PHD PROGRAMME TABLE 38TH CYCLE

Section "Available Positions and Scholarships" integrated on 13/05/2022

PROGRAMME'S NAME	BIOMEDICAL, ELECTRICAL AND SYSTEM ENGINEERING
DURATION	3 years
PROGRAMME START DATE	01/11/2022 (DD/MM/YYYY)
LANGUAGES	Italian, English
MANDATORY STAY ABROAD	3 months
COORDINATOR	Prof. Michele Monaci (michele.monaci@unibo.it)
CURRICULA	1. Automatic Control and Operational Research 2. Bioengineering 3. Electrical Engineering
RESEARCH TOPICS	Detailed list at the bottom of the present document
PhD POSITIONS	7
ADMISSION PROCEDURE	Qualifications and research proposal evaluation Oral examination

Available Positions and Scholarships

Pos. n.	Financial Support	Description	Curriculum
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	3
4	PhD Scholarship	Totally funded by the University of Bologna general budget	3
5	PhD Scholarship	Totally funded by the University of Bologna general budget	3
6	PhD Scholarship	Totally funded by the University of Bologna general budget	1
7	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Electrical, Electronic, and Information Engineering "G. Marconi"	2

Admission Exams

	DATE AND TIME	RESULTS
Qualifications and research proposal evaluation	Applicants' participation is not required	Available from **20/06/2022****
Oral examination	**Date**: starting from **30/06/2022 – 9.30 a.m. CEST*** **Place**: In presence, Sala Giunta, Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi", Viale del Risorgimento 2, Bologna. Remotely, using Microsoft Teams	Available from **08/07/2022****

* In case that the oral examination cannot be completed in one day due to the large number of applicants, the oral examination detailed schedule shall be made available on the webpage Studenti Online together with the results of the qualifications and research proposal evaluation.

** 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**.

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 English translation is required.

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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	
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: - it must **mention on the cover page the Curriculum** the applicant is interested to and the proposal is about. In case the applicant were not to indicate one of the available Curricula, the Admission Board will assign the applicant the Curriculum most consistent with the research proposal and all the submitted documents. The assigned Curriculum will be communicated within the qualifications evaluation results; - **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); The research proposals that successful applicants shall carry out during their PhD career may possibly differ from the one proposed at the application stage. This shall be defined together with the supervisor and approved by the Academic Board.
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 2 reference letters** signed by Italian or 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 detailed in the Call for Applications (Art. 3.2)
Publications	- Full text publications (i.e. monographs, articles on scientific journals) – **max n.3** - Full text minor publications (conference papers, etc.) – **max n. 2**
Other documents	- Postgraduate vocational training programmes relevant to the PhD Programme main research topics - Teaching and/or tutorship 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 - Documents attesting the applicant'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.)

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	Second cycle (Master's) degree final mark. Graduands shall be evaluated according to the Weighted Average Mark (WAM)	15 points max
	Publications	5 points max
	Other evaluable documents	15 points max
	Scientific value and ground-breaking nature of the proposal	5 points max

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Research proposal evaluation	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
Research proposal presentation	25 points max
General knowledge of issues encompassed by the PhD Programme	20 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: Automatic Control and Operational Research

The scientific areas involved in this Curriculum are Automatic Control (ING-INF/04) and Operational Research (MAT/09). These are fundamental subjects for the Master Courses in Management and Information (Electronics, Computer Science, Telecommunications, Biomedical, Automation) Engineering. Moreover, they are also present in most other Master Courses in Engineering and (as far as MAT/09 is concerned) also in Business Administration and Science. The unifying methodological aspect is the System Approach, which provides a very powerful viewpoint to face most problems in modern engineering as well as in many other applied sectors. The basic subjects (system theory, control theory, mathematical optimization, estimation methods, filtering and identification, simulation) provide very useful tools to deal with and solve in a formal and general way complex problems that are often faced with special-purpose procedures, sometimes of empirical type.

- System and control theory
- Nonlinear control
- Geometric approach to control
- Robotics
- Motion control
- Diagnosis of dynamic systems
- Identification of dynamic systems
- Aerial traffic control
- Electric drives
- Combinatorial optimization
- Distributed optimization
- Graph theory
- Transportation and distribution (logistics) problems
- Network optimization problems
- Cutting and loading problems
- Integration between predictive and prescriptive analytics.

The methodologies of many of these topics are of interest to candidates in other curricula of the doctorate. For this reason, common events and activities will be organized among the three curricula to encourage interaction among candidates and the sharing of methodologies, cultural exchange and multidisciplinary education.

Curriculum 2: Bioengineering

The Bioengineering curriculum promotes the acquisition of advanced skills of highly interdisciplinary character (from engineering to medical and biological sciences, from mathematics and physics to computer science) to face - by means of innovative tools and solutions - complex problems in the field of the life sciences. The curriculum offers a wide spectrum of research themes, involving electronic, information and industrial aspects of bioengineering:

- Biomedical Imaging
- Biomedical Signals and Data Processing
- Biomechanics and Motor Function Control
- Rehabilitation Engineering
- Biomedical Instrumentation and Artificial Organs
- Models of Physiological and Biological Systems
- Computational Neuroscience
- Molecular, Cellular and Tissue Engineering.

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Strong connections exist between the various themes; frequently, the training and research activities are placed at the intersection of several themes. Each research project will pursue a specific objective: improvement of physiopathological knowledge, progress in diagnostic and therapeutic techniques, advancement in assistive and rehabilitation technologies, optimization of health-care management. The interaction with the other two curricula - thanks also to common courses and seminars with special emphasis on electrotechnics, control and optimization - certainly stimulates the sharing of methodologies, the cultural exchange and the multidisciplinary training necessary for an effective approach to bioengineering problems.

Curriculum 3: Electrical Engineering

The Electrical Engineering curriculum provides a wide scientific and technical-professional training in electrical engineering, with good base knowledge, capacity for technological and design innovation, and specific electrical knowledge. The Ph.D. candidate must be able to apply the analytical tools and the knowledge concerning the advanced technologies typical of electrical/electromechanical sector also to other engineering leading sectors. The scientific areas involved in this Curriculum are: Electrotechnics (ING-IND/31), Converters, electrical machines and drives (ING-IND/32), Electrical energy systems (ING-IND/33) and Electrical and electronic measurements (ING-INF/07). In particular, the Curriculum in Electrical Engineering aims to develop modern electrical DFC competencies and technologies such as:

- power electronics
- electric drives for automation, robotics, and traction
- unconventional electric machines
- methods of analysis, management and design of the electric power systems
- electricity market
- innovative architectures for the electric distribution
- computer-aided design of electric power systems and components
- rational use of energy and renewable sources
- electromagnetic compatibility
- interactions of electromagnetic fields with biological systems
- electromagnetic characterization of materials
- applied superconductivity
- applied magneto hydrodynamics
- plasma engineering
- magnetic system engineering.
- The activities of the course are customized to each student.

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