ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA | AREA
FORMAZIONE E DOTTORATO

PHD PROGRAMME TABLE 40TH CYCLE

Section “Admission Exams” modified on 14/06/2024

Section “Available Positions and Scholarships” modified on 17/06/2024

PROGRAMME’S NAME	PHYSICS
ASSOCIATED PARTNERS *Pursuant to art. 3 para 2 lett. b) of the MD n. 226/2021*	Istituto Nazionale di Fisica Nucleare - INFN
DURATION	3 years
PROGRAMME START DATE	01/11/2024 (DD/MM/YYYY)
LANGUAGES	Italian, English
COORDINATOR	Prof. Alessandro Gabrielli (alessandro.gabrielli@unibo.it)
PhD POSITIONS	24
ADMISSION PROCEDURE	Qualifications evaluation Oral examination

Available Positions and Scholarships

Pos. n.	Financial Support	Description	Positions linked to research topics
1	***PhD scholarship***	Totally funded by the University of Bologna general budget	Experimental Physics of Fundamental Interactions
2	***PhD scholarship***	Totally funded by the University of Bologna general budget	Experimental Physics of Fundamental Interactions
3	***PhD scholarship***	Totally funded by the University of Bologna general budget	Nanomaterials for hydrogen-based energy conversion and storage
4	***PhD scholarship***	Totally funded by the University of Bologna general budget	Theoretical Physics of Fundamental Interactions
5	***PhD scholarship***	Totally funded by the University of Bologna general budget	Theoretical Physics of Fundamental Interactions
6	***PhD scholarship***	Funded by the Department of Physics and Astronomy with funds made available by the project ERC-2021-STG FFHiggsTop "High-precision multi-leg Higgs and top physics with finite fields” - GA 101040760 - CUP: J33C22002410005 - Ref. Prof. Tiziano Peraro	Amplitudes and Feynman integrals for particles physics phenomenology
7	***PhD scholarship***	Funded by the Department of Physics and Astronomy with funds made available by the project Horizon Europe ERC QUANTHEM “Quantum Synthetic Models for Entangled Matter Out of Equilibrium” - G.A. 101114881 - Ref. Prof. Lorenzo Piroli - CUP J33C23003910006	Sistemi quantistici sintetici fuori equilibrio

8	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy with funds made available by the project H2020 “Genomed4all - Genomics and Personalized Medicine for all though Artificial Intelligence in Haematological Diseases” - GA 101017549 - CUP J55F21001360006 - Ref. Prof. Daniel Remondini	Machine and deep learning methods for high dimensional biomedical data analysis
9	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy with funds made available by the project IMAPP_EMJM_A C - Progetto IMAPP - Erasmus Mundus Joint Master – Ref. Prof. Angelo Carbone (CUP J36E22000110006)	Data analysis and innovative detector developments at LHCb
10	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy	Development and performance qualification of a prototype SiPM readout for the ePIC-dRICH detector at EIC-
11	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy with funds made available by the project ERASMUS+ "Identities - integrate disciplines to elaborate novel teaching approaches to interdisciplinarity and innovate preservice teacher education for stem challenges” – Ref. Prof. Olivia Levrini - CUP J31J19000080006	Interdisciplinarity in STEAM education
12	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy	The SAND detector contribution to neutrino oscillation studies with the DUNE experiment
13	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy with funds made available by the project CRYST^3 ATOM-LIGHT “Crystals in photonic crystals” - GA 964531 - CUP J35F21000210006 -Ref. Prof. Francesco Minardi	Quantum technologies with cold atoms and photonic optical fibers
14	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy with funds made available by the project PRIN 2022 SUPERLATIVO – SUPErlattices of ReLATIVistic Oxides cod. 2022L28H97_002 CUP J53D23001440006 – Ref. Prof. Cesare Franchini	Machine learning approaches for understanding and designing quantum materials
15	***PhD scholarship***	Funded by the University of Bologna general budget and by the Department of Physics and Astronomy with funds made available by the project IMAPP_EMJM_A C - Progetto IMAPP - Erasmus Mundus Joint Master – Ref. Prof. Fabio Maltoni (CUP J36E22000110006)	Theoretical study of quantum information inspired observables at the LHC
16	***PhD scholarship***	Funded by Istituto Nazionale di Fisica Nucleare – INFN	Nuclear, subnuclear and astroparticle physics and physics of the fundamental interactions, investigated experimentally, and technological research and development
17	***PhD scholarship***	Funded by Istituto Nazionale di Fisica Nucleare - INFN	Nuclear, subnuclear and astroparticle physics and physics of the fundamental interactions, investigated experimentally, and

			technological research and development
18	***PhD scholarship***	Funded by Istituto Nazionale di Fisica Nucleare – INFN	Theoretical Physics of Fundamental Interactions
19	***PhD scholarship***	Funded by the Department of Physics and Astronomy in partnership with Max Planck Institute for the Structure and Dynamics of Matter, with funds made available by the project MSCA BITMAP – GA n° 897276 - Ref. Prof. Domenico Di Sante	Developing research activities in the field of first principles simulations of the electronic properties of quantum materials
20	***PhD scholarship***	Funded by the Department of Physics and Astronomy with funds made available by the project IMAPP_EMJM_AC - Erasmus Mundus Joint Master – Ref. Prof. Angelo Carbone (CUP J36E22000110006) and by the project PRIN 2022 - D.D. 104/2022 – Ref. Prof. Maltoni Fabio, Mission 4 Component 2 Investment 1.1, NRRP "The Effective Field Theory path to New Physics" cod. 2022RXEZCJ_001 CUP J53D23001820006	Experimental study of quantum information inspired observables at the LHC
21	***PhD scholarship***	Funded by INFN CNAF - Istituto Nazionale di Fisica Nucleare	Development of advanced software techniques for image/frame analysis from innovative radiation detectors
22	***PhD scholarship***	Funded by the Department of Physics and Astronomy in partnership with ABM srl Automazione industriale and INFN - Istituto Nazionale di Fisica Nucleare	Upgrade and automation of a Gd-water purification plant for neutron veto in dark matter experiments
23	***PhD scholarship***	Funded by the Department of Physics and Astronomy in partnership with Mindicity S.r.l. S.B. and Fondazione Bruno Kessler - FBK	Development of models for prediction and control of complex urban systems
24	***PhD scholarship***	Funded by Istituto Nazionale di Fisica Nucleare - INFN	Study of scintillating plastic materials for high-time resolution calorimeters and data analysis at the LHCb experiment

The number of positions and scholarships may be incremented in case additional funding becomes available, notwithstanding the terms of the application process in the Call. Any amendment, update or integration of the Programme Table will be published on the University website, even after the Call for applications has expired. Any further PhD positions shall be integrated in the PhD Programme Table within ten days before the oral examination.

All PhD positions winners shall fulfill the learning and research obligations decided by the Academic Board and the obligations foreseen in the relevant regulations, funding schemes and eventual agreements, and in the Call for Applications.

Admission Exams

	DATE AND TIME	**RESULTS**
Qualifications evaluation	Applicants' participation is not required	Available from **25/06/2024**
Oral examination	**Date**: starting from ~~02~~ **08/07/2024** – **10.00 a.m. CEST** **Place**: In presence, Department of Physics and Astronomy, via Irnerio 46, Bologna. Remotely, using Microsoft Teams	Available from ~~09~~ **17/07/2024**

The results of the qualifications and research proposal evaluation shall be available on the webpage Studenti Online (select "summary of the requests in progress" > "see detail" and open the .pdf file at the bottom of the page) together

with the oral examination detailed schedule. **No personal written communication will be sent to applicants concerning the examinations results**.

During the oral examination, applicants may express their interest in one or more positions linked to specific research topics.

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	We recommend all applicants to draw up their Curriculum Vitae according to the **Curriculum Vitae form**, in Attachment 1 to the present PhD programme table and downloadable in .docx from the University website (select the PhD Programme → "*More information*", then check "*Notices*" at the bottom of the page). The following experiences will be deemed evaluable: - Postgraduate vocational programmes and/or specialisation programmes relevant to the PhD Programme - Teaching activity carried out at academic level - 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 - Work activity - Curricular or non-curricular professional internships - Documents attesting the applicants's foreign languages proficiency - Study periods 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.)
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 description	Description of the second cycle degree thesis, drawn up using the **template Thesis Description**, in Attachment 2 to the present PhD programme table and downloadable in .docx from the University website (select the PhD Programme → "*More information*", then check "*Notices*" at the bottom of the page). The document cannot exceed a 2-pages lenght (A4, font size 11, single line spacing). It must be structured as follows: - State of the art and scientific background - Thesis abstract, detailing attained or foreseen results - Future development of the research activity begun with the thesis Graduands may submit a description of the thesis they are currently working on. Applicants awarded with a degree in a foreign institution, not including a research thesis as part of the programme, can submit a research proposal with the described structure.
Personal Statement	Personal statement drawn using the **template Personal statement**, in Attachment 3 to the present PhD programme table and downloadable in .docx from the University website (select the PhD Programme → "*More information*", then check "*Notices*" at the bottom of the page). The document cannot exceed a 2-pages lenght (A4, font size 11, single line spacing). It must be structured as follows: - reasons prompting the applicant to attend the PhD Programme - research interests - relevant experiences - position/s linked to a specific research topic applicants wish to express their interest in.

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).
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.

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

Second cycle degree (Master's) final mark. Graduands shall be evaluated according to the Weighted Average Mark (WAM) - taking into account the exams not yet taken	10 points max
Publications	3 points max
Curriculum Vitae evaluation	7 points max
Thesis description	15 points max
Personal statement	15 points max

2. Oral examination

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

English language proficiency	3 points max
Thesis description presentation	25 points max
General knowledge of the PhD programme's main research topics and of the research topics linked to the available PhD positions	22 points max

Oral examination aims to assess the suitability of the applicant for scientific research as well as the general knowledge of the PhD programme's main research topics and of the research topics linked to the available PhD positions.

The oral examination is carried out in English.

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

Attachment 1

Curriculum Vitae

PhD Programme in Physics

Personal Information

First name(s) / Surname(s)	
Nationality	
Date of birth (day, month, year)	
Gender	
Email address	

University Education

Master

Official duration in years				
Dates (start – end or planned end)				
Awarding institution	*(e.g. University of Bologna - Italy)*			
Title of qualification awarded	*(e.g. MSc in Biology)*			
Marks	**YOUR mark**	**Minimum PASS mark**	**Maximum mark**	**ECTS conversion (*if available)***
Final grade (if available)				
Weighted average of exam marks				
Title and topic of Master Thesis				

Bachelor

Official duration in years				
Dates (start – end or planned end)				
Awarding institution	*(e.g. University of Bologna - Italy)*			
Title of qualification awarded	*(e.g. BSc in Pharmacy)*			
Marks	**YOUR mark**	**Minimum PASS mark**	**Maximum mark**	**ECTS conversion (*if available)***
Final grade (if available)				
Weighted average of exam marks				
Title and topic of Bachelor Thesis				

Employment

Currently employed	☐Yes ☐No
Summary of current employment	
Past employment record and skills obtained	

Research and Study Abroad Experiences

List periods of study abroad (Erasmus and/or others), and research periods at universities or public/private institutions (only the last 5 years will be considered)

Scientific research of any kind (basic, oriented, translational, applied etc.)
Periods of study abroad (*e.g.* Erasmus)

Other qualifications

List other experiences relevant to the PhD Programme (only the last 5 years will be considered)

University Master Courses (Master universitari di I e II livello) completed in Italy (1st or 2nd level) relevant to the PhD Programme
Postgraduate training programmes/specialization programmes relevant to the PhD Programme
Internships

University teaching at any level

Other qualifications attesting the applicant's skills and education (prizes, grants etc.)

Language Proficiency

Mother tongue(s)					
Other language(s)	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
Language:	Level:	Level:	Level:	Level:	Level:
	Language certificate:				
Language:	Level:	Level:	Level:	Level:	Level:
	Language certificate:				
	Levels: A1/2: Basic user - B1/2: Independent user - C1/2 Proficient user Common European Framework of Reference for Languages				

Attachment 2

Description of Second Cycle Degree (Master) Thesis or Equivalent Research Project

Description of Master thesis (or corresponding draft for those who have not graduated yet) or equivalent research project (for foreigner candidates who did not work on a thesis): maximum 2 A4 pages, font size 11, single line spacing.

State of the art

Describe here the state of the art and the scientific background of the thesis work.

Results

Outline here the main results obtained (or expected) in the thesis work stressing their scientific relevance and originality.

Future developments

Illustrate here potential future directions of research opened up by the thesis work.

Attachment 3

Personal Statement

Letter of Intent: maximum 2 A4 pages, font size 11, single line spacing.

Motivation

Illustrate here the motivation behind applying for a PhD position in Physics at the University of Bologna.

Research interests

Describe here your scientific interests and the research line you would like to focus on if admitted to the PhD programme in Physics of the University of Bologna.

Personal qualifications

Explain here why you deem yourself well qualified to perform successfully in the PhD programme in Physics of the University of Bologna.

Intentional choice of PhD Scholarships

List here the titles of the PhD Scholarships you are interested in (this list will have to be confirmed at the oral interview, if admitted). A brief description of each PhD Scholarship can be found in the attached file which contains also the name and email address of Unibo and INFN staff who can be contacted to get more info.