Doctorate Course in "Information Technologies for Engineering" (ITE)

Corso di dottorato di ricerca in "Tecnologie dell'Informazione per l'Ingegneria"

General presentation and study plan (Cycle XXXII)

Presentation of the course

The PhD course in *Information Technologies for Engineering* (ITE) aims at deepening theoretical and practical aspects of information technologies and applying them to develop applications in a number of domains under the guidance of experts. The course is characterized by a variety of teaching and research topics, often related to on-going national or European research projects, promoted by the researchers of the Department of Engineering of the University of Sannio.

The course was established in 2014 as a cultural widening of the previous PhD course in Information Engineering, active since year 2000 and produced almost 90 doctoral graduates.

Educational Objectives

We aim at educating researchers with a sound scientific background and a specific culture of design in different areas of application, with an interdisciplinary approach and a vision towards the creation of new solutions.
This will enable the conception and development of innovative solutions and investigation methodologies, a basis to perform advanced research in public and private enterprises with scientific and technical competence, and a managerial attitude.

The education is directed to the acquisition of methodological, technological, theoretical and experimental tools, either traditional or innovative, to be utilized for modelling, designing, prototyping/simulation and testing of

information technologies and their applications to complex information, mechanical, energy, electrical systems and civil work in a natural or anthropic environment.

The objective is also to stimulate the development of a spirit of entrepreneurship.

The education will be complemented with international exchanges or internships at public or private research labs.

The course comprises two curricula, Information Technologies and Energy and Environment.

Employment outlook

A PhD in ITE offers a wide range of job opportunities based on the capabilities, acquired during the course, to manage research activities, write high-quality scientific and technical reports, develop practical results, collaborate within work groups in national or international partnerships, with a good knowledge of the English language, written and spoken.

Students that graduated in ITE at Università del Sannio will be fit for employment in both private and public institutions. Just as an example, five Engineering Schools and a number of Research laboratories of CNR, ENEA, INFN, and other government research agencies operate in the Campania Region. There exist a number of local employment opportunities as postdocs in research and teaching activities. More broadly, our alumni were able to find prestigious academic and industrial positions both in Europe and in the US.

For the sake of illustration we mention here some technical areas where our alumni have found or may find employment:

- Computer aided design of civil works;
- Design and management of software systems;
- Design and management of water systems and water resources;
- Design and simulation of centralized or decentralized computing systems;
- Design and simulation of sensors and systems for ground- or satellite-based data acquisition systems;
- Industrial automation;
- Information-technology and electrophysics support to fundamental research experiments;
- Modelling and analysis of complex components and materials for automotive, aerospace, railways, biomedical, telecommunication, civil development industries;
- Modelling and design of systems for energy conversion and energy management;

- Modelling and realization of measurement system with application in telecommunication, aerospace, bioengineering, industrial manufacturing;
- Planning, design and simulation of transportation systems;
- Planning and management of electrical power systems on regional, national or transnational scales;
- Simulation of geotechnical structures and systems under dynamics inputs;
- Simulation and design of chemical plants and combustion processes.

The work programme

A tutor is appointed for each student. During the first year the tutor will be one (or more) of the researchers and professors of the Department of Engineering, after which an external scholar, approved by the school, can be added.

The course lasts 3 years during which the student must take courses, perform research, and develop a PhD thesis.

The **curricular coursework**, summarized in the Table 1 below, requires

- 24 credits to be acquired along the three years,

  ◦ 12 credits through class organized by University of Sannio;

  ◦ 12 credits through short Ph.D. course or online course organized by external University with final exam;

- two courses at master level or bachelor level,

- enabling" activities, as specified in the table below.

It needs to be emphasized that *acquisition of credits requires a formal exam at the end of the course*.

The definition of "credit" as a number of hours of study (typically 25) including both class attendance and home study in a ratio of approximately 1:3. In other words, to earn 1 credit it is necessary to attend 6 hours of lectures, followed by approximately 19 hours of study, and a final exam. Attending seminars does not provide credits *per se*.

Courses are taught in English, may be taught in Italian if no foreign student is attending (this includes even remote attendance).

Each year the student presents his/her study plan, pre-agreed with the tutor, to the Coordinator who approves it as prescribed by the Doctorate Committee.

A limited numbers of hours (not more than 40) may be devoted to activities of teaching assistantship.

Courses	Details	Number of credits	Note
"Internal" PhD Courses	70% attendance mandatory	At least 12	Graded (A, B, C, D, E, F)
Summer schools		At most 6	pass/no-pass
"External" PhD courses	From other universities	At most 12	Graded according to university's rules
Master or bachelor courses	Two courses, from our university or other universities	No prescription	Agreed upon with the tutor, pass/no-pass
Other activities	Seminars, schools without proper evaluation	-	Agreed upon with the tutor
English course	Enabling competence. Achievement of B2 level is recommended as a minimum. Higher levels are encouraged. (it is not a mandatory for students that just have B2 certification)	-	pass/no-pass
Research management and organization, funding opportunities, team building, IPR	Enabling competences		Mandatory attendance

TABLE 1

The **research activity** is devoted to the development of research products worth publication in scientific papers in prestigious archival journals and presentation at major conferences. The contributions of the various papers produced along the course can be included in the final PhD thesis with the goal of forming a comprehensive, self-contained, and far-reaching piece of work.

Students are expected and encouraged to spend at least 3 months at another research institution, preferably abroad, to improve their knowledge and widen their cultural horizon. During the stay, the scholarship is increased by 50%. These external periods need to be authorized in advance by the Doctorate

Committee.

Proficiency evaluation

Each year the students' activities are evaluated by the Doctorate Committee that decides on the admission of the student to the next year of the course or to the final exam. Students are required to write a report on the activities of the first year to be admitted to the second year. For admission to the third year students must deliver a 20' presentation, preferably in English, to the Doctorate Committee. At the end of the third year students submit a draft of their final thesis to two external reviewers indicated by the tutor and approved by the Coordinator. Reviewers can accept or reject the work or require revisions to the work. Major revision may require up to 6 months of additional work. Students are admitted to the final exams on the basis of:

- their three-year curriculum,

- a 40' presentation of their work,

- the reviewers' comments.

The final version of thesis is submitted to a Committee formed by 3 professors/researchers, experts in the scientific area of the thesis; no tutor of the candidate may participate to the Committee and not more than one of its members is allowed to be an "internal" professor. After a few weeks needed for examination of the thesis, the Committee gathers with the candidate to hear its formal presentation and eventually awards the degree.

At student's request, University of Sannio may attach the label of *Doctor Europaeus* to the PhD degree when the following four conditions have been fulfilled:

1. The two external reviewers of the thesis are professors from two higher education institutions of two European countries, other than Italy;

2. At least one member of the examination Committee comes from a higher education institution in European countries, other than Italy;

3. Part of the defence must takes place in one of the official European languages, other than Italian;

4. The PhD thesis has been prepared as a result of a period of research of at least one trimester spent abroad.

Admission procedure

Each year at least 8 students are admitted to the course. More positions may be available, subject to availability of funds for additional scholarships, typically from on-going research projects. The call for applications is issued in July or September. The selection, on a competitive basis, is conducted in time to start the course by November 1st of each year.

The selection is made by an admission Committee appointed by the Doctorate Committee and is based on evidence from the following items:

- the *curriculum vitae et studiorum* of the candidate;

- topics studied, grade achieved and quality of the final dissertation for master degree;

- interview with the student.

The interview is based on presentation and discussion of a research project/topic chosen by the candidate, and includes an evaluation of English language skills. The interview can take place in "teleconference" for foreign applicants; Italian applicants must motivate the request for a teleconference interview: medical or other reasons must be invoked and supported by adequate documentation.