PHD PROGRAMME TABLE 37TH CYCLE

Section "Available Positions and Scholarships" integrated on 20/05/2021

Section "Available Positions and Scholarships" integrated on 21/05/2021

Section "Available Positions and Scholarships" integrated on 07/06/2021

Section "Available Positions and Scholarships" integrated on 17/06/2021

PROGRAMME'S NAME	BIOMEDICAL, ELECTRICAL AND SYSTEM ENGINEERING
DURATION	3 years
PROGRAMME START DATE	01/11/2021
LANGUAGE	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	17
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	Totally funded by the University of Bologna general budget	Automatic Control and Operational Research	
2	PhD Scholarship	Totally funded by the University of Bologna general budget	Automatic Control and Operational Research	
3	PhD Scholarship	Totally funded by the University of Bologna general budget	Automatic Control and Operational Research	
4	PhD Scholarship	Totally funded by the University of Bologna general budget	Electrical Engineering	
5	PhD Scholarship	Totally funded by the University of Bologna general budget	Electrical Engineering	
6	PhD Scholarship	Totally funded by the University of Bologna general budget	Electrical Engineering	
7	PhD Scholarship	Co-funded by the University of Bologna general budget and the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi"	Bioengineering	
8	PhD Scholarship	Funded by the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi"	Bioengineering	
9	PhD Scholarship	Funded by the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi" with funds made available by the H2020 REMODEL Project	Automatic Control and Operational Research	Collaborative Robot Assembly for Industrial Manifacturing
10	PhD Scholarship	Funded by Gruppo PSC S.p.A.	Electrical Engineering	Development of code for synchronized measuring instruments with

				distributed architecture
11	Research Grant	Provided by the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi". The research grant will have a duration of 12 months, renewable up to 36 months, and gross percipient amount of € 19,367.00.	Automatic Control and Operational Research	Collision Avoidance System to detect and recognize ground and air objects
12	Research Grant	Provided by the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi". The research grant will have a duration of 12 months, renewable up to 36 months, and gross percipient amount of € 19,367.00.	Automatic Control and Operational Research	Unmanned Aerial System collaboration and swarm algorithms
13	Research Grant	Provided by the Department of Electrical, Electronic, and Information Engineering "Guglielmo Marconi". The research grant will have a duration of 12 months, renewable up to 36 months, and gross percipient amount of € 19,367.00.	Automatic Control and Operational Research	Artificial Intelligence for task allocation in multi-agent teams
14	Apprenticeship PhD position	Appreticeship PhD position with OCEM Power Electronics, a division of Energy Technology Srl (the PhD candidate must enter into the contract by 31/12/2021 and adhere to it until 31/10/2024, with the exception of period of suspension resulting in the postponement of the legal duration of the course). The doctoral activities will mainly take place in: OCEM Power Electronics, a division of Energy Technology Srl (Valsamoggia, BO)	Electrical Engineering	Power electronic configurations to generate high-power short-duration pulses for multi-purpose electric applications, such as radiant electromagnetic systems and plasma stability in fusion reactors
15	PhD Scholarship	Funded by Fondazione Carisbo	Electrical Engineering	
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)	Automatic Control and Operational Research	Smart Innovation Farm: Big Data for an intelligent orchard
17	Research Grant	Provided by the Department Electrical, Electronic, and Information Engineering "Guglielmo Marconi" - DEI with funds made available by the project H2020 OPT4SMART – G.A. n. 638992 CUP F82I15000140006. The research grant will have a duration of 12 months, renewable up to 36 months, and gross percipient amount of €19.367,00.	Automatic Control and Operational Research	Artificial Intelligence Methods for Complex Systems in Medicine and Biology

Admission Exams

	DATE AND TIME	RESULTS
Qualifications and research proposal evaluation	Applicants' participation is not required	Available from **18/06/2021****
Oral examination	**Date**: starting from **28/06/2021** - **9.30 am CEST*** **Place**: Remotely, using Microsoft Teams	Available from **05/07/2021****

* 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 evaluation. **During the oral examination applicants may express their interest in the position linked to a specific research topic**.
** 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

(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
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 first page the Curriculum** of the PhD Programme associated to the research proposal. In case the Curriculum were not mentioned in the application or in the research proposal, the Admission Board will assign the applicant the most appropriate Curriculum on the basis of the research proposal contents and of the qualifications during qualifications evaluation; - it **cannot exceed 20000 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). The excess over 20000 characters will not be evaluated. The research projects that successful applicants shall carry out during their PhD career may possibly differ from the proposal submitted 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 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)
Reference Letter/s	**No more than 2 reference letters** signed by **Italian and/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 for the scientific research. Letters shall be uploaded following the procedure on Studenti Online, detailed in the Call for Applications (Art. 3.2).
Publications	- Publications in full text (i.e. monographs, articles on scientific journals, volume chapters) - **max n.3** - Minor publications (conference papers, etc.) - **max n.2**

Other documents	- University Master Courses (Master Universitari di I e II livello), Postgraduate vocational training programmes and/or specialisation programmes relevant to the PhD Programme - Teaching and tutorship activity carried out at university level - 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 allocated on the basis of the consistency with the Curriculum chosen (or assigned by the Admission Board if the applicant does not mention it) and 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 degree final mark. Graduands shall be evaluated according to the Weighted Average Mark (WAM)	15 points max
	Publications	5 points max
	Other documents	15 points max
Research Proposal Evaluation	Scientific value and innovative nature of the proposal	5 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
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), with particular reference to the Curriculum chosen (or assigned by the Admission Board in case it was not indicated by the candidate). 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. These positions will be awarded based on the Curriculum for which the applicant has expressed his/her preference in the statements made while filling in the application and mentioned on the first page of the research proposal submitted. In the event that the applicant has not mentioned the preferred Curriculum as described above, the Admission Board will assign him/her the most appropriate Curriculum based on the research proposal submitted. A sub-ranking list for each Curriculum shall be drawn up. In case of vacancies, only after having scrolled the whole sub-ranking list, vacant positions shall be proposed to eligible applicants, irrespective of the Curriculum chosen.

Considering the expressions of interest for **topic-specific positions**, 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. **In case of vacancies, for the replacement of topic-specific positions only applicants in the sub-ranking list linked to the specific topic shall be taken into consideration.**

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: 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.

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.