BIOMEDICAL, ELECTRICAL AND SYSTEMS ENGINEERING

Section "Positions and scholarships" integrated on 14/05/2020
Section "Positions and scholarships" integrated on 22/05/2020
Section "Positions and scholarships" integrated on 09/06/2020
Section "Positions and scholarships" integrated on 15/06/2020

Coordinator	Prof. Daniele Vigo Dept. of Electrical, Electronic, and Information Engineering «Guglielmo Marconi» Viale Risorgimento 2 – Bologna daniele.vigo@unibo.it
Starting date of the PhD Programme	01/11/2020
Duration	3 calendar years
Language of the PhD Programme	Italian – English
Mandatory stay abroad	Yes (3 months)
Curricula	**Research topics** (tailored training activities shall be planned for each PhD student)
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 - 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 students in other curricula of the doctorate. For this reason, common events and activities will be organized among the three curricula to encourage interaction among students and the sharing of methodologies, cultural exchange and multidisciplinary education.
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.
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 PhD student 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 dfccompetencies 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.

Positions and scholarships

Position n.	Financial support	Description	Curriculum	Positions linked to research subjects
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	Electrical Engineering	
3	PhD Scholarship	Totally funded by the University of Bologna general budget	Electrical Engineering	
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, with funds made available under the "Departments of Excellence" initiative	Automatic Control and Operational Research	
6	PhD Scholarship	Funded by the University of Bologna general budget and co-funded by the Dept. of Electrical, Electronic, and Information Engineering «Guglielmo Marconi»	Bioengineering	
7	PhD Scholarship	Funded by the Dept. of Electrical, Electronic, and Information Engineering «Guglielmo Marconi»	Automatic Control and Operational Research	

8	PhD Scholarship	Funded by the Dept. of Electrical, Electronic, and Information Engineering «Guglielmo Marconi» with funds made available by the project H2020 Integrated Planning of Multi-Energy Systems - PlaMES Grant agreement ID: 863922 (Proff. Daniele Vigo e Michele Monaci)	Automatic Control and Operational Research	Optimization Algorithms for the integrated planning of multi-energy systems
9	PhD Scholarship	Funded by the Dept. of Electrical, Electronic, and Information Engineering «Guglielmo Marconi» with funds made available by the project H2020 REMODEL - Robotic tEchnologies for the Manipulation of cOmplex DeformablE Linear objects (GA 870133) (Prof. Gianluca Palli)	Automatic Control and Operational Research	Robotic Manipulation of Deformable Objects
10	PhD Scholarship	Funded by the Dept. of Electrical, Electronic, and Information Engineering «Guglielmo Marconi» with funds made available by the project H2020 REMODEL - Robotic tEchnologies for the Manipulation of cOmplex DeformablE Linear objects (GA 870133) (Prof. Gianluca Palli)	Automatic Control and Operational Research	Collaborative Robot Assembly for Industrial Manufacturing
11	PhD Scholarship	Funded by MIUR under the "Departments of Excellence" initiative	Bioengineering	
12	PhD Scholarship	Funded by Webasto Thermo and Comfort Italy Srl	Electrical Engineering	Instrumentation and methods for the thermal management of electric vehicles
13	Industrial Doctorate	Position reserved for employees of Wavecontrol S.L.	Electrical Engineering	Design, development and characterization of cutting edge instruments and power line filters for EMC measurements
14	Industrial Doctorate	Position reserved for employees of Prysmian Group	Electrical Engineering	
15	Industrial Doctorate	Position reserved for employees of KEMET Electronics Italia S.r.l.	Electrical Engineering	
16	Research Grant	Provided by Consiglio Nazionale delle Ricerche - Istituto per la Sintesi Organica e la Fotoreattività (CNR-ISOF). The research grant will have a duration of 12 months, renewable up to 36 months, and gross percipient amount of € 19.367.	Bioengineering	Development and validation of carbon-based biomaterials interface and device and interpretative models for the study of glial cells
17	Research Grant	Provided by the Department of Electrical, Electronic, and Information Engineering «Guglielmo Marconi» partly with funds made available by the project “Piattaforma di Ottimizzazione della Distribuzione tramite uso di dati da Contatori elettronici e sistemi di Accumulo disTribuito” (PODCAST), eligible for financing by decree of the Ministry of Economic Development, April 21st 2016, published on G.U.R.I. n. 106 of May 7th, 2016 – CUP 36G16001010003 (Ref. Prof. Carlo Alberto Nucci). The research grant will have a duration of 36 months and gross percipient amount of € 58.101.	Electrical Engineering	Integration of renewable energy into the electricity system

The above positions shall be awarded on the basis of both the final ranking list, as drawn by the Admission Board, and 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 (NB. A sub-ranking list for each *Curricula* shall be drawn up). If the curriculum is not specified by the applicant it will be assigned by the evaluation committee based on the project and the titles of the applicant.
Possible remaining positions linked to specific Curricula shall be proposed to eligible applicants, irrespective of the Curriculum chosen.

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. - where present);
- No more than 2 reference letters signed by Italian and 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.
  Please, note that the above letters cannot be uploaded by applicants. When filling the online application form on http://studenti.unibo.it, applicants will be only allowed to provide the email accounts of the requested academic/professional. The latter shall receive an email from the University of Bologna providing for the instructions for uploading. Only letters in pdf format submitted before the expiry date and time of the Call shall be accepted.
- 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:
  - It must indicate in the cover page the research topic of the PhD Programme covered by the research project proposal and for which the applicant is applying. In the case that the curriculum is not indicated in the application, the Commission will operate this choice on the basis of the project contents and of the qualifications of the applicant at the time of the publication of the evaluation of the qualifications;
  - 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 (such as graphs, diagrams, tables etc - where present);

  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.
- Publications *in extenso* (monographs, articles published on scientific journals, volume's chapters) (max 3).
- Minor Publications *in extenso* (conference papers, etc.) (max 2).
- Professional Master courses completed in Italy (1st or 2nd level) relevant to the PhD Programme.
- Postgraduate vocational training programmes/specialisation programmes relevant to the PhD Programme.
- Teaching activity and support to training activities carried out at university 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 knowledge of foreign languages
- Study periods completed by students 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).

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 **03/06/2020** 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")

<table>
<tr><td rowspan="3">Oral examination</td><td>Date</td><td>22/06/2020
In case that the oral examination cannot be completed in one day due to the large number of applicants, the oral exam schedule shall be made available at the webpage http://studenti.unibo.it together with the results of the qualifications and research project evaluation.</td><td rowspan="2">The results of the oral examination shall be available on the webpage http://studenti.unibo.it starting from 29/06/2020 (please, select “summary of the requests in progress” - “see detail” and open the pdf file “risultati prova orale”).</td></tr>
<tr><td>Time</td><td>09:30 a.m. (local time)</td></tr>
<tr><td colspan="3">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.</td></tr>
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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 and to the research project shall be allocated on the basis of the consistency with the curriculum chosen (or assigned by the Commission if the applicant does not indicate this) and of the following criteria:
   - Graduation final mark. Undergraduates shall be evaluated on the basis of the Weighted Average Mark (WAM): max 15 points
   - Publications: max 5 points
   - other qualifications: max 15 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 5 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

   The oral test is aimed at verifying the candidate's aptitude for scientific research and his/her general preparation on topics related to the PhD Programme, with particular reference to the curriculum chosen (or assigned by the Commission case it was not indicated by the candidate). During the oral examination, knowledge of English language shall be assessed.

   Points relating to the oral examination shall be allocated on the basis of the coherence of the curriculum chosen (or assigned by the Commission in case it was not indicated by the candidate) and of the following criteria:
   - knowledge of the English language: max 5 points
   - research project presentation: max 25 points
   - general knowledge of issues connected to the PhD Programme: max 20 points
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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 enroll on http://studenti.unibo.it by the deadline indicated on the Unibo website, selecting the relevant PhD Programme → “PhD programme information”.