PhD PROGRAM IN INFORMATION ENGINEERING

Disciplines  ING-INF/01, ING-INF/02, ING-INF/03, ING-INF/04, ING-INF/05, ING-INF/07, ING-IND/31, INF/01, MAT/09, FIS/01, FIS/03, FIS/04

Duration 3 YEARS

Academic year 2013/2014

Starting date 01/01/2014

Department Department of Information Engineering

Coordinator Prof. Vittorio Ferrari
Department of Information Engineering
Via Branze, 38 - Brescia

Curricula

Curriculum in Electronics Engineering, Sensors and Instrumentation
The curriculum deals with, among others, the following research topics: electronic instrumentation, analog and digital signal processing, micro/nano-sensors in film and microfabrication (MEMS) technologies, optical instrumentation, optoelectronics and 3D artificial vision, web sensors, wireless sensors, sensor networking, microelectronics, organic electronics, interface circuits for sensors, energy harvesting and electronics for energy, autonomous sensors, sensors and instrumentation for biomedical and agrofood applications.

Curriculum in Computer Science/Engineering and Control Systems
Research activities in this curriculum cover the domains of: artificial intelligence, automated planning and reasoning, automated diagnosis, knowledge engineering, robotics, human-machine interaction, information systems, data bases, web services and semantic web, security of critical-mission hardware and software systems, analysis and control of linear and nonlinear systems, system identification and estimation, adaptive systems, management and planning of complex systems.

Curriculum in Telecommunication Engineering
Research activities in this curriculum cover the domains of: antennas and microwaves (ultra wideband signal transmission and reception, elettrosmog, ...); Digital Signal Processing (wavelets, linear transform families, approximation theory, ...); Information Theory (source coding methods, channel coding bounds, ...); Multimedia Signal Processing (emotion modeling and recognition, face recognition, image and video compression, multimedia indexing, multimedia information retrieval, music information classification, watermarking technologies, ...), Optical communications (non linear fiber optics, optical components, ...), Nanophotonics (optical antennas, imaging, graphene photonics ...), Networking (information security, protocols, traffic classification, ...).

Curriculum in Physical Sciences for Engineering
The research topics deal with matter physics and in particular the development of innovative devices including chemical sensors, biosensors, olfaction systems, field effect emitters, light emitting devices and many others. Metal oxide semiconductors quasi 1D or nanostructured are used successfully for these devices. The ability to control the morphology, crystalline and functional properties of the prepared material may be achieved thanks to the fundamental and functional characterization techniques available. The intended applications are in the fields of environment, security, human health and food industries. Additional topics deal with nuclear physics, in particular general properties of nuclear forces, particle detectors, data acquisition systems, statistical methods of experimental data analysis, simulation of physical processes and performances of experimental setups, long-term environmental and sanitary effects of radiation.
### Available positions

<table>
<thead>
<tr>
<th>PhD fellowships</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>n. 4 funded by Università di Brescia</td>
<td></td>
</tr>
<tr>
<td>n.1 funded by <strong>MIUR</strong> and aimed at supporting young researchers in carrying out scientific research activities in the framework of the project “Innovative wide band telecommunications systems”. This PhD fellowship is available in the framework of the curriculum Telecommunication Engineering.</td>
<td></td>
</tr>
<tr>
<td>n.1 funded by <strong>MIUR</strong> and aimed at supporting young researchers in carrying out scientific research activities in the framework of the project “ICT and electronics devices”. This PhD fellowship is available in the framework of the curricula Electronics Engineering, Sensors and Instrumentation, and Computer Science/Engineering and Control Systems.</td>
<td></td>
</tr>
<tr>
<td>n.1 The Relight project (funded by <strong>CARIPLO</strong>) is supporting one PhD fellowship in a consortium formed by the Polytechnic of Milan, and the Universities of Brescia and Pavia. It aims at creating a joint research effort for the Internet of Things, which means the Internet considered as the collecting point of (processed) data which enable us to sense the world. As examples, the considered research topics include Privacy protection vs. trust in sensor networks, Self-organizing distributed information, space-time signal processing with audio signals, multimodal sensing for smart environments, localization-aided cognitive and sensor networks, smart objects for eHealth, and Internet of Energy. This PhD fellowship is available in the framework of the curricula Telecommunication Engineering, Computer Science/Engineering and Control Systems, and Electronics Engineering, Sensors and Instrumentation.</td>
<td></td>
</tr>
<tr>
<td>n.1 <strong>Fondazione Bruno Kessler</strong> is supporting one PhD fellowship on Semantic Textual Inferences. FBK 1: The project addresses the study and the development of novel approaches for textual semantic inferences, with specific interest on Textual Entailment. The goal is to advance the state of the art in general entailment algorithms (e.g. graph transformations, tree edit distance), and to define a framework where both knowledge resources (e.g. WordNet, Wikipedia) and specific inference components (e.g. temporal, causal) interact</td>
<td></td>
</tr>
</tbody>
</table>
each other while trying to establish an entailment relation between two portions of text. This PhD fellowship is available in the framework of the curriculum Computer Science/Engineering and Control Systems.

n.1 **Fondazione Bruno Kessler** is supporting one PhD fellowship on Reasoning-based Process Mining. FBK 2: Process mining is a recent and rapidly emerging research field, aiming at discovering, monitoring and improving real processes by extracting knowledge from event logs readily available in today’s (information) systems. The aim of this thesis is investigating how to exploit, adapt and combine techniques and approaches borrowed from different research fields, ranging from logic to artificial intelligence, from model checking to statistics, to advance the existing services for process analysis and process model (re-)design from monitoring data. This PhD fellowship is available in the framework of the curriculum Computer Science/Engineering and Control Systems.

<table>
<thead>
<tr>
<th>Extra fellowships for nonitalian candidates, for candidates with a foreign degree, or candidates residing abroad</th>
<th>1</th>
<th>n.1 funded by Università di Brescia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positions without fellowship</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

**Admission requirements**

- University degree obtained after a total academic training duration of at least 5 years, typically referred to as "Master of Science" (MS), which can be retained equivalent to the corresponding Italian academic level by the board of this PhD program for the sole purpose of admission.
- The relevance of the degree with respect to the curricula of this PhD program is a preferential qualification.
- For consideration, applicants must complete their 2nd level program and obtain the degree (MS) before Dec. 31, 2013.

**Admission procedures**

- Candidates must attach to the admission form a written list, ordered by preference, of the curricula they are interested in.
- Maximum score: 20.
- Eligible documentation:
  - University curriculum, including the specification of the degree obtained or to be obtained, title and one-page summary of the Master thesis, and transcript of academic records
  - Scientific publications
  - Any other supporting documentation and qualifications that can be considered relevant and useful for the admission evaluation process.
| Research project proposal | Maximum score: 40.  
The topic of the research project must fall within research activities that are relevant to anyone of the curricula of the PhD program. The research project must be presented as a written proposal, in either Italian or English, with a maximum length of 25,000 characters (including spaces), and should be organized as follows:  
1. Author;  
2. Title;  
3. Summary of State-of-the-art ;  
4. Main motivations and goals of the proposed research proposal;  
5. Detailed description of the research project;  
6. Proposed scientific methodology;  
7. Bibliographic references.  
Only candidates who score at least 24 points in the evaluation of their research proposal will be admitted to the oral exam. |
| Oral exam | Maximum score 40.  
Interview in English which includes a discussion on the presented research project proposal, on the possible candidate’s list of publications and qualifications, and an oral evaluation of English language skills.  
Candidates, upon request, may be allowed to be interviewed remotely with the use of a video-conference application (e.g. Skype), upon approval by the evaluation committee. The computer of the candidate must be equipped with a web-camera in order to ensure proper identification.  
When the application is submitted online, applicants must provide all the information required to activate the online connection and assessment of their identity, including a copy of an identity document (e.g. passport). The interview will take place concurrently to the interviews of other applicants. |
| Venue | Department of Information Engineering |

The number of PhD fellowships may be increased thanks to the support of additional private or public funding institutions.

Candidates, upon request, may be allowed to be interviewed remotely with the use of a video-conference application (e.g. Skype), upon approval by the evaluation committee. The computer of the candidate must be equipped with a web-camera in order to ensure proper identification.  
When the application is submitted online, applicants must provide all the information required to activate the online connection and assessment of their identity, including a copy of an identity document (e.g. passport). The interview will take place concurrently to the interviews of other applicants.