Manifesto of Studies
Academic Year 2009 -2010

During the Academic Year 2009-2010 the Doctoral Programme are in progress and are coordinated by the Department of Electronics and Computer Science Engineering (DEI in Spanish) jointly with the International Doctoral School in Information and Communication Technologies (ICT International Doctoral School) of Trento.

1. ADMISSION AND LENGTH OF STUDIES

Under the Catholic University "Nuestra Señora de la Asunción" Regulations, issued with Law No. 663 on 06.09.1960, applicants must hold an Engineer degree in Informatics, Electronics, or related disciplines to be admitted to the DEI-ICT Doctoral School (ICTDS). Holders of an equivalent foreign Master's degree, as recognised by the admission committee, can also be admitted.

The length of the Doctoral studies is **three years.**

2. LEARNING CREDITS

Doctoral students must earn **180 learning credits** to complete the Doctoral programme. The **learning credits measure the knowledge level, the skills acquired by the student and the quality of the research results achieved.** Credits are assigned by the Doctoral School Committee through the procedure specified below.

It is estimated that, on average, **25 hours of work** are needed to acquire one credit. Thus, a standard educational path that includes the acquisition of 60 credits every year corresponds to **1500 hours of work/year**.

3. STRUCTURE OF THE DOCTORAL SCHOOL

The educational programme is based on the multidisciplinary and interdisciplinary research interests of the faculty members and on the availability of several scientific laboratories. The educational method is aimed at promoting the development of critical, independent and innovative thinking applied to problem finding and problem solving activities, and is structured to encourage the development of discussion and team work skills.

In order to fulfil the educational objectives of the programme and obtain the Ph.D. degree, a student must be active in one of the research areas suggested in the "Call for applications" (Annex A) and show innovative thinking with the potential to contribute to the state-of-the-art of that research area.

The goal of the ICTDS-DEI is to give students the best material and resources to learn the methods and standards of research needed to work professionally at the frontiers of knowledge.

To support students in reaching the educational goals of the ICTDS-DEI, the training programme is organised in two phases: a coursework phase - based on structured courses and seminars - and a research phase – based on an informal to formal working alliance between an advisor and the student, who performs his/her activities within a research team.

The coursework considers general and discipline-specific courses and special-topic seminars.

During their first semester at the school, each student is assigned to a Tutor who facilitates the development of research activities and innovation of international level. The primary responsibility of the Tutor is to suggest a suitable curriculum for the research activity of the student, to evaluate the performance of the student in his/her research activity and innovation, and to assist him/her in planning and preparing a Personal Study Plan that adheres to the rules and regulations indicated by the Manifesto of Studies of the ICTDS-DEI.

The **first year** is mainly devoted to the **acquisition of scientific knowledge** at both basic and high level. From the second semester of the first year, the doctoral student is guided by an advisor, who supervises the research activity and ensures that good research quality is maintained. The advisor also helps the student to adjust to the university environment and follow university rules.

The advisor meets with the student to assess his/her progress in the programme and to provide advice on future work. For this purpose, the head of every research curriculum organises at least once a year **meetings** in which the doctoral students present their research activities to researchers involved in the same area to discuss and exchange ideas.

At the end of the first year, the Doctoral School Committee determines whether the student is:

- **admitted to the second year with a recognition of no less than 45 credits;**
- **conditionally admitted to the second year, with a recognition of no less than 40 credits and an indication for further credits to be acquired, under specific terms and conditions;**
- **excluded from the School.**

The **admission to the second year** and the number of credits that are granted are subject to the student's regular attendance of the School's educational activities. By this time, the student must submit a **report** on his/her research activities and obtain a **satisfactory assessment from his/her advisor**.

4. CREDIT ASSIGNMENT REGULATIONS

Each student follows a specific educational programme.

With the exception of decisions taken by the Doctoral School Committee on a case by case basis, the organisation of educational activities and the assignment of credits must satisfy the requirements described in the following table.

Year	Period	Education in research and innovation	Credits	Development of the specific research and/or innovation	Credits
1	I sem	Doctoral courses[1]	15	Bibliographic research[2]	15
	II sem	Individual and team work[2]	15	Individual and team work[2]	15
2	I sem	Doctoral courses [1]	9	Qualifying exam[1] Bibliographic research[2]	5 5
	II sem	Individual and team work[2]	6	Individual and team work[2] Foreign research centre[3]	20 15
3	I sem			Foreign research centre[3] Research results[4]	15 20
	II sem			Conference presentations[5] Thesis evaluation[2]	5 20
		TOT credits	**45**	**TOT credits**	**135**

Credits are assigned by the Doctoral School Committee according to the following five items:

(1) on the basis of passed exam;
(2) on the basis of tutor's/advisor's satisfactory assessment;
(3) on the basis of external tutor's satisfactory assessment;
(4) on one or more publications in journals or in International Conference proceedings and Workshops, or the development of a prototype system;
(5) a certificate attesting the presentation of a research result at an international conference.

The following table shows how the credits to be acquired are distributed among the different ways of assignment. Any variation in the way credits are assigned must be approved by the Doctoral School Committee.

Type of credits	1	2	3	4	5
Number of credits	29	96	30	20	5

Doctoral students are required to take 24 course credits during the first two academic years, with a required minimum of 15 credits during the first year and 9 during the second year. Each of the following requirements has to be met:

- At least 12 credits must be collected from ICT doctoral courses (see Annex B)
- No more than 6 credits can be earned from ICT advanced courses

- No more than 6 credits can be earned from outside courses (courses attended abroad and CNIT courses)
- Socio-cultural courses does not give credits

(*) Students without a Master's degree in ICT may need more than a month of work to prepare for the Comprehensive exam. In any case, 5 credits are assigned after passing the exam.

4.1 Different Types of Educational Activities

The activities undertaken by students should comprise basic research activities, as well as specialised and innovative activities.

The **basic research education** gives the student a general overview of research and innovation, which develops through general courses and seminars. These courses and seminars should be attended by the student mainly during the first part of the Doctoral programme. The topics covered during the courses are: research methodology, entrepreneurship, property rights, and social impact of the ICT technologies.

The **research specialisation's education** main goal is to prepare the student for the specific research problem or the chosen innovation in the related field. This kind of education is developed through the entire duration of the Doctoral programme, which includes courses on the specific area, curricular courses, specialised seminars, participation in congresses and collaboration in research activities.

Students are guided and supported by the tutor or by the advisor in the following:

- the preparation of an extensive bibliographic research, which has to be accomplished during the first year;
- the critical analysis of the state-of-the-art research and the detection of key elements, useful for the development of the thesis;
- the theoretical verification through computer simulations or experimental verifications of the results presented in the literature;
- the development of such results, with particular attention to the aspects linked to potential results applicable in social and industrial fields;
- the preparation of a report, regarding the state of the art of the chosen research problem as well as methodological and practical improvements already achieved and to be achieved;
- the submission of research results to the international scientific community, usually through conference presentations and/or a publication in international journals; it is requested that during the course of the Doctoral programme the student should **present the results of his/her activity in at least one international conference**.

Moreover, it is expected that the student will spend approximately **six months at a foreign University or Research Centre**. As an alternative, this period can be dedicated to experimental activities in companies for developing prototypes which are innovative with respect to the state of the art.

5. OFFERED COURSES

Courses are offered from mid September through the end of July.

Each activity allowing the acquisition of credits will be assessed. Exams are administrated by commissions nominated according to the University regulations. An exam may consist of a written test, an oral test or other types of procedures defined by the Commission.

Marks are in the range 0-10, with 10 being the highest.

5.1. **Advanced courses** (Specialist degree courses)

These courses cover advanced knowledge in Computer Science (Informatics) (hereafter INF), Electronics (ELE) and Telecommunications (TLC). They are mainly from the "Laurea Specialistica" programme in Computer Science and in Telecommunication Engineering of the University of Trento and give to the student a number of 3 credits.

For more information on the offered courses in Trento, visit the website:

http://portale.unitn.it/scienze (For Computer Science)
http://portale.unitn.it/ingegneria (For Telecommunications Engineering).

5.2. Doctoral courses (Annex B)

The Doctoral courses are aimed to allow students to develop appropriate advanced skills in the fields of the ICT.

These courses cover advanced state of the art**,** research topics in INF, ELE and TLC and give to the student a number of 3 credits.

For more information about the courses offered by the ICT (Trento) visit the website: http://ict.unitn.it/edu/ict/courselist.xml?year=2009

5.3. Outside courses

Upon approval of the Committee on Graduate Studies and with the approval of his/her tutor/advisor, a student can take courses at summer schools or at other foreign Universities offering a graduate programme.

The courses attended abroad must be either in the framework of formalised agreements or approved in advance by the Committee of Graduate Studies and the student will receive a number of 3 credits.

Annex A: RESEARCH AREAS

COMPUTER SCIENCE AREA:

1. INF - Bioinformatics
2. INF - Data and Knowledge Management
3. INF - Distributed Systems
4. INF - Software Engineering and Formal Methods
5. INF – Human Computer Interaction
6. INF - Machine learning and intelligent optimization
7. INF - Networking

TELECOMMUNICATIONS AREA:

1. TLC - Wireless Communication
2. TLC - Digital Signal Processing
3. TLC - Remote Sensing and Systems for Environmental Monitoring
4. TLC - Networking

ELECTRONICS AREA:

1. ELE - Embedded Electronics and Computing Systems
2. ELE - Remote Sensing and Systems for Environmental Monitoring
3. ELE - Networking

Annex B: DOCTORAL COURSES

NN	Area	Title	Credits
G1		Ethics of Computing	3
G3		Entrepreneurship	3
G4		Research Methodology - I (obligatorio)	3
G5		Research Methodology - II	3
G6		Technical English	3
E1	ELE	Advanced Embedded System Design on FPGA	3
E2	ELE	Silicon radiation detectors	3
E3	ELE	CMOS Optoelectronics	3
E4	CAD-ING	VHDL-based digital design	3
T1	TLC	Approximation Techniques for Signal, Image and Video Processing	3
T2	TLC	Satisfying QoS Requirements over a Single Packet Switching Networks	3
T3	TLC	Design and Performance Evaluation of TLC Networks	3
T4	TLC	Analisi dei sistemi MIMO dal punto di vista della teoria dell'informazione coniugata con gli aspetti comunicazionistico-elettromagnetici (preliminary title)	3
INF1	INF	Computational Systems Biology	3
INF2	INF	Advanced Topics in Formal Verification ** Automata-based Decision Procedures	3
INF3	INF	Advanced Topics in Network Security - Access Control and Information Theory	3
INF4	INF	Advanced Topics in Software Engineering - Conceptual Modeling and Ontological Analyis	3
INF5	INF	Knowledge Organization Systems (KOS): Structure and Development	3
INF6	INF	Instance-Based Learning	3
INF7	INF	Solving Combinatorial Problems Using Stochastic Local Search	3
INF8	INF/ELE	Languages for embedded systems design and programming	3
INF9	INF	Machine Learning for Natural Language Processing (Specific to NLP and Kernel Methods)	3
INF10	INF	Statistical Machine Translation	3
INF11	INF	Complex systems	3
INF12	INF	Optimisation Methods	3

Annex D:

REGULATION
QUALIFYING EXAM 2009

Assessment Procedure

1. PREPARATION OF PH.D. PROPOSAL

Ph.D. students must prepare and upload to the Student's Career a research proposal of between 6 and 10 pages, including:

- Survey of the state of the art (2-5 pages approx.)
- Proposal for innovative research contribution for the thesis work with a clear and detailed description of the research directions and objectives (2-5 pages approx.)
- References (max 20)
- list of student publications
- 3-5 keywords

2. ADVISOR'S ASSESSMENT

Ph.D. Advisors fill in the part Qualifying Exam - Advisor's assessment in the Student's Carrer of their candidates. The advisor's assessment is requested to be concise, but also explicit and tailored on the student.

3. EXTERNAL ASSESSMENT

Based on the keywords selected by the student and its own judgment, the Commission usually sends the Proposal to three selected external experts for its evaluation. The experts are taken from a Pool of Experts previously approved by the Committee on Graduate Studies.

4. COMMISSION ASSESSMENT

On the basis of the above information and its own expertise, the Commission (integrated with the Advisor when the overall expert assessment grades unsatisfactory) proposes to the CGS one of the following:

- PASS (positive assessment, proceed)
- PASS - WITH WARNING (positive assessment, proceed but some points of weakness have been detected in the proposal)
- ADDITIONAL ASSESSMENT REQUIRED (negative or very critical assessment, a revision and a further evaluation is necessary)

On this basis, the CGS takes the decision, and informs the students of the outcome.

- NO PASS (very negative assessment)

5. ADDITIONAL ASSESSMENT

The students requiring an additional assessment are requested to deeply revise their proposals according to the received comments. They will be then invited to discuss their revised proposal in front of the Commission. The student's advisor is invited to the discussion. At the end of this second evaluation phase the Commission will propose to the CGS a final assessment. On this basis the CGS takes the final decisions and informs the students of the outcome.