## Coordinator

Prof. Alessandra Costanzo  
Department of Electrical, Electronic, and Information Engineering «Guglielmo Marconi» - DEI  
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alessandra.costanzo@unibo.it

## Starting date of the PhD Programme

01/11/2019

## Duration

3 calendar years

## Language of the PhD Programme

English

## Associated partners

Fondazione Bruno Kessler (FBK)

### Research topics
- Analog and digital circuits and electronic systems
- Analysis and simulation of semiconductor devices
- Applications of Information technologies: smart cities, smart grid, etc
- Communication theory and its applications
- Communications architectures, systems, and networks: wireless, cellular, fixed / mobile terrestrial / satellite, wired and optical
- Electromagnetic theory, antennas, and propagation,
- Electronic devices
- Electronics for telecommunications
- Embedded systems
- Energy harvesting
- Information theory and its applications
- Intelligent sensors
- Micro and nano-technologies
- Microwave Photonics
- Navigation and positioning systems and applications
- Network control and management: software defined networks
- Performance evaluation of communication networks
- Statistical signal processing and its applications
- Ultrasonics
- Wireless power transfer
- Science of Creative Thinking with Applications in the ICT Domain

## PhD positions and scholarships

<table>
<thead>
<tr>
<th>Position n.</th>
<th>Financial support</th>
<th>Description</th>
<th>Positions linked to research subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PhD Scholarship</td>
<td>Totally funded by the University of Bologna general budget</td>
<td></td>
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<tr>
<td>2</td>
<td>PhD Scholarship</td>
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<tr>
<td>3</td>
<td>PhD Scholarship</td>
<td>financed in full from the central budget under the &quot;Departments of Excellence&quot; initiative</td>
<td></td>
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<tr>
<td>4</td>
<td>PhD Scholarship</td>
<td>partly financed from the central budget and co-financed by the &quot;Guglielmo Marconi&quot; Department of Electrical Energy and Information Engineering</td>
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<tr>
<td>5</td>
<td>PhD Scholarship</td>
<td>financed by MIUR under the &quot;Departments of Excellence&quot; initiative</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>PhD Scholarship</td>
<td>financed by the Department of Electrical Energy and Information Engineering &quot;Guglielmo Marconi&quot;.</td>
<td></td>
</tr>
<tr>
<td>Ph.D. Scholarship</td>
<td>Funded by Fondazione Bruno Kessler. The doctoral activities will take place in Trento</td>
<td>Energy efficiency in IoT technology for communities and smart cities</td>
<td></td>
</tr>
<tr>
<td>Ph.D. Scholarship</td>
<td>Funded by Fondazione Bruno Kessler. The doctoral activities will take place in Trento</td>
<td>Decentralization in fog computing environments: management and design</td>
<td></td>
</tr>
<tr>
<td>Ph.D. Scholarship</td>
<td>Funded by Fondazione Bruno Kessler. The doctoral activities will take place in Trento</td>
<td>Blockchain structures and smart contracts in IoT</td>
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<tr>
<td>Research Grant</td>
<td>provided by the Department of Electrical Energy and Information Engineering &quot;Guglielmo Marconi&quot; with funds from the H2020 project ENABLES &quot;European Infrastructure Powering the Internet of Things&quot; (GA 730957) – Principal investigator Prof. Aldo Romani, with a duration of 12 months renewable up to a maximum of 36 months and a gross percipient amount of €19,367. The doctoral activities will take place in DEI - UoS Cesena.</td>
<td>Energy harvesting and micro power management for Internet-of-Things*. The themes of the research activity will be the study and development of new and advanced system circuit solutions for energy harvesting, conversion and management of micro powers, in the specific field of Internet-of-Things and wireless sensor systems.</td>
<td></td>
</tr>
<tr>
<td>Industrial doctorate</td>
<td>position reserved to employees of Alstom Ferroviaria S.p.A.</td>
<td>Application of open networks to railway signaling, in particular WiFi, 4G and 5G mobile networks. How the current Alstom standard interlocking platform, called SMARLOCK400, could evolve to guarantee at least the same levels of redundancy, availability, security (as in the railway sector), cybersecurity and performance, as current working technologies that adopt a closed wired network</td>
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</tr>
<tr>
<td>Ph.D. apprenticeship position</td>
<td>PhD apprenticeship position with JMA Wireless - Teko Systems Group (the PhD candidate must enter into the contract by 31/12/2019 and adhere to it until 31/10/2022, with the exception of period of suspension resulting in the postponement of the legal duration of the course). The doctoral activities will take place in JMA Wireless - Teko Systems Group, Castel San Pietro Terme (Bologna).</td>
<td>5G Radio Technology: beamforming techniques and interference mitigation for massive MIMO systems</td>
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</tr>
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<td>Machine learning aided resource management in 5G network slicing</td>
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<tr>
<td>Ph.D. apprenticeship position</td>
<td>PhD apprenticeship position with Energy Technology s.r.l. (the PhD candidate must enter into the contract by 31/12/2019 and adhere to it until 31/10/2022, with the exception of period of suspension resulting in the postponement of the legal duration of the course). The doctoral activities will take place in Energy Technology (Bologna).</td>
<td>Powerline Communication Systems for Airfield Applications</td>
<td></td>
</tr>
<tr>
<td>Research Grant</td>
<td>provided by the Department of Electrical Energy and Information Engineering &quot;Guglielmo Marconi&quot; with funds from the CNIT - Consorzio Nazionale Interuniversitario per le Telecomunicazioni – Principal investigator Prof. Alessandro Vanelli Coralli, with a duration of 12 months renewable up to a maximum of 36 months and a gross percipient amount of €19,367. The doctoral activities will take place in DEI - Bologna</td>
<td>Machine Learning Techniques for Terrestrial and Non-Terrestrial Communication Systems</td>
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</tbody>
</table>
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.

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)

- 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.

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);

It must include: the state of the art; description of the project; expected results; lead-time for implementation; (proposed) criteria to be used to assess the findings obtained; 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.

- Motivational letter. This must include the reasons prompting the applicant to attend the PhD Programme and those relevant experiences and research interests, that make the applicant suitable for the specific PhD Programme (3000 characters maximum, including spaces).

- List of the publications (monographs, articles published on scientific journals, volume’s chapters).

- List of the minor publications (conference papers, etc.).

- List of the abstracts and posters presented during national and international conferences, etc.

- 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.

- 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.

- Work activity

- Vocational internships

- Curricular and non-curricular training and guidance internships

- 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)

<table>
<thead>
<tr>
<th>Examination type</th>
<th>Schedule (please, note that applicants shall not receive any communication concerning the exams schedule)</th>
<th>Examination results publication (please, note that applicants shall not receive any communication concerning the publication of results)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualifications and research project evaluation</td>
<td>Non-presential.</td>
<td>The results of the qualifications and research project evaluation shall be available online starting from the 07/06/2019 at the page <a href="http://studenti.unibo.it">http://studenti.unibo.it</a> (please, select “summary of the requests in progress” - “see detail” and open the pdf file “risultati valutazione titoli e progetto”)</td>
</tr>
<tr>
<td>Oral examination</td>
<td>Date 25/06/2019 - 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 <a href="http://studenti.unibo.it">http://studenti.unibo.it</a> together with the results of the qualifications and research project evaluation</td>
<td>The results of the oral examination shall be available on the webpage <a href="http://studenti.unibo.it">http://studenti.unibo.it</a> starting from 04/07/2019 (please, select “summary of the requests in progress” - “see detail” and open the pdf file “risultati prova orale”)</td>
</tr>
<tr>
<td></td>
<td>Place Bologna - Viale Risorgimento 2 Dip. di Ingegneria dell'Energia Elettrica e dell'Informazione «Guglielmo Marconi» Sala Giunta</td>
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<td></td>
<td>Time 10 a.m.</td>
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</tbody>
</table>

Applicants can ask to take the exam remotely using Skype. 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 15 points
   - Publications: max 4 points
   - Other qualifications: max 10 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 7 points
   - description and structure of the proposal: max 7 points
   - proposal feasibility: max 7 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 to pursue scientific research as well as the general knowledge of issues connected to the PhD Programme.
   The oral examination is carried out in English.
   Points relating to the oral examination shall be allocated on the basis of the following criteria:
   - knowledge of the English languages: max 5 points
   - research project presentation: max 35 points
   - general knowledge of issues connected to the PhD Programme: max 10 points

Possible evaluation sub-criteria will be available on the Unibo website, selecting the relevant PhD Programme \( \rightarrow \) “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 \( \rightarrow \) “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 \( \rightarrow \) “PhD programme information”.