ICT PHD COURSE

(INFORMATION AND COMMUNICATION TECHNOLOGIES)

STUDY REGULATIONS

The PhD course in Information and Communication Technologies (ICT) aims to provide researchers with the ability to integrate basic research with applied research, and to enable the transfer of academic know-how to industrial technology. The research themes are therefore both theoretical and practical and aim not only to cover theoretical aspects, but also to stress the relevance of the results obtained in terms of technological innovation.

The ICT PhD course includes teaching and research training activities, within a three-year training course. It is divided into three "Curricula":

- "Computer Engineering and Science";
- "Electronics and Telecommunications";
- "Industrial applications of ICT".

The scientific themes included in these three areas offer the student a complete vision of modern information and telecommunications technologies.

The curriculum in "Computer Engineering and Science" includes research subjects in computer engineering and computer science.

The study program "Electronics and Telecommunications" includes the research topics of electronics, measurements, telecommunications, electromagnetic fields and automation.

The "Industrial Applications of ICT" curriculum focuses on all the scientific disciplines mentioned above but also aims to develop innovations and new knowledge to meet the needs of manufacturing processes. The research activity conducted by PhD students who refer to this program is necessarily part of a three-year industrial project conceived and developed in collaboration with a supporting company.

The available research activities of PhD students are updated every year and published on the School's website.

1. Training activities

The ICT PhD course provides educational and research training activities that span over a three years' time frame. This path involves a total study effort that can be evaluated in **180 PhD credits (CFDs)** and ends with the presentation of the PhD thesis. The activities planned in the course are distributed as follows:

- **130 CFDs** for research training activities;
- **30 CFDs** for educational activities;
- **20 CFDs** for the preparation of the PhD thesis.

1.a) Educational activities

The educational activities are organized and coordinated by the PhD School Council and take place mainly in the Engineering Department "Enzo Ferrari" (DIEF) or in other departments of the University.

By educational activities we mean: seminars, tutorials (offered, for example, at international conferences), distance learning courses, certifications and courses organized by companies, courses offered within the framework of a master's degree or a PhD course. Three main kinds of educational activities are considered:

a. **Educational activities with evaluation** - This kind includes the activities listed above for which the doctoral student is responsible for the final evaluation of the learning with relative evaluation. Each year, at least one of such educational activities is established by PhD Academic Council and approved in advance by the PhD Teaching Commission.
b. **Educational activities without evaluation** - This kind includes the activities listed above for which a final verification test is not carried out by the PhD student; however, a certificate of participation is required to acquire the corresponding CFDs.
c. **Tutoring and supplementary educational activities** - This kind includes exercises, internships, and seminars held by the student and cannot include the replacement of professors responsible for the course, nor the responsibility for courses. These activities are entrusted by the PhD Academic Council, having acquired the consent of the interested parties and in agreement with the President / Coordinator of the Degree Course, identifying the disciplinary sectors in which the PhD students can carry out their tutoring and educational activities, which are to be carried out under the supervision of one of the members of the PhD Academic Council or of the tutor.

Concerning the amount of CFDs to be assigned for each of the educational activities, the following rules apply:

1. Each of the educational activities established by the PhD School in ICT allows obtaining at least 3 CFDs after passing a final exam that has to be taken at the end of the educational activity. The correspondence rule that assigns 1 CFD to 4 hours of frontal teaching is applied.
2. A number of CFDs equal to the number of ECTS credits will be attributed to the educational activities offered within the MSc programs.
3. For the tutoring and supplementary educational activities, the correspondence rule that assigns 1 CFD to 10 hours of activity is applied.
4. The following correspondence rule applies to all other training activities:
   - 1 to 2 hours 1 CFD
   - 3 to 5 hours 2 CFDs
   - 6 to 8 hours 3 CFDs
   - over 8 hours quotient [(number of hours - 5) / 4] + 3 CFDs

   except for special cases explicitly indicated by the PhD School.

1.b) Research Training Activities

Concerning the research training for each PhD student, a key role is played by the guidance action carried out by his/her academic tutor and eventually his/her co-tutor. Said training should aim to involve

PhD students in large-scale projects, promoted by national and international collaborations, and in research contracts with institutions or industries. In this context, the opportunity to carry out short training periods (summer jobs) or long-term (internship) in companies operating in the various districts present on our territory or in national or international research centers is particularly important.

The credits that can be acquired through the research activity concern both the theoretical studies and the experiments carried out within the scope of the activities proposed in the three PhD Curricula. The research activity of each student is realized with the production of research products.

2. Arrangement of educational and research activities during the three years' time frame

2.a) General constraints

Within the three years' time frame, the 130 CFDs resulting from research activities are subdivided as follows:

- I year 45 CFDs;
- II year 45 CFDs;
- III year 40 CFDs.

CFDs to be acquired by means of research activities concern not only the theoretical and experimental studies carried out as part of the activities proposed in the PhD program, but also all study carried out abroad.

The 30 CFDs to be acquired from educational activities must be obtained within the first semester of the third year. Their composition needs to comply with the student's training path or any individual study plan and is described in points 2.b) and 2.c).

At the end of each year, the academic tutor and the possible co-tutor of each PhD student submit to the PhD School Council a written report on the activities carried out by the PhD student; this report concerns the activity carried out in the last year, if the PhD student has completed the first year or two of his studies, and the activity carried out in the entire three years' time frame, if the PhD student has completed the three years PhD program. The report gives a short description of the research activity carried out, shows the list of research products on the IRIS database, the list of educational activities with the total number of corresponding CFDs and the list of certificates of attendance or learning verification. It is a task of the PhD School Council to formulate an opinion, based on the aforementioned report, on the acquisition of CFDs deriving from research and educational activities for each PhD student.

2.b) Training paths

Concerning the educational activities to be carried out in order to acquire the educational CFDs, two possible training paths are described below.

Academic training path

This training path is intended for all PhD students whose activity is oriented towards academic research.

For this path it is required that **at least 15 CFDs** must be achieved by **educational activities with final evaluation** and that the PhD student will participate to least 3 educational activities supported by the PhD School, and **no more than 6 CFDs** (with a maximum of 4 CFDs per year) by activities of kind c) described in point 1.a) of these regulations.

Industrial training path

This training path is intended for all PhD students who carry out their research activities partly in the academic field, partly in a company. Therefore, it is mainly intended for those who carry out a PhD in *"alto apprendistato"* (advanced apprenticeship) or an industrial PhD. In addition to the academic tutor, the PhD School Council together with the academic tutor are expected to name also a company co-tutor.

For this path the 30 CFDs related to the educational activity can be acquired through activities either with or without a final evaluation, after authorization of the PhD Education Commission. **No more than 6 CFDs may be achieved** (with a maximum of 4 CFD per year) by activities of kind c) described in point 1.a) of these regulations.

2.c) Individual study plan

If a student intends to follow a different training path from the two types described above, he/she must **submit to the Head of the PhD School** within three months since the start of the first year, a justified request for an individual study plan signed by the tutor and approved by the **PhD School Council**. This option is offered only to students belonging to the following categories: students enrolled in "cotutela" PhD programs, students who do not have a master's degree (or equivalent) in the field of information engineering, students who play a significant part of their training path at a company or a research laboratory. The request must be approved by the tutor before submitting it.

The individual study plan requires that of the 30 CFDs related to the teaching activities, at least **10 CFDs** are obtained from educational activities with final evaluation, at least **10 CFDs** from educational activities without final evaluation, and **no more than 6 CFDs** (with a maximum of 4 CFDs per year) by activities of kind c) described in point 1.a) of these regulations.

2.d) Admission to subsequent years

For all PhD students the following admission rules apply in order to be admitted to the following years and to the final exam.

At the end of the first year, the PhD student *is admitted to the second year of the PhD program* if:

- his/her activities carried out during the first year **have been approved** by the PhD School Council

  and

- he/she has acquired at least 40 CFDs, including at least **10 CFDs** from **educational activities**.

It is considered an educational debt, that will have to be recovered during the second year, any discrepancy with respect to the list of activities scheduled for the first year in the academic and industrial

training paths referred to in point 2.b); or, for students who have been approved for an individual study plan referred to in point 2.c), any discrepancy with respect to the provisions of this study plan.

At the end of the second year, the PhD student *is admitted to the third year of the PhD program* if:

- his/her activities carried out during the second year **have been approved** by the PhD School Council

and

- he/she has acquired at least 100 CFDs, including at least **24 CFDs** from **educational activities**.

It is considered an educational debt, that will have to be recovered during the third year, any discrepancy with respect to the list of activities scheduled for the first and second year in the academic and industrial training paths referred to in point 2.b); or, for students who have been approved for an individual study plan referred to in point 2.c), any discrepancy with respect to the provisions of this study plan.

2.e) Final Exam

- The PhD thesis must be written in English. For justified reasons, it can be written in Italian after obtaining permission from the PhD School Council.
- The PhD thesis must be reviewed by the academic tutor and the possible co-tutor (proposed by the tutor) or by the company co-tutor. The choice of the co-tutor must be approved by the PhD School Council by the end of the second year.
- The student must complete the drafting of the PhD thesis by the deadline chosen by the PhD School Council. Said deadline will be communicated well in advance.
- The PhD thesis, which also includes a report on the activities carried out during the PhD program and on possible publications of the PhD student, is evaluated by two teachers, hereinafter referred to as evaluators. These evaluators must be highly qualified, possibly belonging to foreign institutions, and not in conflict of interest with the tutor, the co-tutor and the student. The evaluators express a written analytical judgment on the PhD thesis and propose admission to the public discussion or postponement if they consider that significant additions or corrections are mandatory.
- The PhD School Council, on the basis of the evaluators' judgment, authorizes the public PhD defense in the ordinary session or its postponement to the next one. PhD student and the PhD Student Office will also receive communications on said decision.
- The public PhD defense of the thesis takes place in front of a judging Commission nominated by the Rector (Vice-Chancellor), based also on the opinion of the PhD School Council.
- If postponed, the PhD thesis is submitted to a new evaluation drafted by the same evaluators, in order to verify the corrections or additions made. The PhD School Council acquires the new judgments of the evaluators and in any case admits the candidate to the public PhD defense.

3. Transitional rules

The present Study Regulations of the PhD Course in ICT will be applied starting from the XXXVI cycle.