Manifesto of Studies
Academic Year 2018 - 19

During the Academic Year 2018 – 19 the first, second and third years of the International Doctoral School in Information and Communication Technologies (ICT International Doctoral School), ICTIDS, are in progress and are coordinated by the Department of Information Engineering and Computer Science.

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 Executive Committee through the procedure specified below.

STRUCTURE OF THE ICT INTERNATIONAL DOCTORAL SCHOOL

The educational programme is based on the multidisciplinary and interdisciplinary research interests of the faculty members and on the availability of the 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 teamwork skills. It is also intended to enhance the entrepreneurial skills of the doctoral students by furnishing theoretical bases and providing concrete professional opportunities.

The goal of the ICTIDS is to provide students with methods and standards of research needed to work professionally at the frontiers of knowledge. The training programme is organised into 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.

During their first semester, each student is assigned to a tutor who facilitates the development of research activities and innovation at international level. The prime responsibility of the tutor is to suggest a suitable curriculum for the student's research, to evaluate the student's performance in his/her research 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 ICTIDS.

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 onwards, the doctoral student is guided by an advisor, who supervises his/her research, supports preparation for his/her Qualifying exam, and ensures that a good research quality is maintained.

At the end of the first year, the Doctoral School Committee determines whether the student is:
1. **admitted to the second year with:**
   a) recognition of no fewer than 6 course credits
   b) positive assessment of the advisor**;**
2. **excluded from the ICTIDS**

In the case of a negative judgment by the advisor, the Executive Committee will decide on the matter.

Admission to the second year and the number of credits granted are conditional on the student's regular attendance on the ICTIDS's educational programme.

During the **second year** the doctoral student deepens his/her **scientific knowledge** and **starts to establish his/her thesis work**, identifying the objectives and research activities to be developed within the thesis. At the beginning of the second year, the student must submit a Ph.D. proposal and make a presentation to a Committee selected by the Doctoral School Committee (**Qualifying exam**; see Annex B for the regulation of the exam). The Ph.D. proposal must contain a review of the state of the art in the area; a description of the research goals and plan; and the preliminary results. On the basis of the Board's assessment, the Doctoral School Committee decides **whether the student can continue his/her Ph.D. programme or whether s/he should be excluded.**

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

1. **admitted to the third year**, with:
   a) recognition of no fewer than 15 course credits;
   b) success in the Qualifying exam
   c) submission of a plan illustrating the scheduling of a period of research of at least 3 months which must be spent abroad by the end of the Ph.D. programme;
   d) submission of plan to achieve at least two ISI- or SCOPUS-indexed publications within the duration of the study programme
   e) positive assessment by the advisor. ;
2. **conditionally admitted to the third year**, with:
   a) recognition of no fewer than 12 course credits,
   b) success in the Qualifying exam
   c) submission of a plan illustrating the scheduling of a period of research of at least 3 months which must be spent abroad by the end of the Ph.D. programme;
   d) submission of plan to achieve at least two ISI- or SCOPUS-indexed publications within the duration of the study programme
   e) a positive assessment of the advisor. Further credits to be acquired, under specific terms and conditions must be indicated as well;
3. **excluded** from the ICTIDS.

In the case of a negative judgement by the advisor, the Executive Committee will decide on the matter

The **admission to the third year** and the number of credits granted are conditional on the student's regular attendance on the School's educational programme.

During the third year, the student focuses on his/her personal contribution to the state-of-the-art on the chosen research topic and/or to the development of the proposed technological innovation. The activity ends with the submission of a **Doctoral thesis**. The thesis must be written in English, must have original content, and must demonstrate the student's ability to carry out research and/or innovation activities at international level. The thesis work generally stems from scientific collaborations and should clearly indicate the specific contributions of the student.

Admission to the Final Examination requires:
   a. completion of a period of research of at least 3 months spent abroad;
   b. completion of at least two ISI- or SCOPUS indexed publications.

In addition, on the basis of the **attendance on the ICTIDS's educational activities and a satisfactory assessment by the advisor**, the Doctoral School Committee decides whether the student is:
- **admitted to the Final exam;**
- **excluded from the ICTIDS**.

The **Final exam** consists of a defence of the thesis before a panel of internationally renowned experts on the thesis research areas.
The instructions on the procedure regarding the Final exam are set out at the following webpage https://ict.unitn.it/enrolled-student/phd-career/final-exam

CREDIT ASSIGNMENT REGULATIONS

Each student follows a specific educational programme. All students are required to acquire 15 course credits during the first two academic years, with a required minimum of 6 credits during the first year.

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	Education in research and innovation	Course credits	Development of the specific research and/or innovation	Credits
1	Doctoral courses	6	Research work • State-of-art analysis • Research problem definition • Research Plan • Individual and team work	45
2	Doctoral courses	9	Research work • State-of-art analysis • Research objectives definition • Preliminary research results • Individual and team work	45
			Qualifying exam	15
3			Research work Foreign research centre Research results Conference presentations	40
			Thesis evaluation	20
	TOT credits	**15**	**TOT credits**	**165**

Any variation in how course credits are assigned must be approved by the Executive Committee.

The required 15 credits must be acquired by passing:
- 3 courses from ICT doctoral courses (see Annex A or https://ict.unitn.it/enrolled-student/courses)
- Research Methodology course
- 1 freely chosen course: doctoral/ M.Sc. course or Summer/Winter School.
  These courses can be offered externally to the ICTIDS as well
- "Academic Writing for Science and Engineering" courses do not give any credits. However, attendance on such courses is mandatory.

No more than one course offered by EIT Digital can have its credits been recognized.

All credits are acquired upon approval by the PhD student's tutor/advisor.

Courses must be followed after enrolment in the Ph.D. Programme. Exceptions may be approved by the Executive Committee;

Courses that have contributed to other degrees and online courses that the student has completed do not apply.

Transdisciplinary Program in Computational Biology

In addition to the objectives of the ICTID program, transdisciplinary programs are established to pursue the following specific objectives:
- Promotion of cross-disciplinary research within the Ph.D. program;
- Training of PhD students with cross-disciplinary skills;
- Increasing collaborations with the other institutions.

A transdisciplinary program is a training path that complements the doctoral program (primary program) with an educational and research component on an additional discipline (secondary program). The secondary program integrates the primary one without changing regulations and constraints. It is possible to achieve the primary title without obtaining the secondary one but not the other way around.

The **transdisciplinary program in Computational Biology** - in collaboration with the International PhD Program in Biomolecular Sciences of the CIBIO - aims at training Ph.Ds with complementary competences in Computational Biology. The Ph.D. candidate enrolled in the ICT course joining the transdisciplinary program receives specific education and guidance to develop relevant research in Computational Biology. The transdisciplinary program offers elements of cellular biology, biotechnology and bioinformatics. Specific attention is devoted to foster interactions and communication across the disciplines.

Doctoral students participating in the Transdisciplinary program are required to acquire 9 credits from ICT doctoral courses, 6 credits from the secondary program and pass both "Research Methodology" and "Academic Writing for Science and Engineering" courses. Secondary program credits are acquired by attending:

- an ad-hoc experimental laboratory course (decided every year by the panel);
- a course selected from the optional courses of the PhD Program in BS or those offered by the M.Sc. degree in Cellular and Molecular Biotechnology.

Qualifying exam

The qualifying proposal of the transdisciplinary program student should contain research aspects which are relevant for the secondary program and a feasible plan for their achievement

Work in progress

At the end of the second and third years, the Transdisciplinary program student presents his/her work in front of a commission appointed by the panel.

Full details about the transdisciplinary program are available at https://ict.unitn.it/enrolled-student/phd-career/trandisciplinary-program

Doctoral Training Center

The Doctoral Training Center - DTC offers an innovation-oriented educational path, combined with EIT Digital and International Doctoral School of the University of Trento.

The DTC offers a business and innovation-oriented training curriculum for Ph.D. candidates in ICT, complementing the PhD program of the ICT International Doctoral School with courses and workshops focused on Innovation and Entrepreneurship.

The purpose of the DTC is to provide a multi-disciplinary and multi-organizational platform aligning with the thematic innovation areas of EIT Digital.

Trento DTC is focused on Digital Cities approaching issues such as urban mobility, analytics for decision making and citizen empowerment, safety - increasing resilience of cities against exceptional events (terrorism, climatic hazards, large events, environment, pollution).

Doctoral students participating in the DTC should fulfill the following requirements:

- passing 2 courses from the ICT doctoral courses which must not be offered by EIT Digital (see Annex A or https://ict.unitn.it/enrolled-student/courses
- passing the 3 courses from the ICT doctoral courses offered by the EIT Digital (see Annex A or https://ict.unitn.it/enrolled-student/courses)
- passing Research Methodology course
- a Business Development Experience developed within the company that sponsors the scholarship. Students are required to converge research with intra-entrepreneurship and innovation activities.
- a 6 months of geographical mobility across EIT Digital Nodes and partners.
- "Academic Writing for Science and Engineering" courses do not give any credits. However, attendance on such courses is mandatory.

Full details about the Doctoral Training Center are available at https://ict.unitn.it/prospective-student/phd-program/doctoral-training-center

Different Types of Educational Activities

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

The **basic research education** should give the student a general overview of research and innovation, which develops through general courses and seminars.

The main goal of **research specialisation** is to prepare the student for the specific research topic or the chosen innovation in the related field. This kind of education is developed throughout the entire duration of the Doctoral programme, which includes courses on the specific area, curricular courses, specialised seminars, attendance at 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 survey, which must be accomplished during the first year;
- critical analysis of the state of the art in research and the detection of key elements useful for the development of the thesis;

- theoretical verification through computer simulations or experimental verifications of the results presented in the literature;
- development of such results, with particular regard to the aspects linked to potential results applicable in social and industrial fields;
- 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;
- submission of research results to the international scientific community, usually through conference presentations and/or a publication in international journals;

Courses' scheduling is available within each course's webpage from: https://ict.unitn.it/enrolled-student/courses

Course	Lecturer	Course offered by
Advanced Numerical Methods for the Electromagnetic Modeling of Complex Communications and Sensing Scenarios	Amir Boag	UNITN
An Introduction to Network Science	Alex Arenas	FBK
Artificial Intelligence for Bioinformatics	Enrico Blanzieri Andrea Passerini Toma Tebaldi	UNITN
Business Model Development	Milena Stoycheva	EIT Digital
Conversational Agents in Computational Linguistics	Bernardo Magnini	FBK
Deep Leaning for Image Processing	Annalisa Verdoliva	UNITN
Energy efficient wireless communications	Simone Morosi	UNITN
Engineering Privacy for Information Systems	Travis Breaux	UNITN
Growth & Harvest (Business Strategy Growth)	Martin Vendel	EIT Digital
High-Frequency Systems-on-Chip for mm-Wave Applications	Johannsen	UNITN
Information Visualisation	Robert Spence	UNITN
Introduction to Deep Learning	Dong Xu	UNITN
Investigating Participation in Participatory Design	Jesper Simonsen	UNITN
Machine Learning with Big Data	Mihai Datcu	UNITN
Machine Translation	Marcello Federico	FBK
Network Softwarization, Virtualization and Slicing Foundations of the 5th Generation Radio Mobile Networks: from the Cloud to the 5G	Roberto Bruschi	UNITN
Predictive Analytics for Structured Data	Saso Dzeroski	UNITN
Requirements Engineering	Angelo Susi	FBK
Research Methodology	Holger Hoos Aliaksandr Birukou Paolo Guarda	UNITN
Security Challenges for IoT and Smart City Systems and Applications	Fabiano Hessel	FBK

Technology Trends for 5G and Wireless Systems	Renato Lombardi Roberto Flamini Christian Mazzucco	UNITN
Academic Writing for Science and Engineering **5 Sessions during a.a. 2018/19**	Fliss Hope	CLA
Presentations for the Sciences and Engineering	Fliss Hope	CLA
Academic Writing II (open to those who have completed Academic Writing for the Sciences and Engineering)	Fliss Hope	CLA

Annex B - REGULATION OF THE QUALIFYING EXAM

The goal of the examination is twofold. First, to allow the advisor and the ICTIDS to assess whether the student has the potential to accomplish the Ph.D. thesis and provide early warning signals. Second, to give the students a first taste of the kind of "examination"/presentation that they will have to face later in their careers.

In the case of suspension, the Qualifying exam can be postponed for the period of the student's absence.

The examination takes the form of a conference-reviewing process. The student is required to make a presentation that is open to the public, followed by a closed-door examination by the Committee.

Each Qualifying examination Board consists of at most 3 members belonging to the Doctoral School Committee or external members nominated by the Executive Committee. The Advisor cannot be part of the Examination Board of his/her own student.

On the basis of the student's submitted research proposal and presentation, the Examination Board proposes to the Executive Committee/Doctoral School Committee one of the following: PASS; RETRY; FAIL

The instructions on the Procedure regarding the Qualifying Examination are set out at the following webpage **new website url**

The deadlines will be sent via e-mail directly by the Secretariat