Section 1. General Description

1.1 School organization

This paragraph addresses the School structure, organized in two curricula, the admission criteria, that are publicly available on the School website, the bodies of the School and the evaluation of the student proficiency.

The School organization is shaped in accordance with the ISO 9001 quality standards and appears to be very well structured. Most notably, the admission has ruled out the written and oral tests in order to simplify the recruitment of foreign students, but set up very thorough evaluation criteria of the applicants. The evaluation is ***excellent****.*

1.2 National & International Collaborations

This paragraph summarizes the information in four histograms showing the evolution over the last four years (from 2007 to 2010) of the national and international academic and non-academic collaborations, of the collaborations based on student exchange, and the number of visiting professors/researchers. In all cases, the three-year reported period (2008-2010) exhibits on average a very substantial increase in the number of international and a significant increase in the number of national collaborations, which was already satisfactory in year 2007.

The growth of academic international collaborations is a good indicator of the interest raised by the School research activities on international academic partners. The large number of collaborating Institutions qualifies the industrial interest of the PhD programs pursued by the School and makes the offer of PhD grants more likely, which is an extremely valuable asset of the School. The evaluation is ***excellent****.*

1.3 Teaching Staff

This paragraph reports the number of School staff members over the years 2007-2010 (steadily around 60, about 50 of whom from the University of Padova) and highlights specific numbers of teachers from other Italian and foreign Universities and from non-academic Institutions. Another histogram shows the distribution of students per supervisor over the years, with a variability from 1 to 10.

The distribution of students per supervisor indicates that, in most cases, professors supervise only one PhD student, and that the distribution drops down very quickly as the number of students increases. This ratio of less than two students per professors is in line with the standard of Italian Universities, but is fairly low if compared with international standards. The evaluation is ***very good****.*

1.4 Research funds

This paragraph reports the global funding per year of projects whose principal investigator is a member of the teaching staff. In the three-year period 2008-2010 the average funding has been around 2.7 M€/year, with a moderate increase with respect to the previous three-year period 2005-2007. The funding sources are primarily Industry and the EU Commission. No attempt is made to discriminate the effective fraction of funding devoted to the PhD student activity.

While realizing the difficulty to extract from the accounting system the expenditures directly related with the support of PhD students (compensations, general costs of a work place, and missions) an estimate of the above costs would be more instructive than the global funding available to the Department. A fair fraction of the global investment in research, such as that devoted to the purchase of new equipment and consumables, enables the creation of a favorable environment for PhD students, but the indirect costs of the permanent staff, such as professors, researchers and technicians, has only a marginal impact on the PhD School. The evaluation is ***good****.*

1.5 Students

This paragraph reports the partial and global number of PhD students in years 2008-2010. The total number of national students declined from 90 in 2008 to 78 in 2010, and the number of foreign students slightly increased from 3 to 5. The grant sources from the University declined in 2010 from 15 to 12, but this downturn was more than compensated by Department funds covering 8 grants. Other sources (MIUR, Industry, Foundation and Research funds) covered 13 additional grants for a total recruitment of 33 in year 2010.

The funding of 8 grants by the Department using resources from research funds is a great demonstration of the willingness of many professors to sacrifice their own funding to support the PhD School as a whole. On the other hand, the small number of foreign students would require a stronger internationalization efforts. The evaluation is ***very good****.*

1.6 Specific financial resources of the School

This paragraph reports about the spending capacity of the School to support student training, long and short-term student mobility as well as evaluation expenses. The expenditure in year 2010 turned out to be 82.000 €, as opposed to 46.600 € in year 2007, split among payment of courses given by foreign academic personnel (22.000 €) long-term mobility support (40.000 €) and short-term mobility support for conferences and workshops (20.000 €).

As opposed to the former three-year term, the expenditures of the School to the benefit of PhD students has nearly doubled, covering their training and mobility needs. The evaluation is ***very good****.*

Facilities and instruments of the School

The Department of Information Engineering hosts 12 computer labs (light labs) and 18 instrumentation labs (heavy labs), for a total of 30 labs (20 in year 2007) covering the main research areas in its domain of expertise. Every student is assigned a desk equipped with a PC with full access to the Department software services, including the access to the University Library System; they are allowed to reserve two meeting rooms and the videoconference room and are granted assistance from the Department administrative, computing laboratory and technical services on the same basis as Faculty members.

The large number of Labs available at the Department of Information Engineering and the high-level standard of good practice in their use make DIE a nearly-ideal environment for PhD students. The evaluation is ***excellent****.*

Section 2. Research Activity

2.1 Research Areas

This paragraph illustrates the wide selection of active research fields made available to PhD students since the very beginning of their training program. The selection is mainly based on the research proposal submitted by the student as part of the documentation for the admission to the School. The offer spans over a large fraction of the topics in the broad field of Information Engineering, in particular in the areas of Applied Optics, Bioengineering, Computer Science, Electronics, Systems and Control Theory and Telecommunications.

The offer of subject areas for PhD students is very wide and is fully in line with the broad range of topics investigated within the Department and the general goals of the PhD School. The evaluation is ***excellent****.*

2.2 School staff publications

The information concerning the publications on international peer-reviewed journals of the teaching staff is provided in the form of histograms representing the number of publications per staff member over the 5-year period 2006-2010.

The information concerning the publications of the teaching staff is much improved with respect to the list of 10 publications per school-staff member in the previous report. The resulting distributions shows a large variability (from 120 to 1) but more than 50% of the staff members exhibit 10 or more publications. The evaluation is ***very good****.*

2.3 PhD students publications

This paragraph shows a histogram representing the distribution of the students who graduated in 2010 vs. the number of publications in a given range, splitting off the journal and proceedings publications of second- and third-year students.

The histogram shows that 28 out of 29 students exhibit at least one publication in proceedings of international conferences, and that 24 out of 29 exhibit at least one publication in an international journal. The histogram does not allow for an exact evaluation of the average number of publications per student, but this number is probably in excess of 3 for the proceeding publications and of 2 for the journal publications. The histogram shows a fairly large variability in scientific productivity, which probably reflects the variability in the number of publications per staff member. The lack of refereed publications in archival journals for five of the students who graduated in 2010 should deserve a corrective action. The evaluation is ***good****.*

Section 3. Teaching Activity

3.1 Courses and seminars of the School

This paragraph illustrates the teaching initiatives of the School, which offered a number of courses, specifically devised for Ph.D. students, varying from 21 in 2008 to 19 in 2010. Five courses were delivered by professors from other Italian of foreign Universities in year 2010. The course catalog includes a 20-hour course entitled “Project Management”, which is meant to deliver the fundamentals of project as well as spin-off management. Every student is requested to take courses from the catalog for a minimum of 80 lecture hours, corresponding to

20 credits in the accounting system of the School. Every course ends with a final test. In addition, the PhD School organizes three seasonal Schools in “Bioengineering”, “Information Engineering” and in “Electronic Measurements”. Finally, the Department periodically organizes public meetings to verify the coherence of its research activities with the international trends as well as the demands of the local Industry.

The offer of graduate courses is fairly wide, especially considering that graduate courses in the Italian system are not institutional and, therefore, do not imply any duty from the professors. Also, the organization of three seasonal Schools in Bressanone, one of which with a national breath, is an indication of the strong effort committed by the School to the teaching activity. The evaluation is ***excellent****.*

3.2 Training activities out of the University of Padova

This paragraph summarizes the overall student mobility in the period 2008-2010, indicating that about 2/3 of the PhD students spent a period of time abroad ranging from 4 to 18 months, with an average of about 10 months in years 2009-2010. The student activity plan always included research activity training through the participation to a project at the host institution under the guidance of a local supervisor and, in some cases, also education through graduate courses available at the host institutions.

The relatively-large fraction of students undergoing research activity in foreign environments during their attendance of the PhD School is a good indication of the School effort to support stages abroad meant to broaden the student research experience. The evaluation is ***very good****.*

Section 4. Conclusive Analysis

4.1 Vocational and academic recruiting

This paragraph illustrates data concerning the professional career of 43 Doctors graduated at the PhD School under evaluation. Of these, 21 found a post-doc position at national (14) and foreign (7) Universities; 8 found a post-doc position at national (4) and foreign (4) Research Institutes; 11 were recruited by national (6) and foreign (5) Industries; 2 were recruited by a national (1) and international (1) spin-offs.

About 50% of the former PhD students of the School were recruited by academic institutions in Italy and abroad as post-docs; 20% were recruited by research Institutes and 25% were recruited by Industries. No specific evaluation is given on this point.

Mission and Vision

This paragraph highlights the mission of the PhD School and the vision of its governing bodies concerning both ethical and organizational issues.

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Presentation given by Prof. Bertocco

The presentation delivered by Prof. Bertocco addressed several aspects of the School organization, such as the School Web page (http://www.dei.unipd.it/phd), the admission procedure, the course catalog and the evolution over the years of the number of PhD grants made available to the School.

Visit to a selected number of labs

The Scientific Committee members who attended the meeting held in Padova on 16 March 2011 were given the opportunity to visit a number of Laboratories listed below

1. Blade computing cluster facility
2. Multimedia Technology and Telecommunication (LTTM)
3. Control Systems
4. Autonomous Navigation and Computer Vision (NAVLAB)
5. Department of didactical and administrative services
6. Microelectronics – RF-MEMS Reliability and Advanced Optoelectronic Devices
7. Special Interest Group on Networking (SIGNET)

The visit was carried out with the assistance of the technician in charge of the Labs, who provided all the requested information concerning internal procedures for the purchasing of equipment and consumables. Every lab is run under the scientific supervision of a professor and avails itself of the activity of PhD students and/or post-docs who carry out their scientific work in that Lab. We always found a responsible student, post-doc or technician who gave us a detailed description of the available infrastructure, general objectives and major achievements of the Lab. Also, every Lab appears to be nicely equipped and that the research themes are up to date and at the state of the art.
Most noticeable is the office where two administrative persons take care of teaching and administrative services specifically devoted to PhD students, including the management of course-attendance applications, mission reimbursements, purchasing of consumables and the like.

Overall Evaluation

The overall evaluation of the Doctoral School in Information Engineering of the University of Padova is based on the reading of the self-evaluation report for the three-year period 2008-2010, the presentation of the School organization and management delivered by Prof. Bertocco, Director of the School, the interaction with the staff members attending the meeting we had in Padova on 16 March 2011, namely Profs. Bertocco, Neviani and Pupolin and, last but not least, the visit to a selected number of Labs where the PhD students carry out their research work.
The Doctoral School in Information Engineering of the University of Padova is organized in two main curricula, namely Information Science and Technology (IST) and Bioengineering (BIO), the first of which is the result of a merging process of several former courses. The unifying effort represents a major achievement of the School, which can now exhibit in a single curriculum a nearly complete coverage of all major disciplines of Information and Communication

Technology (ICT). On the other hand, the Bioengineering curriculum opens up an important connection of Engineering with Life Sciences, whose social impact in an aging society is rapidly growing fueled by emerging disciplines such as Nanotechnology, Molecular Biology and Proteomics.

The self-evaluation report is organized in four consecutive sections, namely: 1. General Description; 2. Research Activity; 3. Teaching Activity and, 4. Conclusive Analysis. Section 1 addresses the organization of the School, the national and international collaborations with academic and non-academic partners, the teaching-staff research funds, the number of doctoral students, the financial resources, the facilities and instruments of the School. Section 2 reports on the research areas, the publications of the teaching staff and those by the students who received the PhD in 2010. Section 3 illustrates the courses and seminars organized by the School, the training initiatives outside the University of Padova, and the teaching activity carried out by the students. Section 4 presents the vocational and academic recruiting of the former students.

From the self-assessment report, it appears that the quality of the Doctoral School in Information Engineering of the University of Padova is generally very good with a number of excellent assets. Strong points are: (i) the organization of the School, which conforms to the stringent requirements of the ISO 9001 quality standards; (ii) the strong interaction of the School with academic and industrial partners; (iii) the allocation of resources to support graduate courses delivered by national and international scientists; (iv) a wide choice of research areas and their relevance within the ICT field; (v) a wide variety of advanced research labs and, (vi) the transparency of the recruitment procedures.

Areas where a substantial improvement has been observed with respect to the previous three-year period are:

1) The timeliness of the self evaluation report, which covers the three-year period 2008-2010 and was delivered on February 4, 2011 to the Scientific Committee.
2) The governing bodies of the Doctoral School have been clearly specified along with their duties and responsibilities.
3) The entrepreneurial skills of the students are fostered and a strategic approach to spin-off generation appears now to be pursued.
4) The self-assessment report specifies the minimum requirements for the attendance of training courses (minimum number of credits per year) and that these courses are followed by an examination.
5) The number of grants funded by external institutions (Industry, Foundations, Research funds) is now specified by the report and in 2010 8 grants have been supported by the Department of Information Engineering.
6) The spending capacity of the School to support the student mobility as well as training courses given by foreign professors has been substantially increased with respect to year 2007, and is now fully adequate to the students' needs.
7) The teaching-staff scientific productivity has been presented much more concisely and effectively by distribution histograms, highlighting the broad spectrum of scientific proficiencies of different research areas.
8) The number of refereed journal papers and conference proceedings co-authored by former PhD students who received the doctoral degree in year 2010 is not fully comparable with those of third-year students provided in the former report. However, the reported publication distribution shows that only a minimal number of Doctors graduate with zero journal papers.

9) The number of students with a research experience abroad (about 2/3) is reasonably good. However, the number of foreign students attending a PhD program at the School (5 out of 78 students), while improving from the previous number of 2, is still too small and reveals that the attractiveness of the School is still limited abroad, despite the simplification of the recruitment procedure. This problem is fairly general in Italian Universities and may be partly due to external factors, such as the language barrier.

Overall, it appears that the organization of the School runs very smoothly and efficiently, that every student need is taken care of with well-established procedures and clear rules invariably posted on the web site of the School, and that much attention is devoted to the transparency of the procedures, which translates into equal opportunities for every PhD student.
As the former ethical issue is concerned, the transparency of the recruiting process is especially emphasized as a critical aspect to enhance the attractiveness of the School to the eyes of the best students. From the organizational standpoint, the importance of high-level graduate courses, well-equipped research labs, participation to conferences and visits abroad is fully recognized.

SCIENTIFIC COMMITTEE EVALUATION TABLE

Evaluation of the three year period (2008/2010): for each row please specify a score from 1 to 5 (1= unsatisfactory, 2 =Satisfactory, 3=Good, 4=Very Good, 5=Excellent)
Follow-up of the previous evaluation of the Scientific Committee: for each row specify a score from 1 to 3 (1=suggestions have not been implemented; 2=suggestions have partly been implemented, 3= suggestions have completely been implemented)

	Evaluation of the three year period (2008/2010)	*Follow-up of the previous evaluation**	*Comments*
	score 1 -5 (min 1 – max 5)	*score 1-3 (min 1 – max 3)*	
Quality of the training aims	5	3	
National and international collaborations with Academic partners	4	3	
National and international collaborations with non Academic partners	5	3	
Research funds of the teaching staff	3	2	
School funds availability	4	3	
Spaces and instruments of the School	5	2	
Relevance of the research areas	5	2	
Teaching staff publications	4	3	
PhD students publications	4	2	
Quality of the courses/ seminars of the School	4	2	
PhD students training activities outside the University of Padova	3	2	
Vocational and academic recruiting	4	2	

**Do not fill in the third column if you did not provide any comment or suggestion to improve the quality of the PhD programs on the corresponding item of the first column. However, you are kindly requested to evaluate whether or not [rating scale: min 1 – max 3] the School accepted the suggestions you provided.*