

PHD PROGRAMME TABLE 37TH CYCLE

Section “Available Positions and Scholarship” integrated on 22/04/2021

Section “Available Positions and Scholarship” integrated on 13/05/2021

Section “Available Positions and Scholarship” integrated on 20/05/2021

Section “Available Positions and Scholarship” integrated on 08/06/2021

PROGRAMME'S NAME	MECHANICS AND ADVANCED ENGINEERING SCIENCES (DIMSAI)
DURATION	3 years
PROGRAMME START DATE	01/11/2021
LANGUAGE	Italian, English
MANDATORY STAY ABROAD	3 months
COORDINATOR	Prof. Marco Carricato (marco.carricato@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 research topics
1	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	1	
2	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	2	
3	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	2	
4	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	2	
5	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	3	
6	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	3	
7	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Industrial Engineering	3	
8	Industrial PhD	Position reserved for employees of Hypertec Solution S.r.l.		
9	PhD position without scholarship			
10	PhD position without scholarship			
11	Research Grant	Provided by the Department of Industrial Engineering with funds made available by an agreement with Istituto Ortopedico Rizzoli. The	1	3D printing, Augmented Reality and Computer

		research grant will have a duration of 12 months, renewable up to 36 months, and gross recipient amount of € 19.367,00		Aided Design for diagnosis, preoperative planning and design of cutting guides
12	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 recipient amount of € 19.367,00	2	Models and tools for the design, optimization and control of the Digital Industry Ecosystem: production, operations and logistics
13	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 recipient amount of € 19.367,00	2	Decision-support systems for Environmental- and Socialdriven planning and control of supply chains ecosystems
14	Research Grant	Provided by the Department of Industrial Engineering with funds made available by the project ERC STARTING GRANTS - Numerical Restoration of Historical Musical Instruments (NEMUS) - (G.A. 950084) P.I. Prof. Michele Ducceschi. The research grant will have a duration of 36 months and gross recipient amount of € 78.522,00	3	Numerical simulation of nonlinear string vibration. Application to the digital restoration of historical musical instruments
15	PhD Scholarship	Funded by the Department of Industrial Engineering with funds made available by an agreement with ENEA	2	Design and management for energy communities
16	PhD Scholarship	Funded within the Research training projects "Big Data per una regione europea più ecologica, digitale e resiliente" (Fondo POR FSE – Resolution n. 752 of 24/05/2021)	2	Big Data and I4.0 technologies for the design and management of smart, integrated, sustainable and resilient supply chain networks

Admission Exams

	DATE AND TIME	RESULTS
Qualifications and research proposal evaluation	Applicants' participation is not required	Available from 16/06/2021*
Oral examination	Date: 02/07/2021 – 9 a.m. CEST Place: Remotely, using Microsoft Teams	Available from 09/07/2021*

* 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 the position linked to a specific research topic.**

Required and Supporting Documents to be attached to the application

(only documents in Italian, English, French, German and Spanish shall be considered as valid and be assessed by the Admission Board)

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. The Curriculum Vitae shall contain all the mandatory information detailed in the form attached at the bottom of the present document . If the CV lacks said information, the qualifications will be evaluated zero: therefore, the applicant will not be admitted to the oral examination.
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	
Research proposal	The multi-annual research proposal must meet the following requirements: <ul style="list-style-type: none"> - it cannot exceed 20.000 characters, including spaces and formulas, if present. This figure does not include: the title, the outline, references and images (such as graphs, diagrams, tables etc. - where present); - it must include: state of the art; project's description; expected results; references; - it must put special emphasis on the activities to be completed during the first-year course.
Thesis abstract	Abstract of the second cycle degree thesis . Graduands may submit the draft of their thesis (abstracts cannot exceed 5.000 characters, including spaces and formulas, if present. The above figure does not include: title, outline, images such as graphs, diagrams, tables etc. if present)
Publications	List of publications divided into main publications (i.e. monographs, articles on scientific journals, volume chapters) and minor publications (conference papers, etc.)
Other documents	<ul style="list-style-type: none"> - Research activity - whether basic, applied, translational, etc. - carried out in any capacity, including when covered by research grants, and as a staff member of research units - Language proficiency certificates - Periods of study abroad, outside the country 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	University degree final mark. Graduands shall be evaluated according to the Weighted Average Mark (WAM)	20 points max
	Publications and other documents attesting the applicant's training and skills	5 points max
Research proposal evaluation	Scientific value and innovative nature of the proposal	15 points max
	Description and 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 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 includes the presentation of the research proposal and 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, 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”.

Final Ranking List and Enrollment

Each PhD position is reserved for one of the Curricula covered by the PhD programme. PhD positions will be awarded on the basis of the Curriculum for which the applicant has expressed his/her preference in the statements made at the time of filling in the application and indicated on the first page of the research proposal submitted. In the event that the applicant has not indicated the preferred Curriculum as described above, the Admission Board will assign him/her a Curriculum based on the research project submitted.

A sub-ranking list for each Curriculum shall be drawn up. In case of vacancies, after having scrolled the whole sub-ranking list, possible unassigned PhD positions will be proposed to eligible applicants from the general ranking list.

Considering the expressions of interest for the **topic-specific position**, the Admission Board will establish if the applicants can be considered eligible for the allocation of the positions linked to specific research topics, taking into account their skills, experience and aptitude. A sub-ranking list for each topic-specific position shall be drawn up.

Within the time limits indicated for enrollment, eligible applicants who did not succeed in the selection procedure may express their interest in a **position without scholarship**, should the latter become available.

After the publication of the results of the oral examination, the **final ranking list** will be available on the [University website](#), selecting the relevant PhD Programme > “More information”, section “Notices” at the bottom of the page.

Following the publication of the final ranking list, successful applicants shall **enroll** on [Studenti Online](#) by the deadline indicated on the [University website](#), selecting the relevant PhD Programme > “More information”.

If a successful applicant withdraws from a position, the following applicant in the ranking list, who is also eligible for the specific position, will be contacted. During the replacement procedure, the new terms of enrollment shall be communicated via e-mail to the chosen applicant.

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.

REQUIRED INFORMATION (to be detailed in the CV)

Surname _____ Name _____ Date of birth _____

CURRICULUM of the PhD programme:

(please, select one option only from the list below)

- Engineering and Industrial Design, Machine Construction, Metallurgy, and Manufacturing Technologies
- Fluid Machinery, Energy Systems, Mechanics of Machines, and Industrial Mechanical Plants
- Thermal Physics, HVAC Systems, Acoustics, Nuclear Technologies and Industrial Applications of Plasmas

EDUCATION

Bachelor's Degree *(or equivalent first cycle degree)*

Programme's name: _____

Programme's type (es. Bachelor's degree, ...): _____

Awarding institution: _____

Degree final mark: _____ (Highest possible mark: _____)

Master's Degree *(or equivalent second cycle degree)*

Programme's name: _____

Programme's type (es. Master's degree, ...): _____

Awarding institution: _____

Degree final mark: _____ (Highest possible mark: _____)

For graduands only

Programme's name: _____

Programme's type (es. Master's degree, ...): _____

Awarding institution: _____

Weighted Average Mark (WAM): _____ (Highest possible mark: _____)