

PHD PROGRAMME TABLE 38TH CYCLE

Section “Available Positions and Scholarships” integrated on 13/05/2022

Section “Available Positions and Scholarships” integrated on 07/06/2022

Section “Available Positions and Scholarships” integrated on 08/06/2022

Section “Available Positions and Scholarships” integrated on 13/06/2022

PROGRAMME’S NAME	MECHANICS AND ADVANCED ENGINEERING SCIENCES (DIMSAI)
DURATION	3 years
PROGRAMME START DATE	01/11/2022 (DD/MM/YYYY)
LANGUAGES	Italian, English
MANDATORY STAY ABROAD	3 months
COORDINATOR	Prof. Lorenzo Donati (l.donati@unibo.it)
CURRICULA	<ol style="list-style-type: none"> 1. Engineering and Industrial Design, Machine Construction, Metallurgy, and Manufacturing Technologies 2. Fluid Machinery, Energy Systems, Mechanics of Machines, and Industrial Mechanical Plants 3. Thermal Physics, HVAC Systems, Acoustics, Nuclear Technologies and Industrial Applications of Plasmas
RESEARCH TOPICS	Detailed list at the bottom of the present document
PHD POSITIONS	16
ADMISSION PROCEDURE	Qualifications and research proposal evaluation Oral examination

Available Positions and Scholarships

Pos. n.	Financial Support	Description	Curriculum	Positions linked to a specific research topic
1	PhD Scholarship	Totally funded by the University of Bologna general budget	1	
2	PhD Scholarship	Totally funded by the University of Bologna general budget	2	
3	PhD Scholarship	Totally funded by the University of Bologna general budget	2	
4	PhD Scholarship	Totally funded by the University of Bologna general budget	3	
5	PhD Scholarship	Funded by the Department of Electrical, Electronic, and Information Engineering “Guglielmo Marconi” with funds made available by the project PRIN_2020_Co-MiR_MELCHIORRI - CUP 2020CMEFPK_001	2	Mobile Multi-Robot Cable-driven Systems
6	Research Grant	Provided by the Department of Industrial Engineering with funds made available by the project H2020 NEMUS - Numerical Restoration of Historical Musical Instruments – NEMUS - G.A. n. 950084 – CUP	3	Experimental vibro-acoustical analysis of orthotropic plates. Application to the digital restoration of historical musical instruments

		J55F21000920006. Ref.: Prof. Michele Ducceschi. The research grant will have a duration of 36 months and a gross percipient amount of € 81,774.00		
7	Research Grant	Provided by the Department of Industrial Engineering with funds made available by the project H2020 NEMUS - Numerical Restoration of Historical Musical Instruments – NEMUS - G.A. n. 950084 – CUP J55F21000920006. Ref.: Prof. Michele Ducceschi. The research grant will have a duration of 36 months and a gross percipient amount of € 81,774.00	3	Haptic-Enabled Hardware Interface Design for Advanced Physical Models
8	PhD Scholarship	Funded by the Department of Industrial Engineering	2	Elastodynamic analysis of horns for ultrasonic welding systems
9	Research Grant	Provided by the Department of Industrial Engineering. The research grant will have a duration of 12 months, renewable up to 36 months, and gross percipient amount of €24,482.52	1	Study of intelligent composite material solutions for the design and manufacture of lower limb prosthetic components
10	Apprenticeship PhD position	Apprenticeship PhD Position with Energy Technology Srl. The applicant awarded with such position must enter into the contract by December 31st, 2022 and maintain it until October 31st, 2025, or longer in case of suspension or extension resulting in the postponement of the legal duration of the programme.	3	Investigations on electromechanical solutions for the safe interruption of high currents in superconducting magnets
11	PhD Scholarship	Co-funded by the University of Bologna general budget and by the Department of Industrial Engineering	1	
12	PhD Scholarship	Co-funded by the University of Bologna general budget and by the Department of Industrial Engineering	2	
13	PhD Scholarship	Co-funded by the University of Bologna general budget and by the Department of Industrial Engineering	3	
14	PhD Scholarship	Co-funded by the University of Bologna general budget and by the Department of Industrial Engineering	3	
15	PhD Scholarship	Funded by NewCleo Srl	3	Development of a methodology for the sensitivity and uncertainty analysis to nuclear data applied to the reactivity swing during burnup for an innovative reactor, and its implementation in the deterministic neutronics code ERANOS

16	PhD Scholarship	Funded by NewCleo Srl	3	Development of the conceptual design of the instrumentation system supporting the control and protection functions for an innovative lead-cooled fast reactor
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Admission Exams

	DATE AND TIME	RESULTS
Qualifications and research proposal evaluation	Applicants' participation is not required	Available from 29/06/2022*
Oral examination	Date: 06/07/2022 – 9.00 a.m. CEST Place: In presence, Department of Industrial Engineering. Remotely, using Microsoft Teams	Available from 12/07/2022*

* The **results of the admission exams** will 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). 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 Italian**. In case of documents originally issued in any other language (e.g. identity document, qualifications), an official English 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)
Research proposal	Multi-annual research proposal, with special emphasis on the activities to be completed during the first-year course . The proposal must meet the following requirements: <ul style="list-style-type: none"> - it cannot exceed 20,000 characters, including spaces and formula possibly used. This figure does not include: the title of proposal, the outline, references and images (such as graphs, diagrams, tables, etc. - if present); - it must include: the state of the art; description of the proposal; expected results; references.
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.
Publications	Lists of publications (i.e. monographs, articles on scientific journals) and minor publications (conference papers, etc.)
Other documents	<ul style="list-style-type: none"> - 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 - Documents attesting the applicant's foreign languages proficiency - 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 and research proposal evaluation

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

Qualifications evaluation	First (Bachelor's) and second cycle (Master's) degrees final marks. Graduands shall be evaluated according to the Weighted Average Mark (WAM)	20 points max
	Publications and other qualifications attesting the applicant's training and skills	5 points max
Research proposal evaluation	Scientific value and ground-breaking nature of the proposal	15 points max
	Structure of the proposal	5 points max
	Proposal feasibility	5 points max

2. Oral examination

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

English language proficiency	5 points max
Applicant's suitability for academic research and knowledge of the topics connected to the research proposal	30 points max
General knowledge of issues encompassed by the Master's degree thesis	15 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 language proficiency shall be assessed.

The oral examination is carried out in Italian or in English.

* Possible further evaluation criteria will be available on the [University website](#), selecting the relevant PhD Programme > "More information", at the bottom of the page in the section "Notices".

Research Topics

Curriculum 1 - Engineering and Industrial Design, Machine Construction, Metallurgy, and Manufacturing Technologies

The curriculum pursues the education of researchers and high-qualified engineers, operating in the fields of Mechanical Engineering and able to address issues related to design and research activities in disciplines such as:

- Tribological behavior of metallic materials, with and without surface modifications
- Metallurgical features of metallic components produced by innovative process, such as additive manufacturing
- Mechanical design and structures
- Microstructure and mechanical properties of advanced metals and metal matrix composites
- Experimental stress analysis, characterization and development of constitutive models
- Design methods and tools in industrial engineering
- Mechanical technologies and materials.

Curriculum 2 - Fluid Machinery, Energy Systems, Mechanics of Machines, and Industrial Mechanical Plants

The curriculum includes different subjects, ranging from internal combustion engines to industrial mechanical plants. For the cultural fields Internal Combustion Engines, Fluid Machinery, Energy Conversion Systems the curriculum studies fluid machinery and energy conversion systems, addressing thermodynamic, fluid dynamic, energetic, ecological and technological issues by means of modeling, control and testing.

In particular, the main research areas are:

- Modeling, control and testing of internal combustion engines and hybrid vehicles
- Fluid dynamics simulation of internal combustion engines and fluid machinery
- Numerical and experimental analysis in the field of gas turbines, combined cycles, steam engines, prime movers, and integrated systems for the processing and storage of energy from renewable and non-renewable sources.

For the cultural fields Mechanics of Machines and Industrial Mechanical Plants the curriculum comprises scientific and operative issues concerning the analysis, design and management of devices, machines, processes and industrial plants, through the adoption of a systemic approach and of methodologies drawn from theoretical, applied and experimental mechanics, industrial plants and production. The main research areas are:

- Automation, robotics and mechatronics
- Biomechanics
- Vehicles, transport and lifting systems

- Dynamics and machine vibrations
- Monitoring, diagnostics and prognostics of mechanical systems
- Industrial plants and production systems
- Maintenance and industrial safety
- Instrumentation
- Logistics and operations.

Curriculum 3 - Thermal Physics, HVAC Systems, Acoustics, Nuclear Technologies and Industrial Applications of Plasmas

- Heat transfer and convection theory
- Thermal analysis of porous media
- Thermal and fluid-dynamic aspects of single-phase and two-phase flows in conventional devices and microdevices (microfluidics)
- Applied thermal engineering and HVAC systems
- Heat exchangers and heat recovery systems
- Renewable energy for HVAC (heat pumps, solar plants)
- Environmental acoustics, building acoustics, architectural acoustics, sound absorbing materials and systems, noise control techniques, digital processing of acoustic signals and lightning
- Energy efficient buildings
- Design of nuclear plants
- Radioprotection
- Risk analysis and safety
- Modelling of neutron, charged particle and photon transport
- Applications of nuclear technologies to medicine, industry and cultural heritage
- Direct Numerical Simulation (DNS) of two-phase flow
- Development and validation of advanced computing platforms
- Thermo-hydraulics of advanced nuclear reactors
- Reliability and risk analysis at the system level
- Calculation of thermodynamic and transport properties of plasmas
- Physical modelling and design-oriented simulation of plasma assisted processes
- Diagnostics of plasma sources and processes
- Biomedical applications of cold atmospheric plasmas and plasma medicine.