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: 5
Admission: Academic and scientific qualifications + oral exam (remotely/presence)
Beginning of the Courses: 1 October, 2025

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: 23rd March, 2025
Oral Exam: 8th and 9th April, 2025

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

Deadline for online submission of applications: 24th August, 2025
Oral Exam: 9th and 10th September, 2025

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, 2025**

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: 4th March, 2025

Oral Exam: **24th – 27st March, 2025**

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

Ph.D course in Geometry and Mathematical Physics

Head of the Ph.D course: Prof. Marcello Porta
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
- Derived algebraic geometry
- Quantum groups, noncommutative Riemannian and spin geometry, applications to models in mathematical physics
- Mathematical methods of quantum mechanics and statistical physics
- Mathematical aspects of quantum field theory and string theory
- Symplectic geometry, sub-Riemannian geometry, stochastic geometry, real algebraic geometry
- Complex differential geometry
- Generalized complex geometry
- Low dimensional topology

Fellowships available: **8**
Admission: **Academic and scientific qualifications + oral exam (remotely)**
Beginning of the Courses: **1st October, 2025**

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.

Deadline for online submission of applications: **16th January, 2025**
Oral Exam: **10th to 14st February, 2025**

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

Deadline for online submission of applications: **8th August, 2025**
Oral Exam: **8th and 9th September, 2025**

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, 2025**

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: **9th February, 2025**
Written Exam: **10th March, 2025**
Oral Exam: **11th March, 2025**

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

Deadline for online submission of applications: **30th August, 2025**
Written Exam: **10th September, 2025**
Oral Exam: **11th September, 2025**

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

Ph.D course in Molecular and Statistical Biophysics

Head of the Ph.D course: **Prof. Cristian Micheletti**
Web site: **Molecular and Statistical Biophysics**
Research lines:

- Statistical mechanics of complex molecular systems
- Activity-driven biological processes
- Stochastic processes and biological noise
- Biomolecular simulations
- Simulations of rare events
- Soft Matter Physics
- Quantum Computing for Soft Materials

Fellowships available: **4**
Admission: **Academic and scientific qualifications + written exam + oral exam (remote)**
Beginning of the Courses: **1st October, 2025**

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

Deadline for online submission of applications: 28th April, 2025

Written Exam: **12th May, 2025**
Oral Exam: **13th May, 2025**

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

Deadline for online submission of applications: **25th August, 2025**

Written Exam: **4th September, 2025**
Oral Exam: **5th September, 2025**

Admission to the oral 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
- 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, 2025

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

Single Session

Deadline for online submission of applications: 4th March, 2025

Oral Exam: 17th to 21st March, 2025

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: **6**
Admission: **Academic and scientific qualifications + oral exam**
Beginning of the Courses: **1st October, 2025**

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: 17th February, 2025

Oral Exam: **18th – 21st March, 2025**

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. Alessandro Silva**
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: 7
Admission: Academic and scientific qualifications + oral exam (remotely)
Beginning of the Courses: 1st October, 2025

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: 4th March, 2025

Oral Exam: 17th – 21st March, 2025

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**
Research lines:

- 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

Fellowships available: 5
Admission: **Academic and scientific qualifications + written exam + oral exam**
Beginning of the Courses: 1 October, 2025

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

First Session

Deadline for online submission of applications: 14th February, 2025

Written Exam: **28th February, 2025**
Oral Exam: **10th - 13th March, 2025**

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