PhD Programme Table - 38th cycle
NRRP "National Recovery and Resilience Plan" Call for Applications

Section "Available Positions and Scholarships" integrated on 27/07/2022

Section "Available Positions and Scholarships" integrated on 29/07/2022

PROGRAMME'S NAME	MATHEMATICS
DURATION	3 years
PROGRAMME START DATE	01/11/2022 (DD/MM/YYYY)
LANGUAGES	Italian, English
COORDINATOR	Prof.ssa Valeria Simoncini (valeria.simoncini@unibo.it)
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	3
ADMISSION PROCEDURE	Qualifications evaluation Oral examination

Available Positions and Scholarships

Pos. n.	Financial Support	Description	Positions linked to a specific research topic
1	***PhD Scholarship Ex M.D. 351/2022 - PA***	Funded by the EU - NextGenerationEU with funds made available by the National Recovery and Resilience Plan (NRRP) Mission 4, Component 1, Investment 4.1 (MD 351/2022) – Public Administration	Big data and computational methodologies for decision-making processes in management
2	***PhD Scholarship Ex M.D. 352/2022***	Funded by the EU - NextGenerationEU with funds made available by the National Recovery and Resilience Plan (NRRP) Mission 4, Component 2, Investment 3.3 (MD 352/2022) and by Spike Reply	New mathematical methods for machine learning applied to threat and risk management for automotive cyber security
3	***Executive PhD***	PhD position reserved for employees of MARPOSS SpA	Problems of system identification by neural networks and applications to the mapping of measure errors

Applicants awarded with Ex M.D. 351/2022 or Ex M.D. 352/2022 PhD scholarships shall have specific obligations (i.e. mandatory research periods abroad and/or in a firm) during their PhD programme. For detailed information, refer to the Call for Applications, articles 1.2 and 1.3, and to the text of the law.
For any other eventual PhD positions, a 3-month research period abroad is mandatory.

Admission Exams

The admission exams detailed schedule shall be published **starting from July 12th, 2022:**

- on the University website, selecting the relevant PhD Programme > "More information", at the bottom of the page in the section "Notices";

- on Studenti Online (select "summary of the requests in progress" > "see detail" and open the .pdf file at the bottom of the page). **No personal written communication will be sent to applicants**.

Required and Supporting Documents to be attached to the application

All the documents listed below **shall be drawn up in English or in Italian**. In case of documents originally issued in any other language (e.g. identity document, qualifications), an official translation is required.
Only qualifications obtained **during the last 5 calendar years** shall be taken into consideration, except for the University Degree. The Admission Board will assess the relevance of the supporting documents to the PhD Programme.

REQUIRED DOCUMENTS	
Identity document	Valid identity document with photo (i.e. identity card, passport)
Curriculum Vitae	No specific CV format is required
Degrees	Documents attesting the awarding of the first and second cycle degrees, the exams taken and the marks obtained (see Art. 3 of the Call for Applications)
SUPPORTING DOCUMENTS	
Thesis abstract	Abstract of the **second cycle degree thesis.** Graduands applicants may submit the draft of the thesis. Abstracts cannot exceed 5,000 characters, including spaces and formula possibly used. The above figure does not include: the title of the thesis, the outline, references, and images such as graphs, diagrams, tables etc.
Reference letter/s	**No more than 3 reference letters** signed by Italian and international academics and professionals in the research field, which do not form part of the Admission Board, attesting the suitability of the applicant and his/her interest in the scientific research. Letters shall be uploaded following the procedure on Studenti Online, detailed in the Call for Applications (Art. 3.2).
Personal Statement	The statement shall include the reasons prompting the applicant to attend the PhD Programme and **those relevant experiences and research interests**, that make the applicant suitable for the specific PhD Programme (3000 characters maximum, including spaces).
Publications	Lists of publications (i.e. monographs, articles on scientific journals), minor publications (conference papers, etc.), abstracts and posters presented during national and international conferences, etc.
Other documents	- Postgraduate vocational programmes and/or specialisation programmes relevant to the PhD Programme - Research activity of any kind - whether basic, applied, translational, etc. - carried out in any capacity, including when covered by research grants, and as a staff member of research projects - Periods of study abroad, completed by applicants outside their countries of origin (e.g. Erasmus programme or other similar mobility programmes) - Other qualifications attesting the suitability of the applicants (scholarships, prizes, etc.)

Evaluation criteria*

Scores will be expressed in points out of 100, as follows.

1. Qualifications evaluation

Minimum score for admission to the oral examination: 30 points, Maximum score: 50 points

Passed exams, final mark and Weighted Average Mark (WAM) for the First (Bachelor's) and Second cycle degrees (Master's), in order to evaluate the applicants' whole study, general knowledge and their consistency with the PhD programme's main research topics	13 points max
Publications	2 points max
Thesis abstract	5 points max
Reference letter/s	12 points max
Curriculum Vitae, personal statement and other evaluable documents	18 points max

2. Oral examination

Minimum score for eligibility: 30 points, Maximum score 50 points

English language proficiency	2 points max
General knowledge of issues encompassed by the PhD Programme	48 points max

Oral examination aims to assess the suitability of the applicant for scientific research as well as the general knowledge of issues encompassed by the PhD Programme (see the list of research topics at the bottom of the present document). **During the oral examination, the applicant's English proficiency shall be assessed**.

The oral examination is carried out in Italian or English.

* Possible further evaluation criteria will be available on the University website, selecting the relevant PhD Programme > "More information".

Research Topics

- Commutative algebra and classical algebraic geometry
- Algebra and combinatorics
- Complex analysis
- Geometric and harmonic analysis for data analysis and machine learning
- Phase space geometric analysis of pdes
- Geometric analysis on Carnot groups
- Stochastic analysis and applications
- Applications of microlocal analysis to mathematical physics
- Stochastic optimal control
- Data science and artificial intelligence
- Didactics of mathematics
- Nonlocal equations and fractional minimal surfaces
- Quantitative finance
- Geometry of varieties
- Continuum mechanics
- Statistical mechanics and applications
- Functional analysis methods for pdes
- Optimization methods for ill-posed inverse problems in imaging
- Numerical optimization methods without derivatives
- Numerical and matrix methods for the treatment of differential problems and in data science
- Geometric modeling and processing
- Mathematical models in medicine and physiology
- Non-linear wave propagation and non-equilibrium thermodynamics
- Properties of linear and non-linear elliptic operators
- Properties of subelliptic operators
- Random fields and percolation
- Dynamical systems and applications
- Quantum information theory
- Perturbation theory and spectral analysis in quantum mechanics
- Geometric measure theory
- Spectral theory
- Geometric and computational topology