantum Gravity
- Physics beyond the Standard Model and at the LHC
- Flavour Physics

Fellowships available: 5

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

Beginning of the Courses: 1st October, 2024

Evaluation of academic and scientific qualifications: 20 points
Access to Written Exam: minimum mark of 14/20 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: 40 points

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent

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Deadline for online submission of applications: 4th March, 2024

Written Exam: 20th March, 2024
Oral Exam: 21st and 22nd March, 2024

Results of all evaluations and the final ranking will be notified by email.

Ph.D course in Theory and Numerical Simulation on the Condensed Matter

Head of the Ph.D course: **Prof. Giuseppe Santoro**

Web site: **Theory and Numerical Simulation on the Condensed Matter**

Research lines:

- Non-equilibrium dynamics of correlated systems
- Theoretical Quantum Technologies
- 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: **6 financed by SISSA**

1 co-financed by Leonardo SpA on *"Hybrid quantum and classical computation workflows for quantum machine learning"*

1 co-financed by Commisariat à l'Énergie Atomique et aux Énergies Alternatives (CEA - France) on *"Development of theoretical and numerical tools to predict capture cross-sections and decay rates in non-radiative phenomena"*

Admission: **Academic and scientific qualifications + oral exam (remotely)**

Beginning of the Courses: **1st October, 2024**

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

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent

Deadline for online submission of applications: 27th February, 2024

Oral Exam: **11th -15th March, 2024**

All results and the final ranking will be notified by email.

Ph.D course in Theoretical and Scientific Data Science

Head of the Ph.D course: **Prof. Roberto Trotta**

Web site: [**Theoretical and Scientific Data Science**](#)

Fellowships available:

4 financed by SISSA
- Bayesian methods and machine learning
- Theory and applications of neural networks
- Information theory
- Simulation-Based Inference
- Unsupervised segmentation of high-dimensional data and dimensionality reduction
- Statistical modelling of biomedical data and bioinformatics
- Cosmological and astrophysical data analysis and model selection
- Applications of data science to statistical mechanics, neurosciences, and condensed matter physics
- Machine learning applied to Oncology

2 financed by Human Technopole Foundation (see also specific announcement)
- Data Science methods for molecular biomedicine and biological imaging
- Computer vision applied to biological data
- Statistical physics, machine learning and systems biology for the prediction of antibiotic resistance
- Cancer evolution and reconstruction of dynamical systems
- Spatial modelling of gene expression in tissues

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

Beginning of the Courses: 1 October, 2024

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

To be considered eligible, candidates must pass all the phases (academic qualifications, written test, and interview) with a minimum mark of 7/10 or equivalent

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First Session

Deadline for online submission of applications: 23rd February, 2024

Written Exam: 11th March, 2024
Oral Exam: 25 -29th March, 2024

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

Deadline for online submission of applications: 23 August, 2024

Written Exam: 2nd September, 2024
Oral Exam: 9th - 13th September, 2024

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