

MECHANICS AND ADVANCED ENGINEERING SCIENCES (DIMSAI)

Section "Curricula and research topics" modified on 07/05/2020

Section "Positions and scholarships" integrated on 19/05/2020

Section "Positions and scholarships" integrated on 28/05/2020

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Starting date of the PhD Programme	01/11/2020
Duration	3 calendar years
Language of the PhD Programme	Italian and English
Mandatory stay abroad	Yes (3 months)
Curricula	Research topics
<p>1. Engineering and Industrial Design, Machine Construction, Metallurgy, and Manufacturing Technologies</p>	<p>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:</p> <ul style="list-style-type: none"> - 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
<p>2. Internal Combustion Engines, Fluid Machinery, Energy Conversion Systems, Mechanics of Machines and Industrial Mechanical Plants Fluid Machinery, Energy Systems, Mechanics of Machines and Industrial Mechanical Plants</p>	<p>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;</p> <ul style="list-style-type: none"> - 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. <p>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:</p> <ul style="list-style-type: none"> - 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

<p>3. Thermal Physics, HVAC Systems, Acoustics, Nuclear Technologies and Industrial Applications of Plasmas</p>	<ul style="list-style-type: none"> - 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.
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PhD positions and scholarships

Position n.	Financial support	Description	Curriculum	Position linked to specific research subject
1	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	1	
2	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	1	
3	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	2	
4	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	2	
5	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	2	
6	PhD Scholarship	Totally funded by the University of Bologna general budget	3	
7	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Department of Industrial Engineering	3	
8	Research Grant	Provided by the Department of Industrial Engineering with funds made available by the project H2020 CASTELDERE G.A. 807083 (GAM AIR 2018) (Prof.ssa Francesca De Crescenzo). The research grant will have a duration of 36 months, with a gross percipient amount of €	1	Methodology for co-creation of ar, vr & mr environments

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9	PhD position without scholarship			
10	PhD position without scholarship			
11	PhD Scholarship	Funded by the Department of Industrial Engineering	2	Control of variable impedance actuators for collaborative robotics applications
12	PhD Scholarship	Funded by the Department of Industrial Engineering	2	Applications of collaborative robotics
13	PhD Scholarship	Funded by the Department of Industrial Engineering	3	Numerical study of single and multifase flows in microchannels
14	Research Grant	Provided by the Department of Industrial Engineering with funds made available by the project H2020 Ontology driven Open Translation Environment (OntoTRANS) Ref. Prof. Emanuele Ghedini. The research grant will have a duration of 12 months, renewable for up to 36 months, and gross percipient amount of € 19.367.	3	Translation environment for representing in a standard ontological form manufacturing process challenges and connecting them with relevant information sources and materials modelling solutions, capable to support optimal materials and process design
15	Research Grant	Provided by the Department of Industrial Engineering. The research grant will have a duration of 12 months, renewable for up to 36 months, and gross percipient amount of € 19.377,95.	2	Design, optimisation and control of sustainable production and logistic systems
16	Research Grant	Provided by the Department of Industrial Engineering. The research grant will have a duration of 12 months, renewable for up to 36 months, and gross percipient amount of € 19.367,00.	2	Development of actuation and gripping devices based on electro-static forces
17	Research Grant	Provided by the Department of Industrial Engineering. The research grant will have a duration of 12 months, renewable for up to 36 months, and gross percipient amount of € 19.367,00.	2	Development of electro-adhesive devices with integrated sensing
18	Research Grant	Provided by the Department of Industrial Engineering in partnership with Soc. Marchesini Group Spa. The research grant will have a duration of 36 months and gross percipient amount of € 73.277,97.	2	Robotic devices for vision-assisted pick&place operations for high-dynamic automatic machinery feeding
19	PhD position without scholarship			
20	PhD Scholarship	Funded by Metalcastello Spa	2	

Each PhD position is reserved for one of the Curricula covered by the PhD programme. These 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 cover page of the research project 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.

Possible unassigned PhD positions related to a specific Curriculum will be proposed to eligible applicants from the general sub-ranking list.

Positions linked to specific research subjects: during the oral test, applicants may express their interest in one or more positions linked to specific research subjects. Considering the expressions of interest above, the Admission Board shall express its view on the suitability of the interested applicants, taking into account their specific skills, experience and aptitude.

Positions without scholarship: within the time limits indicated at the bottom of the final ranking list, eligible applicants who did not succeed in the selection procedure may express their interest in a position without scholarship, should the latter become available.

Admission requirements

Please, see art. 2 of the Call for applications

Mandatory documents to be attached to the application

Please, see art. 3 of the Call for applications

Further qualifications that may be attached to the application, if in possession of the applicant (only qualifications attested by documents drawn up in Italian, English, French, German and Spanish shall be considered as valid and assessed by the Admission Board)

- Abstract of the second cycle master's degree thesis. Undergraduate applicants may submit the draft of the thesis approved by their supervisor (please, note that abstracts cannot exceed 5.000 characters, including spaces and formula possibly used. The above figure does not include: the title of thesis, the outline, and images such as graphs, diagrams, tables etc.)
- Multi-annual research project, with special emphasis on the activities to be completed during the first-year course. The proposal must meet the following requirements:
 - o **It must indicate in the cover page the curriculum of the PhD Programme for which the applicant is applying and on which the research project proposal is focused (projects lacking the indication of the Curriculum in the cover page will be assigned zero points; in this case, the applicant will not be admitted to the oral exam);**
 - o It cannot exceed 20.000 characters, including spaces and formula possibly used. This figure does not include: the title of project, the outline, references and images;
 - o It must include: the state of the art; description of the project; expected results; references.

The research projects that successful applicants shall carry out during their doctoral career may possibly differ from the project proposed at the application stage. This shall be defined together with the supervisor and approved by the Academic Board.

- List of the publications (monographs, articles published on scientific journals, volume chapters).
- List of the minor publications (conference papers, etc.).
- 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 knowledge of foreign languages
- Study periods spent abroad (e.g. Erasmus programme or other similar mobility programmes).
- Other qualifications attesting the suitability of the applicants (scholarships, prizes, etc).

Admission exams (art. 4 of the call for applications)

Examination type	Schedule (please, note that applicants shall not receive any communication concerning the exams schedule)	Examination results publication (please, note that applicants shall not receive any communication concerning the publication of results)
Qualifications and research project evaluation	Non-presential.	The results of the qualifications and research project evaluation shall be available online starting from the 16/06/2020 at the page http://studenti.unibo.it (please, select "summary of the requests in progress" - "see detail" and open the pdf file "risultati valutazione titoli e progetto")
Oral examination	Date	The results of the oral examination shall be available on the webpage http://studenti.unibo.it starting from 08/07/2020 (please, select "summary of the requests in progress" - "see detail" and open the pdf file "risultati prova orale")
	Time	
Applicants shall take the exam remotely. For further details please refer to the relevant provision laid down in art. 4 of the Call for applications.		

Evaluation criteria

Points will be allocated to applications out of a total of 100 on the basis of the following weighting:

1. Qualifications and research project

- Minimum for admission to the oral exam: 30 points
- Maximum: 50 points

Only qualifications relating to the last 5 calendar years prior to the calendar year of publication of the Call for applications shall be taken into consideration, with the exception of the University Degree (Diploma di laurea). Please, note that qualifications must be consistent with the PhD Programme.

Points relating to qualifications shall be allocated on the basis of the following criteria:

- Graduation final mark. Undergraduates shall be evaluated on the basis of the Weighted Average Mark (WAM): max 20 points
- Publications and other qualifications: max 5 points

Points relating to the research project shall be allocated on the basis of the following criteria:

- Scientific value and ground-breaking nature of the proposal: max 15 points
- description and structure of the proposal: max 5 points
- proposal feasibility: max 5 points

2. Oral examination

- Minimum for inclusion in the final ranking list: 30 points
- Maximum: 50 points

Oral examination includes the presentation of the research project and is intended to assess the suitability of the applicant in respect of pursuing of scientific research as well as the general knowledge of topics connected to the PhD Programme. During the oral examination, knowledge of English language shall be assessed.

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

Points relating to the oral examination shall be allocated on the basis of the following criteria:

- knowledge of the English language: max 5 points
- applicant' suitability for academic research and knowledge of the topics connected to research project: max 30 points
- general knowledge of issues connected to the 2nd cycle Master's degree dissertation: max 15 points

Possible evaluation sub-criteria will be available on the [Unibo website](#), selecting the relevant PhD Programme → "PhD programme information" at the bottom of the page in the section "Notices".

Final ranking list and enrolment (arts.6 and 7 of the call for applications)

After the publication of the results of the oral exam, the final ranking list will be available on the [Unibo website](#), selecting the relevant PhD Programme → "PhD programme information" at the bottom of the page in the section "Notices".

Following the publication of the final ranking list, successful applicants must enrol on <http://studenti.unibo.it> by the deadline indicated on the [Unibo website](#), selecting the relevant PhD Programme → "PhD programme information".