EIE · SURVEYOR

reference point for

Electrical and **I**nformation **E**ngineering in Europe

Overview of
the Bologna Process
Implementation in Europe
In
Electrical
and
Information Engineering

EAEEIE

Nancy-Université
Université Henri Poincaré

Directorate-General for
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EIE-Surveyor Project

Overview of Bologna Process

Implementation in Europe

In Electrical and

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(Bachelor, Master, Doctoral studies)

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Coordination of the EIE-SURVEYOR Thematic Network:

Jean-Marc Thiriet

(Université Joseph Fourier, Grenoble, France)

Coordination of the Monograph : Maria João M. Martins

(Instituto Superior Técnico, Lisboa , Portugal)

With the help of M. PEREIRA for formatting and editing

Last revisions were performed by a working group composed by: Fernando Maciel BARBOSA (University of Porto, Portugal), Joseph BARSICS (Haute-École de Liège, Belgium), Olivier BONNAUD (Université de Rennes 1, France), Juan Carlos BURGUILLO (University of Vigo, Spain), Cyril BURKLEY (University of Limerick, Ireland), Dervis DENIZ (Eastern Mediterranean University), Karl GUDMUNDSSON (University of Iceland), Hélène FREMONT (Université de Bordeaux 1, France), Josef JASENEK (University of Bratislava, Slovakia), Gert JERVAN (Tallinn University of Technology, Estonia), Jan LIGUS (Technical University of Kosice, Slovakia), Maria João MARTINS (Instituto Superior Técnico, Portugal), Daniel PASQUET (ENSEA, Cergy, France), Christian PERRA (University of Cagliari, Italy), Michel ROBERT (Université Henri Poincaré Nancy 1, France), Jean-Marc THIRIET (Université Joseph Fourier Grenoble, France), Anthony WARD (University of York, U.K.), Hamed YAHOUI (Université Claude Bernard Lyon 1, France).

Table of Contents

PRESENTATION

- 1 -

This report has been written during the academic years 2005-2008 by a consortium composed of 107 universities, which are members of the EIE-Surveyor Thematic Network (www.eie-surveyor.org), with the cooperation of the EAEEIE (European Association for Education in Electrical and Information Engineering, http://www.eaeeie.org).

This monograph has been published in the summer of 2008 and therefore the available information corresponds to the situation in higher education institutions in Europe at this time.

The monograph consists of two parts:

In the first part two contributions try to give a general overview of:

- the Bachelor and Master studies in Europe in 2008 **("*New Trends of Electrical and Information Engineering Higher Education in Europe*")**

- the Doctoral studies situation and possible trends of its evolution *("New Trends of Doctoral Studies in Europe: Special Considerations for the Field of Electrical and Information Engineering"*)

In the second part an overview of the three cycles of EIE studies in each partner country is presented.

Every effort has been made to make the contents of the present monograph accurate, but apologies are given for any accidental errors or omissions. In order to correct any new release of the monograph, please contact:

mariajoaomartins@ist.utl.pt   or
jean-marc.thiriet@ujf-grenoble.fr

- 2 -

First Part

**New Trends of Electrical and
Information Engineering
Higher Education in Europe**

**New Trends of Doctoral Studies in Europe:
Special Considerations for the Field of
Electrical and Information Engineering**

**A contribution to improve the level of
mobility in Electrical and Information
Engineering Higher Education in Europe**

New Trends of Electrical and Information Engineering Higher Education in Europe

Maria João M. Martins

The author is a member of EAEEIE, IEEE, and the EIE-Surveyor-Network, a European Thematic Network in the ERASMUS program.

1. Introduction

Higher education all over the world is undergoing a series of changes. The most important ones are: the impact of globalization on higher education; new roles of higher education and research in the knowledge society; the impact of ICTS on higher education and the relationship between the world demographic trends and their impact on higher education in the future.

The constant and growing amount of exchanges amongst researchers and professors, the many joint projects undertaken by international groups and the increased mobility of undergraduate and graduate students, encouraged by the establishment of Exchange programs such as Erasmus, demand for a new paradigm in higher education.

The most important changes that arise in this new context are:

- Meeting the demand for increased access to higher education
- Transnational education
- ICT`s application in higher education
- Quality assurance, accreditation and the international recognition of studies and qualifications
- Funding higher education
- Status of higher education teachers
- The role of Continued Education in the permanent updating of knowledge and skills.

This is especially applicable in electrical and information engineering where there is a tendency already, to two tier systems, mainly arising from the British and German technical courses tradition.

Innovative approaches to the internal functioning of higher education are implemented through two independent processes: curriculum reform and the use of ICT.

Regarding the first, common core structures of study programs, modularization and the adoption of the credit system, are emerging as the most important tools to achieve that goal. Besides, these tools have several potential benefits in terms of mobility of students, flexibility of higher education programs, and international recognition of studies and qualifications.

The Bologna Declaration on the creation of the European Higher Education Area (EHEA) which will be achieved in 2010, has given rise to a process that favours the convergence of various educational

systems in order to achieve greater transparency and compatibility for study programs and degrees, and promotes the adoption of a higher education system essentially based on three main cycles — Bachelor, Master and Doctorate.

In this paper we analyze the impact of these changes in the new course architecture and propose some guidelines for future syllabus.

2. The BMD model and its impact on EIE Education

The Bologna Declaration in 1999 is a strategic plan for achieving the integration of all the higher education systems in the European Union by the end of the year 2010. Its goal is to coordinate the diverse higher education systems that function in the different member countries so that they can become more transparent while respecting the cultural diversity and autonomy of each university. This model favours not only a common credit system (ECTS) that allows an easy homologation that promotes mobility amongst undergraduate and graduate students, but also favours an earlier integration in the labour market, by shortening the duration of the first cycle to three or four years, a second cycle of 2 years and finally the doctorate to be achieved in three years.

The corresponding titles are denominated Bachelor, Master, and Doctoral degrees- also known as the BMD model.

Hence, it is necessary to evaluate the possibility of implementing pedagogical strategies, make adjustments in the teaching and evaluation areas, design flexible curricular structures, optimize academic study periods and using information and communication technologies (ICTs) within our own universities in order to be more efficient in terms of the time required for the training of engineers. Quality and efficiency are fundamental for any educational process.

The main concern is that the standardization of educational systems may overlook the cultural diversity of the countries and, therefore, be insensitive to their specific local or regional needs. Some fear that traditional schools may disappear because of the Internet, while others discuss the internationalization and Americanization of the contents of some programs. The problem, undoubtedly, is a serious one. There are universities everywhere that are good and efficient, as opposed to others that are unable to guarantee a minimum training for their students.

It is therefore necessary to reach international agreements for quality assurance, accreditation and recognition for programs and titles that reduce the risks generated by globalization and insure quality in the educational systems.

The idea of mutual recognition of national systems of quality assurance is important and essential.

From what has been explained above it is evident that, due to the rapid growth and expansion of higher education, it is urgent to establish world-renowned mechanisms for quality assurance in the

sector. The challenge is to seek the best way to maximize benefits and minimize the dangers of a global higher education system.

The convergence of higher education in Europe is now gaining way, even with all of its uncertainties and challenges, its difficulties and appeal, thanks to the crucial help of universities, academics and students that have joined in the struggle after the initial stage, during which decisions were made on a political level.

When faced with the challenge to adopt a new paradigm based on the first two cycles (bachelor and master) to replace longer term courses with a typical duration of five or six years, there are problems that arise in the process of transition.

1. What should be the minimum content needed for this first cycle to offer training that will enhance job performance?

2. There is a justifiable concern of lowering quality standards due to the reform requiring a reduction of the content levels.

3. How to clearly differentiate these new titles from the ones already being offered in technological or similar level programs?

Along with reforming the structures of existing titles, the content of study programs must also be pondered. A curricular reform per discipline is therefore irreversible. In this context, the greatest challenge is figuring out how to go from teacher-focused learning models to student-focused learning models.

According to the current ECTS system a 15 weeks semester of higher education corresponds to 30 credits and 1 credit is proportional to the student workload, including classes, individual work and exams.

Regarding undergraduate degrees, there is a clear trend across Europe toward assigning between 180 and 240 ECTS credits, equalling 3 to 4 years full-time study, while graduate degrees at Master level normally carry 60-120 ECTS credits. As the length and the content of Bachelor degrees vary, there is a need to have similar flexibility at the Master level. The most common pattern appears to be: 180 credits Bachelor+120 credits Master.

These considerations were the backbone of the Thematic Network (TN) EIE-Surveyor proposal. The new thematic network was launched based on the results of the *THEIERE* project [1], [2] (www.eaeeie.org/theiere) during which an observatory on the implementation of the Bologna process [3] in EIE throughout Europe was established.

EIE-Surveyor: Reference Point for Electrical and Information Engineering in Europe (www.eie-surveyor.org) has been a three-year European ERASMUS TN running from October 2005. The main objectives of this thematic network are:

- a reflection on generic competences and subject-specific competences in Electrical and Information Engineering (EIE),

- an implementation of quality assessment methodologies on some educational resources available in EIE,
- a reflection and proposition of a methodology for accreditation, in order to enhance comparability and common certification procedures,
- a census of the existing curricula in EIE in Europe, the multinational degrees, and the situation of the implementation of the Bologna-process in EIE, at the bachelor, master and PhD levels.

3. The EIE-Surveyor consortium

This TN comprises 107 European academic institutions representing 29 eligible countries (all the 27 current EU countries except Luxembourg) plus Norway, Iceland, Turkey, and 2 non eligible countries (Ukraine and Lebanon). Besides the academic institutions some other organisations, such as: industrial companies, research institutes and societies, are involved in the network: BEST (Board of European Students of Technology), EAEEIE (European Association for Education in Electrical and Information Engineering), IEEE French and German chapters on Education and the French Club EEA (www.clubeea.org).

The goal of the project is to become a reference point in EIE and, at the same time, to enhance the attractiveness of the European Research Area (ERA), the links with industry, and to participate in the continuous evolution of higher education in Europe. To answer these needs, the ongoing activities of the project, as identified in the contract, are:

- the setting up of common definitions about the competencies to define the paths of the students, during their studies,
- the analysis of accreditation procedures and methodologies all over Europe (and also in third world countries) in order to make some propositions for a common or shared approach, throughout Europe, in order to enhance comparability of curricula and recognition of diplomas,
- the setting of quality assessment of some pedagogical resources available in EIE in Europe,
- the state of the art of the implementation of the Bologna process in EIE in Europe, the various curricula available, at the Bachelor, Master and PhD levels,
- the existence of international curricula.

Figure 1- The EIE-SURVEYOR consortium

4. Description of the study

(A survey of the Bologna process in EIE at the bachelor, master and PhD levels)

The activities in this task are the finalization and update of the maps of European undergraduate and postgraduate studies. As mentioned previously, a monograph (Collective, 2003) [4] was published during the THEIERE project (2000-2003), but some countries were still to be completed and some information needed to be updated because the situation was still evolving. Another monograph issued during the THEIERE-DISS project (2004-2005) [5], concerning an overview of PhD studies must be completed, together with the identification of the existing links between masters and PhDs, taking into account the master courses which will prepare the students for PhD studies.

5. Comparative analysis

The construction of the European Higher education Area until 2010 is the aim of the Bologna process. Since then follow-up conferences in Prague (May 2001) and Berlin (September 2003), have reviewed some of the initial objectives.

A three-cycle system was established, with a common credit system – ECTS. The first cycle, entitled **Bachelor** should not last more than 4 years, with a number of credits varying from 180 to 240 credits. The second cycle – **Master**, after the first degree, should require 90 to 120 credits. The third cycle-**Doctorate**, should not last longer than 3 years.

The true revolution of the Bologna process also known as the **BMD (Bachelor-Master-Doctorate)** process is that the teaching-learning process is focused on learning outcomes, rather than on syllabus, with the learners as the focal point of the educational strategy.

The use of learning outcomes to define the programmes means that the content of a specific course is expressed as knowledge, competences and skills acquired, rather than on information delivered. ECTS are based on workload rather than on presential class hours. Two initiatives have defined a framework for the establishment and development of the educational process and qualification system - the Dublin Descriptors and the Tuning project [8] [9].

At present, the situation still presents a varied profile, since some countries have already applied in full the Bologna recommendations whereas others are still discussing the implementation.

An overview of the process allows the conclusion that a convergence of Higher Education Degrees has been attained at this level. The 3 cycle BMD system is used now in most European countries and the crediting system ECTS is applied in all the countries that have signed the declaration.

The Doctorate level is the one that is still under revision and presents more changes between the old and the new framework.

While the implementation of the Bachelor and Master's degrees according to the Bologna process began in 2000, the situation of doctoral studies was only raised in 2003, since access to this third cycle required a successful completion of the second cycle.

A previous study [5] showed that there were big differences in the doctorate in Europe, concerning duration, financial supports and duties, as for example complementary classes and seminars that are compulsory in some countries and non-existing in others, or with respect to duties as lecturers.

The Bologna-follow-up conference in London in May 2007, was an important step towards the reflection of the evolution in doctoral studies. The main objective is to promote a closer alignment of the European Higher Education Area (EHEA) within the European Research Area (ERA), with the aim of improving the quality and competitiveness of European higher education.

An overview of doctoral studies, shows that there is a recent trend to include, besides the thesis research work, additional lectures, seminars, summer-schools, etc. that are particularly oriented at the needs of doctoral candidates [7] (see also the following paper in this book entitled "*New trends of Doctoral studies in Europe: special considerations for the field of Electrical and Information*

Engineering"). Some ECTS credits are awarded for attending these events. The total workload of these events during the doctoral phase might be 50 to 150 hours in the average. It must not exceed this time in order not to put at risk successful research works.

As shown in the figure below, the integration of European higher education systems into a common crediting procedure (ECTS) is already achieved for most of the European countries with the exception of U.K. and Estonia.
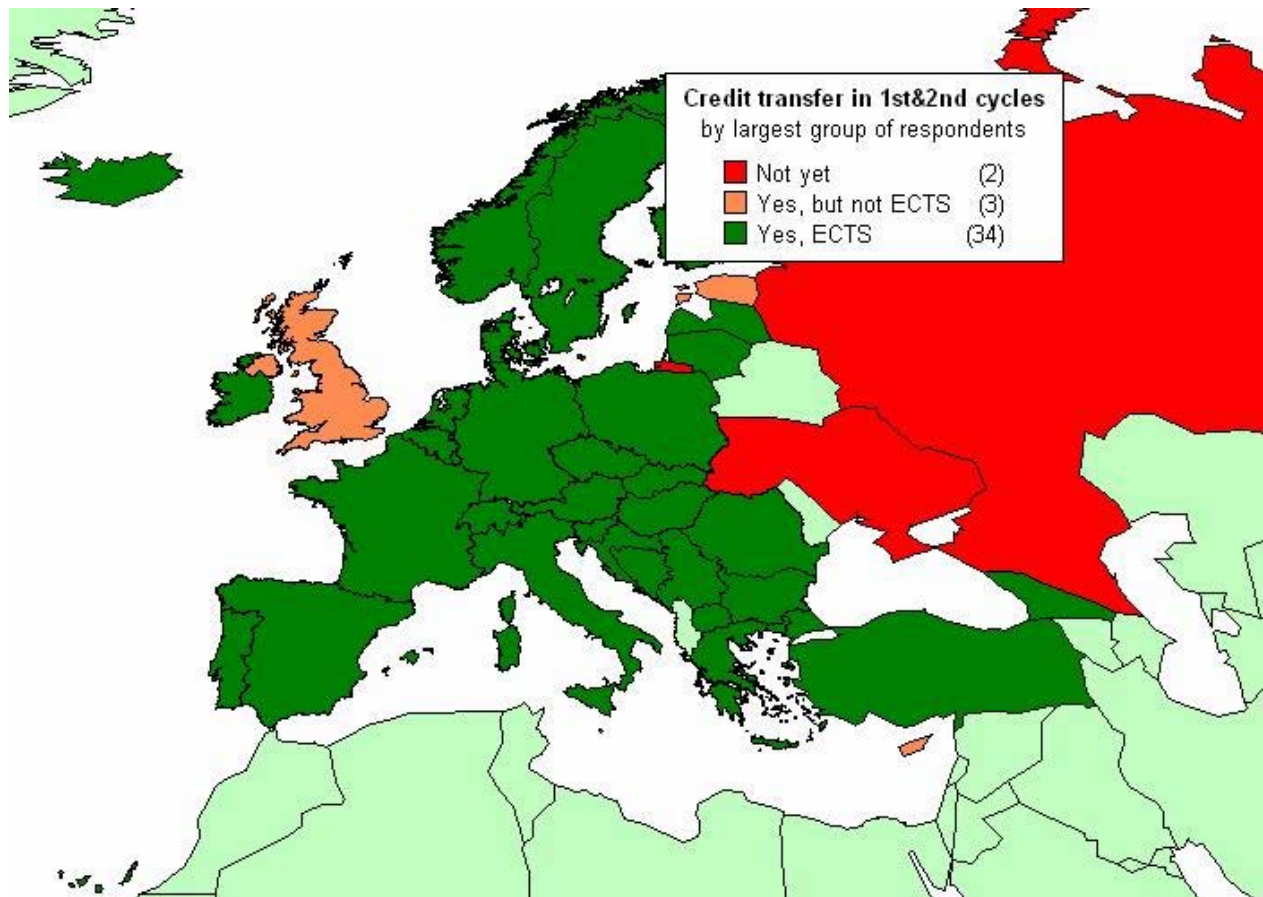
Figure 2- **Implementation of ECTS in Europe**

In figure 3 is presented the state of implementation of the Bologna-B-M-D system in Europe. As can be inferred the state of implementation of the new model still presents a lot of difference between the various countries. This is due to the fact that a very important factor is the acceptance and recognition of the new model by the professional engineering associations that accredit the degrees and the needs and expectations of the labour market.

The costs associated with a change of paradigm are also a key factor that may delay the transition to a new educational framework.
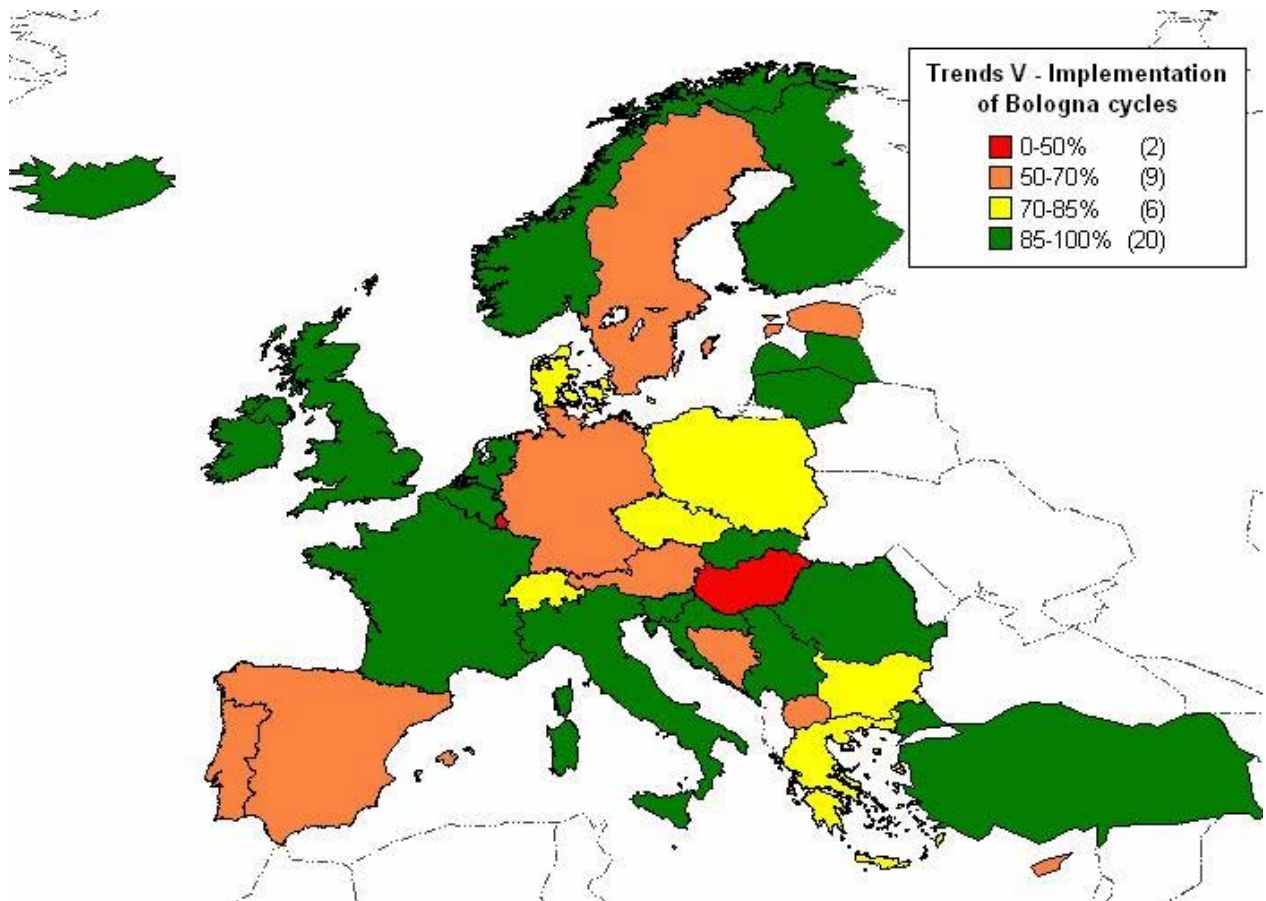
Figure 3 - State of implementation of the Bologna model in Europe in 2008.

6. Conclusions

This publication presents a summary of the Electrical and Information Engineering higher education in 2008. In some cases it was impossible to obtain information or an up-date of the existing information for some countries. The following pages essentially reflect a joint effort of the various EIE-Surveyor partners to provide an accurate picture of the evolution of European Higher Education in their respective countries. We will try to update the information in an interactive way by using the EIE project website (http://www.eie-surveyor.org).

As a conclusion we might say that the main objective of introducing a two cycle basic formation in EIE has been applied in most countries in Europe. The crediting system is now for the most part based on ECTS, which facilitates the inter-institutions recognition of diplomas and student mobility.

Doctoral studies have lagged behind and there is still a lot of controversy, namely on the weight of independent research work and the mandatory inclusion of seminars and courses also credited by ECTS.

Acknowledgements

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New Trends of Doctoral Studies in Europe: Special Considerations for the Field of Electrical and Information Engineering

Olivier Bonnaud, Michael H.W. Hoffmann

The authors are members of EAEEIE, IEEE, and the EIESurveyor-Network, a European Thematic Network in the ERASMUS program. Prof. Bonnaud is the director of doctoral studies in Rennes, France. Prof. Hoffmann is chairman of the consortium for the engineering doctorate in the council of faculties of engineering and informatics at German universities (4ING).

1. Introduction: the doctorate in the framework of the European policy of education

The doctorate was already mentioned in the early beginning of the Bologna process [1]. The latter was set-up in order to harmonize studies in Europe and to build the European Higher Education Area (EHEA).

During that phase of the Bologna process, the classification of the doctorate was not yet as clear cut as it is nowadays, due to the adoption of the European Qualification Framework (EQF) by the European parliament [11].

Indeed, the Bologna scheme concerned at first only two main cycles of higher education, undergraduate and graduate. The doctorate was considered as part of the graduate cycle, as it is still seen (in a way) in the US.

While the European partners began in the early 2000's to set-up the Bologna process for the bachelor and master studies, it was as late as 2003, when European ministers in charge of higher education mentioned "doctoral studies" for the first time [12], to which access should be given after successful completion of the second cycle, and which was seen from then on as "the third cycle in the Bologna process".

Since then, all levels of higher education, i.e. bachelor level, master level and doctorate (in France comparable to the level of *Doctorat*, in the US comparable to the PhD level, in Germany comparable to the level of a Doktor) are covered by the Bologna regulations.

An analysis of the situation showed that there were big differences in the doctorate in Europe, especially concerning duration, grants and financial supports, not only for doctoral candidates but also for related laboratories, and concerning duties as for example complementary classes and seminars that are compulsory in some countries and in others not, or as another example, with respect to duties as lecturers. In Germany, universities and industrial associations even do not see the engineering doctorate as part of higher education, but as first part of the professional career with a stronger research oriented profile.

During the Bergen conference in 2005, European ministers in charge for higher education decided to further develop "the basic principles for doctoral programmes" [7].

In France, new official texts were produced by the government in 2006 [2], which gave new rules for the doctoral studies. There, doctoral studies are organized in doctoral schools that have new missions and that are evaluated by a national evaluation agency (AERES [3]) with well-defined criteria.

The Bologna-follow-up conference in London in May 2007 was an important step towards the reflection of the evolution in doctoral studies. From the communiqué of this conference [4], the following text is extracted:

"*Closer alignment of the EHEA with the European Research Area (ERA) remains an important objective. We recognise the value of developing and maintaining a wide variety of doctoral programmes linked to the overarching qualifications framework for the EHEA, whilst avoiding overregulation. At the same time, we appreciate that enhancing provision in the third cycle and improving the status, career prospects and funding for early stage researchers are essential preconditions for meeting Europe's objectives of strengthening research capacity and improving the quality and competitiveness of European higher education. We therefore invite our Higher Education Institutions (HEIs) to reinforce their efforts to embed doctoral programmes in institutional strategies and policies, and to develop appropriate career paths and opportunities for doctoral candidates and early stage researchers. We invite EUA to continue to support the sharing of experience among HEIs on the range of innovative doctoral programmes that are emerging across Europe as well as on other crucial issues such as transparent access arrangements, supervision and assessment procedures, the development of transferable skills and ways of enhancing employability. We will look for appropriate opportunities to encourage greater exchange of information on funding and other issues between our Governments as well as with other research funding bodies.*"

The following part of this document deals mainly with the specific characteristics of the doctorate in the field of Electrical and Information Engineering (EIE). After some general considerations on the main objectives of the doctorate, skills and competences are analyzed that are required in order to respond to the needs of the academic and economical world. Emphasis is given to the expected roles of the involved institutions, as for instance laboratories, and doctoral schools. Finally, evaluation (and where applicable accreditation) of the doctoral phase is considered together with the problem of assessing competences of doctoral candidates, and later of the performance of doctors in their professional positions for purposes of quality assurance.

2. The main objectives of doctoral studies

The first point to be analyzed is the expected purpose of doctoral studies. Several centuries ago, in the early era of "doctoral studies", the main objective was to enable scientists to improve competences in science to qualify for academic positions at universities.

A major change was initiated during the industrial revolution in the 19th century, where a distinction between pure and applied sciences became apparent due to the increased need of improved industrial products, and due to the need of new production methodologies and techniques. It is annotated that also military purposes were a major motivation for changes in higher education at that time! In the 19th century, for instance, particular educational institutions for engineers were founded in France and in Germany, and special degrees for engineers were created (see for example the history of Ecole Polytechnique [5], or a history of engineers [13]). Engineers were then defined in these countries by their education.

In the 20th century, the focus of engineering education changed more and more to a high level of skills and competences concerning technical aspects, which was triggered by the rapid industrial development. This led to the formation of engineers on a very high level in very specialized fields of interest. During the last decades, this highly specialised knowledge was acquired during the doctoral studies. As a consequence, learning objectives changed to skills and competencies that are closer to industrial needs.

In recent years, the "third cycle of higher education" within the Bologna process has gained much more attention [6]. The Bergen Communiqué [7] that expresses this fact with these words:

"*The core component of doctoral training is the advancement of knowledge through original research. Considering the need for structured doctoral programmes and the need for transparent supervision and assessment, we note that the normal workload of the third cycle in most countries would correspond to 3-4 years full time. We urge universities to ensure that their doctoral programmes promote interdisciplinary training and the development of transferable skills, thus meeting the needs of the wider employment market. We need to achieve an overall increase in the numbers of doctoral candidates taking up research careers within the EHEA. We consider participants in third cycle programmes both as students and as early stage researchers.*"

Thus, it definitively emphasises the importance of doctoral studies, and of doctoral programmes. It attempts to limit their mean duration with the aim to meet the needs of the wider employment market.

Electrical and Information Engineering (EIE) as a field of applied sciences lives in an area of conflict between scientific exactness on one side, and practicability on the other side. It must always find a good compromise between research and development. This defines the following competencies that a doctor of engineering should acquire:

- the proven ability to use profound knowledge at the most advanced frontier of a highly specialized field, the most advanced skills and personal, and methodological abilities required to solve critical problems of this field, and substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research [11]. In other words, this must be the result of serious and deep activities in the field, mainly acquired under the supervision of a professor at an academic research laboratory. This academic laboratory is "*the unique environment in which young researchers are trained by and through research*" [6],

- the proven ability to establish an up-to-date bibliography on a chosen item, to analyze the main results and to extract the main ideas related to innovation in term of experiments, approach, methodology, etc.,

- the proven autonomy in disclosing new sources of knowledge,

- the proven ability to further develop this knowledge by applying scientific methods,

- the proven ability to manage an own research or development project,

- the proven ability to critically analyse obtained results and to evaluate them in a scientific, creative, and innovative way,

- the ability to work in a team, and in the environment of large facilities, e.g. using large instruments or common experimental platforms,

- the social competence to guide and instruct less qualified members of their team, including definition of work packages, and planning of tasks for those who technically or administratively support the research activities,

- the ability to self-contained circulate knowledge in a suitable form to others, mainly by their thesis, or by presentations at national and international conferences, and by peer-reviewed publications, thereby enhancing the body of knowledge in their fields of expertise,

- the ability to acquire financial and other means for bringing forward their work.

The above list of competencies is not necessarily specific to doctors of engineering, since it is quite general. It must be completed by sectarian competencies.

3. Organization of doctoral studies: important point in EIE

The doctoral phase must be organized in a way that it responds to the above mentioned requirements of competencies.

The first major point is that the doctoral candidate in electrical and information engineering must be integrated into a working research structure. As a general rule, this is a recognized laboratory. This research structure must be able to host the doctoral candidate and to provide her or him with the necessary financial support and technical equipment to perform the required research activities. One way of insuring private financial covering might be employment of the doctoral candidate as a scientific assistant with contractual promise to use a certain percentage of time for own research (as it is mostly done at German universities), another way might be awarding grants (which is the most common way

in France). These grants may come from governments, lands, regions, EU, but also research organisms or foundations, research programmes, and international cooperation structures or directly from companies via contracts between laboratories and these companies. During the doctoral phase in electrical and information engineering, the financial support from industry represents a significant part of the laboratory budget, as well in France as in Germany.

The second point concerns some additional lectures, seminars, summer-schools, etc. that are particularly oriented at the needs of doctoral candidates. In order to measure the workload for attending these events, they might be awarded by ECTS-credits. The total workload of these events during the doctoral phase might be 50 to 150 hours in the average. It must not exceed this time in order not to put at risk successful research work in EIE. These additional events are gaining increasing importance at some institutions.

The role of these additional events for doctoral candidates is the following:

- deepening scientific knowledge in a special field of EIE;
- opening the fields of knowledge in a multidisciplinary approach (mathematics, computer sciences, physics, chemistry, biology, etc.);
- enhancing general knowledge and general skills, for example in foreign languages, management techniques, presentation techniques, human resources management etc;
- increasing knowledge in economics and business administration;
- enhancing the ability of circulate or disseminate scientific knowledge.

The third point deals with the valorisation of research results. In other words, the doctoral candidate must demonstrate quality and originality of her or his work by means of publications in peer-reviewed international journals of the field or by presenting the main results in well-reputed international conferences related to the scientific domain.

Some results need to be protected by patents. The choice between patents and other publications is not at all evident. Here is an important role the supervisor must play, since this choice may have strategic consequences, not only for the doctoral candidate, but also for the research laboratory.

In EIE, the nature of the doctoral work has two different aspects, namely basic research and basic (pre-) development of technical products. A careful balance between these both aspects is necessary for a safe existence and the survival of the laboratory.

While in Germany the doctoral phase is administratively mainly managed by university faculties (schools of engineering), it is managed in France by doctoral schools (called graduate schools in some countries; there exist some graduate schools at German universities, also). These schools are frequently common to several institutions (universities, engineer schools, etc.), because the attached laboratories are also frequently common. In 2007, 16 European countries reported that their institutions have introduced doctoral, graduate or research schools [6]. In France, these schools must:

- organise admission of the doctoral students at the first registration with transparent rules and regulations, and thus guarantee the quality of the selection,
- check the financial conditions, in which the student will be during the three to four years of the doctoral phase; a guarantee to insure the basic life expanses is required,

- suggest, organize and manage the additional lectures, seminars, etc. and validate the specific formations attended by the student during her or his studies,
- validate the extra activities such as summer/winter schools, scientific seminars,
- control the progress of the research studies from the thesis commissions or equivalent internal evaluation structure, often proper to the research laboratory,
- encourage some "professional" experiences in terms of teaching or consulting in company that must be compatible with a full time researcher position,
- take care of the total duration of the thesis. If the doctoral student is given a grant (which means full time studying), this duration should be at least three years, and not more than four years (in average). The aim of this regulation is to enable doctors of engineering to start professional life before the age of 30, which is preferred by industry.
- validate the defence of the thesis on the base of reports produced by at least two external specialists of the field preferably chosen at international level,
- establish report to the evaluation organisms or to Ministry,
- promote the activities of the doctoral school by sustaining a website, advertising in scientific forums, financially supporting doctorate networks, doctorate seminars and workshops. A target is to attract the best foreign students,
- encourage international cooperation and exchanges by the way of several actions: i) mobility grants, ii) thesis co-direction, iii) co-tutorial agreement, iv) involvement of foreign reviewers to evaluate doctoral works and to participate to the defense jury.

At German universities, similar, but not so strongly formalised tasks are performed by a board in charge for doctoral candidates. The main tasks are to select candidates for admission, to organise independent, reputed examiners for the doctoral thesis and the doctoral examination, to act as an appealing instance in case of complaint, and to perform some other formal aspects.

Where graduate schools exist, another board is in charge for the organisation of lectures, seminars, and other events. There is no admission for the doctorate without acceptance by a professor as a supervisor, or without a given field of research. It is in the responsibility of a potential supervisor to not accept a doctoral candidate, if there is no financial covering of the work.

4. Evaluation and accreditation of doctoral studies and schools

It goes without saying that the quality of the doctoral phase must be held at a high level. Several approaches to solve that problem are already in effect. Let us mention the French AERES agency, a governmental structure [3], or the council of faculties of engineering and informatics at German universities (4ING) [8-9], which creates a link between the German schools of engineering and politics.

Several criteria are used for this approach. A previous paper was devoted to the presentation of these criteria in the field of EIE in the case of a French doctoral school [10]. These criteria are mainly:

- the reputation, the audience and the scientific outputs of the research laboratories attached to the doctoral school (quality of the research teams, research staff, researcher visitors, and post-doctoral searchers, exhaustive list of publications and conference proceedings),

- the existence of a scientific policy about the priority of the disciplinary fields, the choice of the grant fields, multi-disciplinary approach inter or infra doctoral schools, accompanying of the emergent teams, etc.),
- the relevance and the quality of the thesis subjects proposed by the doctoral school,
- the international policies and the number of co-tutorial theses,
- the average duration of each thesis and the associated scientific production that includes first of all international publications in journals and patents,
- the existence and the application of thesis chart (specific regulation establishing an agreement between the student, the laboratory, the doctoral school and the institution),
- the pedagogical organisation of seminars and complementary lectures, the originality and the quality of the proposed lectures, professional approach, economical learning, etc,
- the existence of a scientific and pedagogical council in agreement with the regulation (external members coming from socio-economical world, students, etc.),
- the existence of an observatory having in charge the analysis of evolution of the doctors after their thesis, that means the professional position of the doctors in the research community, in the companies or in academic world,
- the average annual flux of new doctors in regard with the number of registered students; the average duration must be between 3 to 4 years in France in EIE,
- the quality of the transfer towards companies in the research teams.

This rather long list (including several annexes) is mandatory for renewal of accreditation in France. It clearly highlights the increasing importance of the doctorate schools in the EHEA.

German universities resist accreditation of their doctoral programmes. There are, however, two different control mechanisms. First of all, allocation of financial means by the states and the federation depends strongly on criteria similar to those defined above for French research laboratories. The second control mechanism is the need of German schools of engineering to acquire a good part of their finances by so-called third-party funds. These are financial means given by companies, foundations, and other organisations to perform specific research or pre-development projects. The success in procurement of these funds is strongly based on the reputation of the respective school of engineering, which on its part depends on the quality of doctoral theses. Thus, only high quality of research including doctoral theses ensures survival of the schools of engineering at German universities.

5. Conclusion

The education of successfully working engineers in research and development is more and more important for the economic welfare of Europe. Its response to this challenge is the creation of the European Higher Education Area, and in particular the advancement of higher education on all levels, including the doctorate. In engineering, and in particular in electrical and information engineering, achievement of this goal has led to new trends and structures in doctoral education.

The example of very similar developments in France and in Germany shows that a change has taken place. Meanwhile, knowledge, skills, and competencies define the quality of a doctor of engineering, not only on scientific or technical sectors, but also in interdisciplinary areas. Universities and their schools and laboratories have reacted to the new requirements. They have initiated organisations and structures to control the quality of the doctoral phase and to make it more efficient.

It is to be expected that all European partners will be part of this change, and that they will contribute to maintain and to improve the quality of doctors in the fields of engineering, particularly in the field of "High Technology", in order to stay competitive in a globalized world.

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A contribution to improve the level of mobility in Electrical and Information Engineering Higher Education in Europe

Coordination: Hamed Yahoui

PARTICIPANTS OF THE TASK: Jan Ligus (Technická univerzita v Košiciach/Technical University of Košice, Slovaquia), Lars Ericsson (Uppsala universitet, Sweden), Anselmo Seoane (Universidade de Vigo, Spain), Almudena Suarez (Universidad de Cantabria, Spain), Hélène Fremont (Université Bordeaux 1, France), Fabrice Meriaudeau (Université de Bourgogne, France), Christian Perra (Università degli studi di Cagliari, Italia), Hubert Roth (Universität Siegen, Germany), Bahar Karaoglan (Uluslararası Bilgisayar Enstitüsü / Ege University, Turkey), Daniel Pasquet (Ecole Nationale Supérieure de l'Electronique et de ses Applications, Cergy, France), Jean Marc Thiriet (Université Joseph Fourier Grenoble, France), Cyril Burkley (University of Limerick, Ireland), Michael Hoffmann (Universität Ulm, Germany), Michael Chmela (Vysoké učení technické v Brně / Brno University of Technology, Czech. Rep.), Silvia Stefanova (Русенски университет "Ангел Кънчев" / University of Rousse, Bulgaria), Zbigniew Mrozek (Politechnika Krakowska im. Tadeusza Kościuszki, Poland), Hamed Yahoui (Université Claude Bernard Lyon 1, France), Juan Carlos Burguillo (Universidade de Vigo, Spain), Christophe Simon (Université de Nancy 2, France).

Associate partners: Tamara Forza (BEST Organisation)

ABSTRACT: The work presented in this report gives at first a survey of existing tools to help international students aiming to study in Europe. The undergraduate and graduate programme profiles are not always easy to find for the student who wishes to prepare themselves for mobility. Information such as description of courses and schools, contact details, application procedures, admission requirements, scholarships, degrees/qualifications awarded and other relevant information are not always available but are fundamental to help with the preparation of the learning agreement between the two institutions. After studing the problems associated with mobility for engineering students, we propose a new tool using the information provided by institutions of our network which have adopted the Bologna process.

1. Introduction: Current Situation of Erasmus mobility design

The main aim of the Erasmus programme is to allow students and teachers of European Higher Institution to participate in an exchange period within the mobility actions financed by the European commission. For student exchanges, there are two kinds of mobility, one is dedicated to a training period and mainly used at the end of a Master curriculum and the second is a scholar one mainly used at the end of a bachelor curriculum or at the beginning of a Master curriculum.

The previous Erasmus Socrates programme (until 2007) was based on the signature of a bilateral agreement between two European institutions in a specific discipline. In this way, the two institutions were encouraged to respect the set of rules related to the implementation of the ECTS which is a credit accumulation system in the Lifelong Learning European programme.

Considering the engineering field Figure 1 shows the evolution of mobility of engineering students.
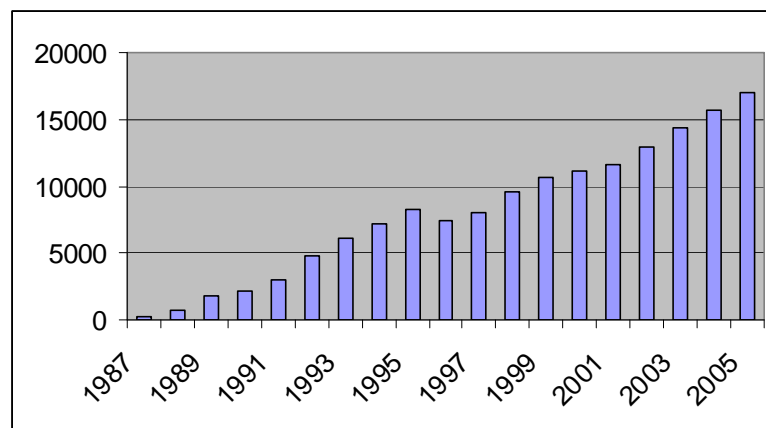
Figure 1

The Kerstin Janson's survey [1], has shown clearly that an Erasmus mobility is an important factor in improving qualification, competencies and professional success of our students but at the same time his work underlines the need for transparency and the availability of the necessary information before the ERASMUS period for the selection of host High Education Institution. Another important recommendation was to ensure a systematic procedure of recognition at the departmental instead of individual recognition to avoid a duplication of the procedure.

To participate in the Erasmus programme under the new European commission programme (Lifelong Learning Programme 2007-2013), all higher education institutions have to get an Erasmus University Charter [2]. For this application, the higher education institution is required to develop and include an Erasmus Policy Statement which will be published and given wide visibility with the international strategy defined in the mission statement of the institution.

2. Difficulties encountered during the mobility agreement preparation.

Submissions for Erasmus mobility are usually required in the year before the training period in which you have to study, but the process of finding a corresponding institution and the right contact and designing a good proposal can take a significant time and represent a considerable workload for the

supervisor [3-4]. Information related to the description of courses are not always available making the recognition a difficult step to achieve between the two institutions (Figure 2).
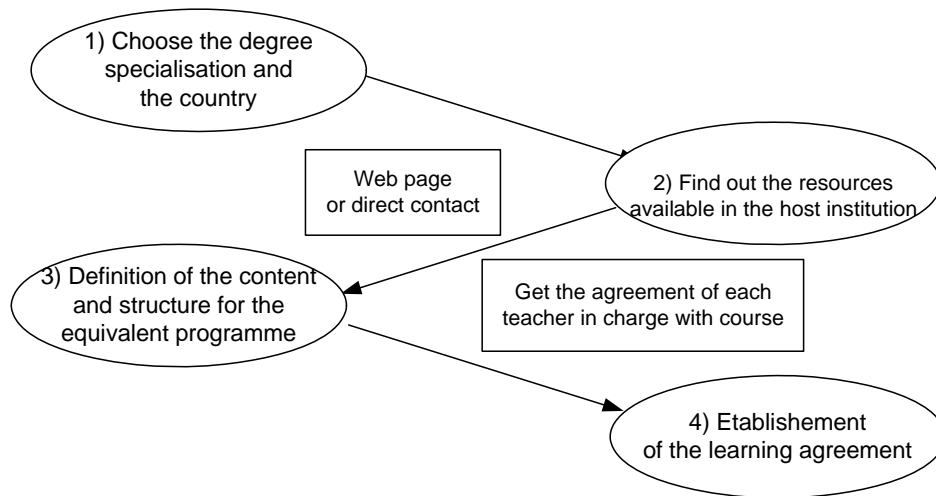
Figure 2: Mobility learning agreement flowchart

3. Results on Mobility Survey for the EIE: The student and supervisor point of view.

At this time all the result has not been gathered and the current data is based on a 1490 Students sample. Most of them 70% were at bachelor level; around 27% at master level and 3% at were Phd student. One of the questionnaire purposes was to know if the student has a clear view about the current Bologna process through the following questions (figure 3):

Do you know what is the ECTS?

Do you know what is the average number of ECTS for one year ?

| Do you know what the supplement Diploma is? | Do you know what the learning agreement is? |
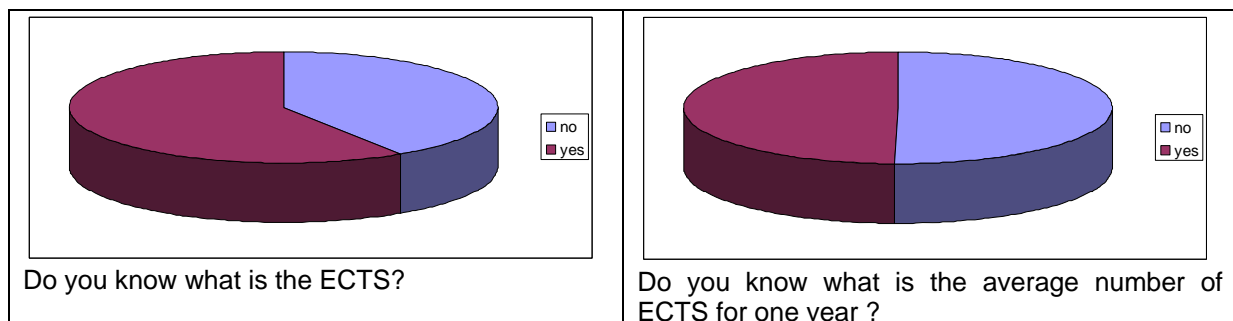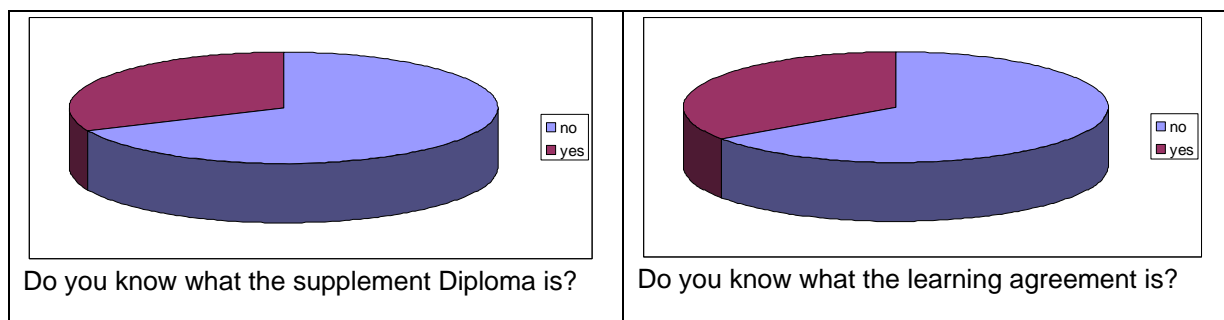
Figure 3: Knowledge about Bologna process

It is interesting to see with these results that they are not aware of the current harmonisation process in the Erasmus programme. The lack of transparency about mobility opportunity at student level will not motivate them to apply in this kind a project. We can imagine that without a practical experience of mobility it will not help them to insert their future professional careers in the global market job. It means that the universities and higher institutions in Europe should have a strong policy to incitate and encourage students for the mobility, considering mobility as an important aspect of the education of students. The accreditation procedures [5] should also integrate this aspect strongly.

In the second part of the questionnaire we dedicated a set of questions to validate how are perceived the propositions to bring to our students the possibility to undertake a learning mobility.

Main problems and issues related to mobility	Very Important %	Important %	Not Important %	Not applicable %
Insufficient information on possibilities to go abroad	30	47	14	9
Foreign Language problem	45	55	0	0
Not enough financial support	55	45	0	0
Distance from home	11	32	0	57
Studies not recognized in home country	43	57	0	0

Motivation for choice of your destination:	Very Important %	Important %	Not Important %	Not applicable %
Availability of bilateral agreement	32	62	0	6
Contacts in the receiving institution	29	64	0	7
Specialized courses relevant for job placement	42	53	0	5

Useful factors to facilitate mobility :	Very Important %	Important %	Not Important %	Not applicable %
Website	56	39	0	5
Open Network of Education: Harmonisation of degrees by the design of linked Master at European Level to facilitate the mobility and the Recognition in the same spirit of an Erasmus Socrates agreement?	42	53	0	5

We can notice through these main student questionnaire results that transparency of curricula is an important step to facilitate mobility at the student level. This opinion is confirmed by the mobility supervisor through the result of their questionnaire where 100% of them have showed their interest to work on the design of mobility network.

4. Conclusions and recommendations.

As a result of the Bologna process considerable progress has been made in relation to the harmonisation of University curricula in a number of countries. The two main innovations are:

a) The European Credit Transfer System; The European Credit Transfer System (ECTS) has been introduced to facilitate student mobility and international curriculum development. The main features that an institution must achieve to comply with ECTS are:

- ECTS has to be based on the principle that 60 credits measure the workload of a full-time student during one academic year (the workload of a full-time study is around 1500-1800 hours per year and in those cases one credit stands for around 25 to 30 working hours),

- The institution has to provide the Information on the Course Catalogue by publishing it in its national language and in English on the Web or in a hard copy.

b) The introduction of a two or three cycle system makes it necessary to revise all existing study programmes which are not based on the concept of cycles. In practice these programmes have to be redesigned because in a cycle system each cycle should be seen as an entity in itself.

At this stage of the Bologna Process, many of the European countries have adopted the reform but only a few of them have provided the Information on the Course Catalogue by giving it in an English version. Following our survey results, we recommend a new tool to assist the mobility and to help in the preparation of the learning agreement. To Evaluate the feasibility of using this tool through experimental implementation into some chosen bachelors, masters and PhDs programmes, within a network of exchange, a working group will participate to test the methodology on some test cases, and see how to adapt the curricula accordingly (market needs, Tuning approach, EQF qualification system), even at the experimental level. With the help of the

ECTS and through the involvement of our network partners, we can develop a new tool to ensure the transparency of our curriculum in the European higher education area. The project is not only dedicated to Socrates mobility but it could help the 'free mover' students too. However it is not always possible to make an Erasmus agreement for a specific destination particularly when the number of students is not large enough to meet the annual agreed target number or when the institution make a limitation in this number.

5. References

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6. Appendices

DESIGN OF A SOFTWARE TO HELP IN THE MOBILITY
IN ELECTRICAL AND INFORMATION ENGINEERING

The design of the software needed to run the Web portal has been built by a dedicated task managed by the partners from Vigo and Nancy II. The Web tool is able to search compatible courses and contains standard method to describe the course contents. The level of authorised access will depend of the user body as shown in the following figure 1:
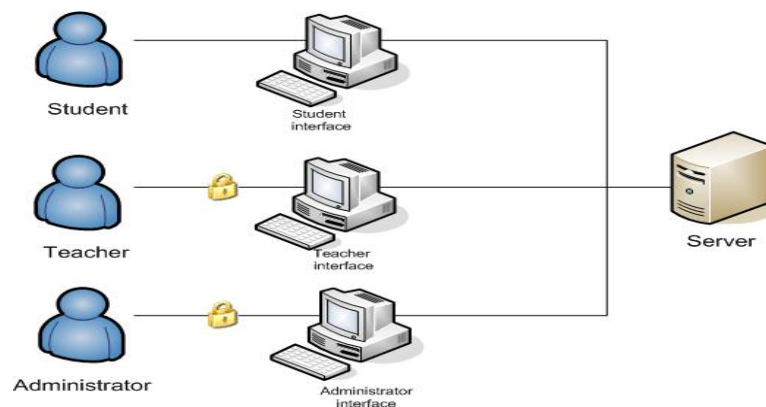
Figure 1

The student interface will permit two types of requests:
- Course to course (Chained lists and Database percentages) presented in figure 2a,
- Group of courses (Group formation, Whole description) presented in figure 2b.
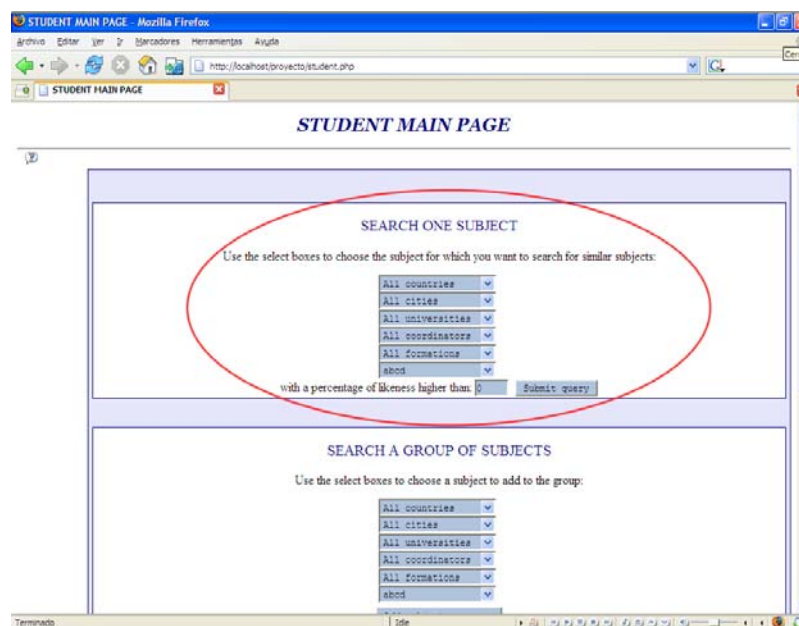
Figure 2a Student Interface: Searching a subject
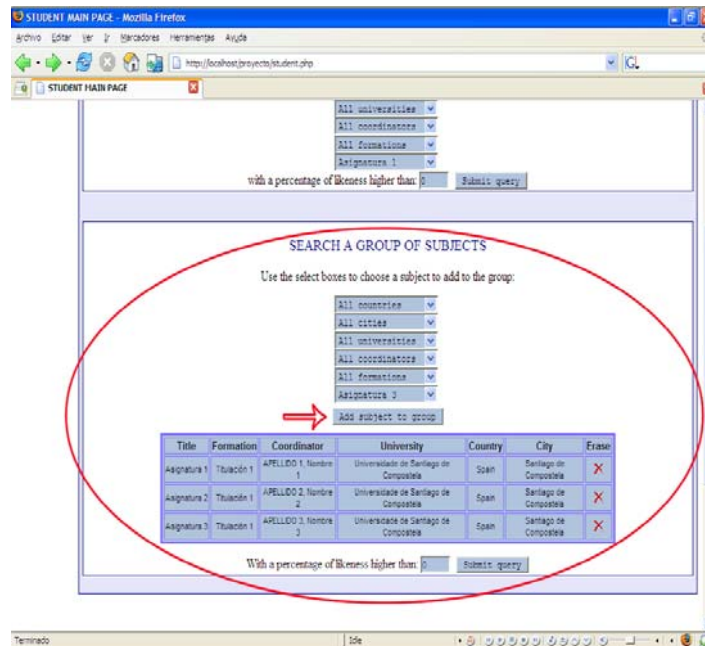
Figure 2b Student Interface: Searching a group of subjects

Figure 3 shows the application teacher's interface that allows a teacher to:

- Register,
- Add a course,
- Modify a course,
- Erase a course,
- View course information,
- Modify personal data.
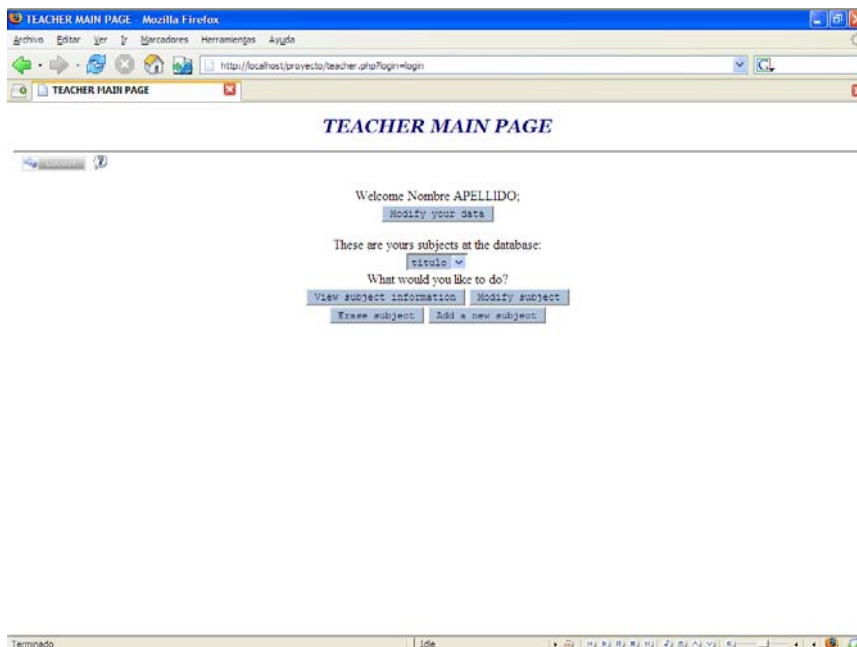
Figure 3: Teacher interface

The administrator's interface (figure 4) allows him to make some statistic on the whole Web site such as:

- Universities   - Professors   - Verbs
- Countries   - Degrees   - Concepts
- Cities   - Courses   - Pairs
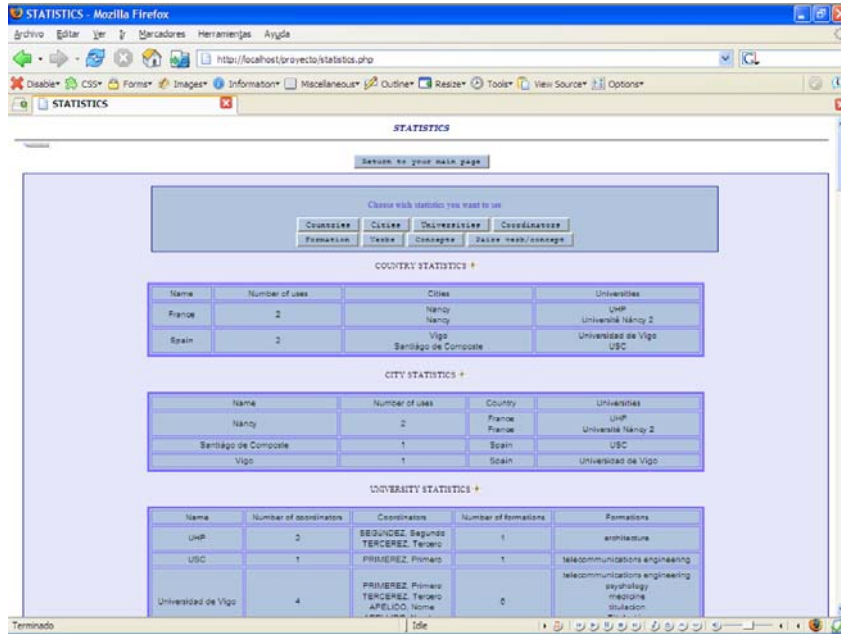
Figure 4: Administrator interface

Second Part

Overview per Country

1. BE: België - Belgique - Belgien (Belgium)

Authors: Raf CATHOOR (Flanders) (EAEEIE, Karel de Grote Hogeschool, raf.catthoor@kdg.be),

Joseph BARSICS (Wallonia), (HEPL, Haute École de la Province de Liège,

Joseph.Barsics@provincedeliege.be)

1.1. General information

Capital: Brussels. Population (thousands): 10,500.

In 1993, Belgium became a federation of three communities, each with their own legislative council and government: the Flemish speaking, the French speaking and the German speaking communities. The three communities have autonomy in education.

+1	+2	+3	Bridge Year	+4	+5	+6	+7	+8	+9

Bachelor in Applied Sciences

NL : Bachelor in de Toegepaste Wetenschappen.

FR : Bachelor en Sciences Appliquées.

Master in Applied Sciences

NL : Burgerlijk Ingenieur.

FR : Ingénieur Civil

PhD in Applied Sciences

(delivered by Universities)

UNIVERSITIES

Bachelor in Industrial Sciences

NL : Bachelor in de Industriële Wetenschappen (Hogescholen).

FR : Bachelor en Sciences Industrielles (Hautes Écoles).

Master in Industrial Sciences

(Dutch Speaking Community)

Master in Industrial Sciences

(French Speaking Community)

PhD preparation, but no awarding

Professionnal Bachelor
(non academic level)

**UNIVERSITY COLLEGES OF PROFESSIONAL EDUCATION
HOGESCHOLEN (NL)   &   HAUTES ÉCOLES (FR)**

Figure 1.1: Belgian Higher Education System in EIE disciplines.

1.1.1 *Electrical and Information Engineering in Belgium, boundaries of the field of study*

In the past, the first university degree (licentiate/engineer) was awarded after 4 of 5 years, and an intermediate degree (called candidate) after 2 years.

After the Bologna process, a new higher education decree restructured university study programmes into a Bachelor programme of 180 ECTS credits followed by a Master programme of at least 60 ECTS credits. The introduction of the new Bachelor programmes started in the academic year 2004/05, and of the Master programmes in 2007/08. Both the traditional universities and the university colleges of professional education ("Hogescholen" in Flanders, "Hautes Écoles" in Wallonia) are adapted to this system:

1.   Traditional universities were offering a 5 year programme (2+3) + PhD which is now transformed into academic bachelor (3) + master (2) + PhD.

2.   University colleges of professional education were offering a 4 year programme (2+2) of academic education which is now transformed into:

- (Hogescholen) in Flanders: an academic bachelor (3) + master (1);

- (Hautes Écoles) in Wallonia, an academic bachelor (3) + master (2)..

3.   The Hogescholen and Hautes Écoles were also offering a 3 year programme of Professional Education, which is now transformed into a professional bachelor. This bachelor degree is different from the academic one. It is a professional or vocational bachelor, and minimum one bridge-year is required for having access to master studies.

Almost all university master programmes consist of 120 ECTS credits, where many Hogescholen master programmes consist of 60 credits only (Flanders). Maybe their master programmes will be extended in the future to 90 or 120 ECTS (which is already the case in Wallonia), but at the moment, no extra funding neither a decree is foreseen by the Ministry of Education.

In Flanders, all university colleges of professional education are associated with a traditional university in order to ensure a quality control and the necessary link to research. An important condition for obtaining an accreditation for their master programme is the requirement to work out significant scientific research activities intra muros. Some university colleges of professional education are associated with a university without a faculty of engineering.

In Wallonia, this type of formal association is currently not mandatory, and not generalized, but it exists, and it is more or less a goal. When it does not exist, the relevant university college nevertheless gets links to research and/or to regional, national or european R&D projects funding on its own abilities.

1.1.2 *Content, degrees and accreditations*

The content is defined by the law: there is a domain specific reference frame of education profiles. Each institution has the possibility to add a serial of specific courses. EIE education profiles and the professional job profiles have been defined in cooperation with representatives from the industry.

1.1.3 *Implementation of the Bologna-BMD system in Belgium*

The traditional universities implemented Bachelor-Master programmes of 180 ECTS credits for the Bachelor, 120 credits for the Master, and doctoral studies.

Their master title in EIE is called "master in applied sciences" (Dutch: "master in de toegepaste wetenschappen"; French: "master en sciences appliquées").

The university colleges of professional education in Wallonia adopted this system for their academic programmes. The university colleges of professional education in Flanders did the same, except that they still have a one year master of 60 credits.

Their bachelor/master title in EIE is "called bachelor/master in industrial sciences" (Dutch: bachelor/master in de industriële wetenschappen; French: bachelor/master en sciences industrielles). The faculties are called "faculty of industrial sciences" (Dutch: faculteit industriële wetenschappen; French: faculté des sciences industrielles).

Doctoral studies can only be done at traditional universities, but PhD students may accomplish a part of their research inside these HEIs and be supervised by their academic staff.

The university colleges of professional education also offer a professional bachelor degree, which is not of academic level, there is no master on top of it.

Examples: professional bachelor in Electronics-ICT, in Multimedia and Communication technology, in Applied Informatics ...

A minimum of one bridge-year is required for having access to master studies.

1.2. *Figures on the weight of EIE in Belgium*

In the Universities of Professional Education, one cycle type, the number of EIE students is about 10 % of the total population.

In the Universities of Professional Education, two cycle type, the number of EIE students is about 8.5 % of the total population.

In the Universities, the number of EIE students is about 6 % of the total population.

Figures on the weight of EIE in Flanders
http://www.ond.vlaanderen.be/hoger_onderwijs/online_statistiekennieuwSTART.htm

In the University colleges of Professional Education, professional bachelor, the number of EIE students is about 10 % of the total population.

In the University colleges of Professional Education, academic programme, the number of EIE students is about 8,5 % of the total population.

In the Universities, the number of EIE students is about 6 % of the total population.

Figures on the weight of EIE in the French speaking Community.
http://www.statistiques.cfwb.be/publicationsDetails.php

In the University Colleges of Professional Education, professionnal bachelor, the number of EIE students is 9.2 %.

In the University Colleges of Professional Education, academic programme, the number of EIE students is 12.2 %.

In the universities, the number of EIE students is below 7.3 %.

In general, engineering studies are less popular than 10 years ago. Today, EIE students are mainly interested in Informatics, Multimedia, Web design... They have less interest in electricity and electronic design courses.

1.3. Degrees in EIE in Belgium

All students who hold an upper secondary education certificate have access to higher education. Belgium has a three tier higher education system:

The **Universities of Professional Education** delivers a secondary school ("sec. sch.") + 3 year diploma for their one-cycle education, which is not of academic level. The secondary school + 3 year diploma is a bachelor degree, e.g. bachelor in automatic control, bachelor in electronics, bachelor in telecommunications....

The **Universities of Professional Education in the Flemish speaking Community,** deliver a "sec. sch." + 4 year diploma for their two-cycle education. This diploma is of academic level. The "sec.

sch."+ 4 system ends with the diploma of "Industrial engineering", e.g. industrial engineering in electronics.

In the French speaking Community, this is a "sec. sch. + 5 year diploma.

Classical Universities with EIE curricula have in general a "sec. sch." + 5 year system. It ends with the "*Burgerlijk Engineer*" (Flemish community) or "*Ingénieur civil*" (French community) degree, which is equivalent to a Master degree, e.g. master in electronics, master in electricity, …
Only these universities organise an admission exam.
Computer Technology and Informatics is also a final degree in the faculty of Science, which is now a 4 year study programme.

1.3.1 *Bachelor level (previously named "Gegraduerde/Graduat")*

Bachelor in Electronics-ICT

Bachelor in Applied informatics

Bachelor in Multimedia and Communication Technology

Bachelor in Informatics

Bachelor in Management Computing

Bachelor in Computing & Systems – Industrial Computing option.

Bachelor in Computing & Systems – Networking & Telecommunication option.

Bachelor in Computer Graphics & Multimedia Design.

Bachelor in Medical Electronics.

1.3.2 *Master+4 (Industrieel ingenieur) & Master+5 (Ingénieur Industriel) levels :*

Industrial Engineering in Electronics specialisation Design Techniques

Industrial Engineering in Electronics specialisation Information and Communication Techniques

Industrial Engineering in Electricity – Electricity option

Industrial Engineering in Electricity – Electronics option

Industrial Engineering in Electricity – Computing option

1.3.3 <u>Master level (Burgerlijk ingenieur/Ingénieur civil)</u>

Master in Electronics-ICT

Master in Electrotechnics, specialisation physical electronics

Master in Electrotechnics, specialisation ICT-micro-electronics

Master in Electrotechnics, specialisation ICT-multimedia and signal processing

Master in Electrotechnics, specialisation ICT-telecommunication and telematics

Master in Informatics

Master in Computer science (4 years)

1.4 References

The information given in this monograph is based on the following documents and web links:

1. Education in the Flemish community:

   http://www.ond.vlaanderen.be/

2. Education in the French community:
   http://www.agers.cfwb.be/
   http://www.restode.cfwb.be

3. Société Européenne pour la Formation des Ingénieurs (SEFI): http://www.sefi.be

Doctoral

Studies

1.5 Doctoral Studies in Belgium

1.5.1. Supervision

Scientific Board or Supervisor

The <u>Scientific board</u> is composed by six members or more elected by the Faculty or Department. The student, <u>in most cases,</u> has the same personal supervisor during its thesis work on an <u>active</u> research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between the student and the supervisor.

Who can be a Supervisor

Any professor or lecturer in the department.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	NO

Duration

Four years.

1.5.2. **Development**

Courseware?

Yes.

Course Work

1.   The students have to take course work during their doctoral degree preparation and offered as specialist graduate course units. The course work in some cases can be assessed by examinations. When it is not, it consists of personal work directly linked to the research. If the student fails in the course work, he/she can retake the exam, take a different course unit, or develop non-course-work activities.

2.   Extension: 30 hours or more, in the first year and sometimes in the second year.

3.   Credit system: ECTS. 2 to 3 credits. / 30 to 60 credits are allocated to course work.

4.   Monitoring of the doctoral student when the course work is assessed by examinations.

Contribution to Teaching

1.   Supervision of undergraduate laboratory work; tutoring of undergraduate groups and marking of undergraduate assessments/homework.

2.   Coaching of master thesis work.

Presentation of Work

1.   In the department.

2.   At national conferences.

3.   At international conferences.

1.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   Languages normally used: English and French (specially used in the French part of the country). Although permitted, alternative languages are rarely used: Flemish and German.

2.   No credits are allocated to the doctoral thesis.

3.   The doctoral thesis is a dissertation in the French part of the country. In the Dutch part of the country it can be a previously unpublished substantial written report, or a collection of individual or co-authored scientific papers with an introduction and/or commentary.

Oral Presentation of Thesis Work

1.   Languages normally used: English and French (specially used in the French part of the country). Although permitted, alternative languages are rarely used: Flemish and German.

2.   Oral presentation with oral examination for a closed audience behind close doors in the French part of the country. In the Dutch part of the country there is an oral presentation for an open audience.

3.   Duration: typical duration from 45 min or 1 hour to 2 hours including examination (upper time limited).

1.5.4. Examination

Thesis Examination Board

1.   Composition: from three internal examiners and two external examiners to several members. In the Dutch part of the country there is also an independent chairman.

2.   Selection by the supervisor and/or by the scientific committee of the institution and/or by the rector or equivalent.

Evaluation

1.   Result based on the reading of the thesis and the oral presentation of the thesis work. There isn't a grading system, but in special circumstances there can be "felicitations of the jury" in extra.

2.   If the student fails, he/she may resubmit a revised thesis within a few months or do further work as specified by the examination board. Normally, the commission only advises the faculty for the presentation of the thesis when she thinks the student is ready.

1.6. Questionnaires

Belgium (Flemish)

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	<u>YES</u>/NO
3.1.2	**How many members are in the Scientific Board?**	6

Likely 6 or more. At least 2 from the own research group, at least two of other research groups generally two or more (preferably international) assessors. Others because of there expertise (plus people from dept./faculty/administration of the university …). The president of the commission is not from the department of the student and is nominated by the Chancellor of the university.

3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	<u>YES</u>/NO
3.1.3.2	Chosen by the student?	YES/<u>NO</u>
3.1.3.3	Chosen in another way? Please specify:	YES/<u>NO</u>

3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	<u>YES</u>/NO
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	<u>YES</u>/NO
3.1.4.4	Assigning the thesis subject.	<u>YES</u>/NO
3.1.4.5	Other. Please specify:	<u>YES</u>/NO

In the end, advise the faculty if the student may present the thesis.

3.1.5	Does the student need a personal supervisor during her/his studies?	<u>YES</u>/NO
3.1.5.1	Does the same person supervise her/his thesis work?	<u>YES</u>/NO
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	YES/<u>NO</u>[1]

[1] But this is the case for more then 99%.

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

<u>YES</u>/NO [2]

3.1.7.2   After a specified period of coursework?

YES/<u>NO</u>[3]

3.1.7.3   Other. Please specify:

[2] but it can be steered upon progress of the student or progress of science.
[3] No, but several courses generally have to be taken in the beginning of the doctoral studies.

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

<u>YES</u>/NO[4]

3.1.8.2   Any researcher in the department?

YES/<u>NO</u>

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

YES/NO

3.1.8.3   Any researcher in another institution?

YES/NO

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

YES/NO[5]

3.1.8.4   Other methods. Please specify:

[4] But minimum PhD level is required and only for nominations of   the highest academic levels. [5] Many times, there is a co-promoter. He can be from another university. See also 3.1.2.

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

YES/NO

3.1.9.2   Other methods. Please specify:

<u>YES</u>/NO

A resolution of the Scientific Board, without taking into account the preferences of the students. The board looks how it can best obtain the aim of the study. In this way personal capabilities of the student come into the play. The students interest for the subject is mandatory

3.2- COURSE WORK

3.2.1	Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.	<u>YES</u>/NO

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	Year 2	Year 3	Year 4
hrs	hrs	hrs	hrs

In general during the first and sometimes second year, the students follow some courses on subjects he needs for his PhD work. Sometimes this is for about 30ECTS; sometimes it is for over 60ECTS.This is settled for each student depending on his strengths and weaknesses. Other tasks, such as presenting papers can count towards the needed ECTS. The courses are many times specialist courses. They can be at the own university or at other universities.

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3	Is the coursework assessed by examinations? If not, please give details:	<u>YES</u>/NO

3.2.3   **Credit system**

3.2.3.1	Is the coursework in your institution described by a credit system?	<u>YES</u>/NO
3.2.3.2	Is it the ECTS system?	<u>YES</u>/NO

If not, what is the relationship with ECTS?

3.2.3.3	How many credits are allocated to coursework?	__ **credits**

See above.

3.2- COURSE WORK

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking
coursework?   <u>YES</u>/NO

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.
<u>YES</u>/NO

- Take a different course unit.
<u>YES</u>/NO

Generally exams are retaken, but many times the PhD is stopped here if no good
results are obtained.

3.3- Presentation of work results:

3.3.1   In the department.
<u>YES</u>/NO

3.3.2   At national conferences.
<u>YES</u>/NO

3.3.3   At international conferences.
<u>YES</u>/NO

These days it is unlikely that you get a PhD without papers and work presented at
international seminars/conferences. Minimum requirements: one publication at international
level, two seminars about the PhD work or on general subject and one international
congress, and one set of seminars with positive grading, and a regular demonstration of
progress for the PhD commission.

3.4- Contribution to teaching:

3.4.1   Supervision of undergraduate laboratory.
<u>YES</u>/NO

3.4.2   Teaching undergraduate courses.
<u>YES</u>/NO

Tutoring undergraduate groups**,** marking of undergraduate assessments/homework**,**
coaching of master thesis work**.** When the mandate allows extra functions; many students
take up some teaching under supervision in the department. However, when you teach for
50% for example your PhD will take longer. This teaching brings some income for the
student to live on. PhD students that (cannot take) don't take any teaching as a function
generally will help with small tasks keeping the dept. running. (Occasional tutoring, labs or
marking). Such tasks are preferable for students who want an academic career afterwards.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	English
4.1.2	Are alternative languages used for the thesis? Please Specify:	YES/No

Basically NO, other languages are permitted by the commission but are seldom used. Flemish, French and German are rarely used. English (99%).

4.1.3	Which language is normally used for the oral presentation and/or examination?	English
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	YES/NO

Officially it can be but normally it is English. French (very low %).Flemish (very low %).

4.1.5	Are credits allocated to the doctoral thesis?	YES/NO

4.1.6   The doctoral thesis is:

4.1.6.1	A previously unpublished substantial written report.	<u>YES</u>/NO
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	<u>YES</u>/NO
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES/NO
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	

The PhD commission most of the time is expanded with internal and external assessors.

4.2.2.2	External examiners.

Most of the time several.

4.2.2.3	TOTAL.

Other (e.g. independent chairperson)   people from the dept. or faculty or university administration: <u>independent chairman as for the PhD commission</u>.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.   <u>YES</u>/NO

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   <u>YES</u>/NO

4.2.4.2   The oral presentation of the thesis work.   <u>YES</u>/NO

4.2.4.3   Both.   <u>YES</u>/NO

Examiners also based their evaluation on: answers given to the examination board, answers given to the general audience, an oral examination of the candidate, including detailed questions on the thesis.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   1 to 2 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   YES/NO

The commission will give the student an indication for the duration of his contribution and the president of the commission will lead the exam in general.

4.2.5   Is the oral part of the examination taken behind closed doors?

4.2.6   *What happens if the student fails?*

4.2.6.1   May not resubmit for doctorate.   YES/NO

4.2.6.2   May resubmit revised thesis.   YES/NO

4.2.6.3   May do further work as specified by examination board.   <u>YES</u>/NO

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   *What happens if the student fails?*

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?
Please specify: YES/NO

Normally when the commission thinks the student is not ready; she will not advise the faculty for presenting the thesis.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the
work?   YES/NO

Basically it is Yes Or NO. But in special circumstances there may be" felicitations of the jury" in extra (seldom).

Belgium (French)

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	6
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	N
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	N
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y
3.1.7	The doctoral thesis subject is normally assigned:	
3.1.7.1	At the beginning of the doctoral studies?	Y
3.1.7.2	After a specified period of coursework?	N
3.1.7.3	Other. Please specify:	N

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

Y

3.1.8.2   Any researcher in the department?

N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4   Other methods. Please specify:

Y/N

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

Y

3.1.9.2   Other methods. Please specify:

N

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	Year 2	Year 3	Year 4
30 hrs	0 hrs	0 hrs	0 hrs

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.

Y

- As course units taken from the undergraduate programme.

N

- Other. Please specify.

3.2.2.3   Is the coursework assessed by examinations? If not, please give details:

N

Personal work directly linked to the research.

3.2- COURSE WORK

3.2.3   Credit system

3.2.3.1   Is the coursework in your institution described by a credit system?

Y

3.2.3.2   Is it the ECTS system?

Y

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?

2 or 3

3.2.4   Monitoring

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?

N

3.2.4.2   What regulations apply in case of failure in one or more course units?

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

Y

3.3.2   At national conferences.

N

3.3.3   At international conferences.

N

3.3- CONTRIBUTION TO TEACHING

3.4.1   Supervision of undergraduate laboratory.

Y

3.4.2   Teaching undergraduate courses.

N

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	French or English
4.1.2	Are alternative languages used for the thesis? Please Specify:	N
4.1.3	Which language is normally used for the oral presentation and/or examination?	French or English
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	NO
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	N
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	N
4.1.6.3	Other. Please specify: Dissertation.	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	NO
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	3
4.2.2.2	External examiners.	2
4.2.2.3	TOTAL.	5

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   Y

4.2.3.2   By the scientific committee of the institution.   Y

4.2.3.3   By the rector or equivalent.   Y

4.2.3.4   By the national ministry.   N

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   Y

4.2.4.2   The oral presentation of the thesis work.   Y

4.2.4.3   Both.   Y

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   45 minutes

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   Y

4.2.5   Is the oral part of the examination taken behind closed doors?   Y

4.2.6   *What happens if the student fails?*

4.2.6.1   May not resubmit for doctorate.   N

4.2.6.2   May resubmit revised thesis.   Y

4.2.6.3   May do further work as specified by examination board.   Y

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify: Y
A few months.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   N

2. BG: България (Bulgaria)

Coordinating author: Assoc. Prof. Yoana Ruseva, PhD (Rousse University, ioana@ru.acad.bg),
Other contributors: Assoc. Prof. Dimiter DIMITROV, PhD (University of Sofia, dcd@tu-sofia.bg),
Pr. Lect. Nina BENCHEVA (Rousse University, NBencheva@ecs.ru.acad.bg)
Review: Fernando. MACIEL-BARBOSA (EAEEIE, Universidade do Porto, Portugal)

2.1. General information

In Bulgaria the curriculum is slightly different at each University. The basic courses are mandatory, but there are some courses that are optional. The Academic council of each University validates the curriculum in connection with the Academic Autonomy of the Bulgarian Universities.
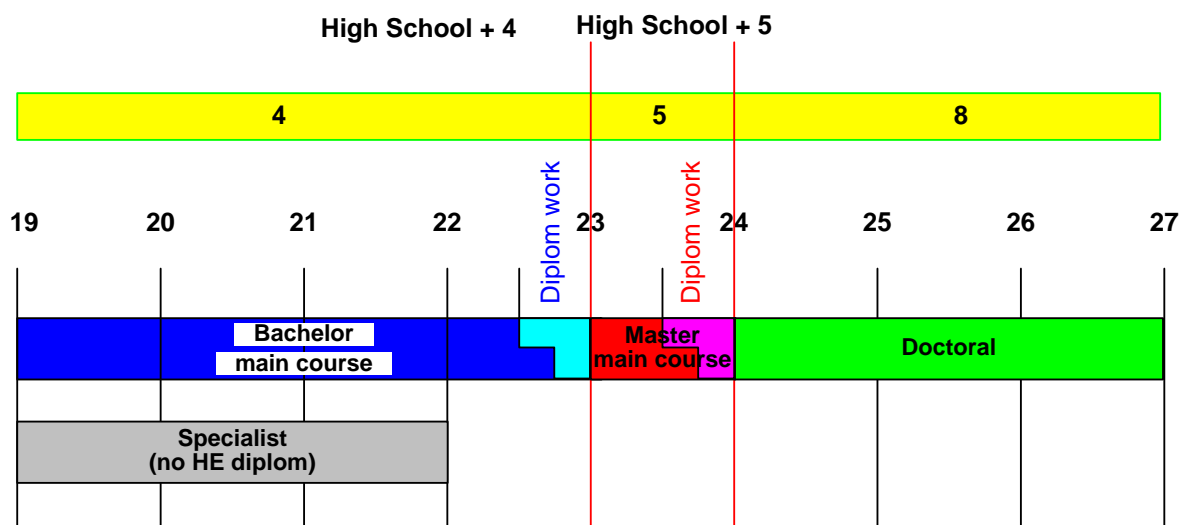
Figure 2.1: Bulgarian Higher Education System in EIE disciplines

2.1.1 Electrical and Information Engineering in Bulgaria, boundaries of the field of study

List of general Education Areas and Professional Directions and **EIE Education Areas and Professional Directions**
The List of general Education Areas and Professional Direction is established by the Bulgarian government. The Classification of Higher Education Areas and Professional Directions is prepared on the basis of Bulgarian Experience in Higher Education and is consistent with appropriate Education Areas and Professional Directions in the world.

Classification Of Higher Education Areas and Professional Directions			
Code	Higher Education Area	Code	Professional Direction
4	Natural Sciences, Mathematics and Informatics	4.6	Informatics and Computer Science
5	Technical Science	*5.2*	*Electrical Engineering, Electronics and Automation including Power engineering and electrical equipment*
		5.3	*Communication and computer Engineering*

The code 4.6. is removed because that professional direction is not classified as engineering yet.

2.1.2 Content, degrees and accreditations

The Government defines the pedagogical content of the degrees. It defines the curriculum and the list of the compulsory subjects in general for each of the above-mentioned professional directions for the period of education (semester shared). In this frame the Academic Council of each University independently (principle academic autonomy) determines and votes the teaching programmes for each professional direction.

2.1.3 Implementation of the Bologna-BMD system in Bulgaria

The Bologna-BMD system is now available in Bulgaria. The higher education system has been structured in three levels, bachelor-master/magister-doctor, since April 2002.

2.2. Figures on the weight of EIE in Bulgaria

Educational Institution, Teaching Staff and Students					
	2002/03	2003/04	2004/05	2005/06	2006/07
Institutions	42	42	43	43	43
Teaching Staff	18710	20218	20145	21534	21300
Students	211272	207340	214398	214693	226923
Doctors	4440	4834	5079	5163	4816

Distribution of the students in EIE specialities

2005/2006

full time students

- ■ Informatics and Computer Science
- ■ Electrical Engineering, Electronics and Automation
- □ Communication and Computer Engineering
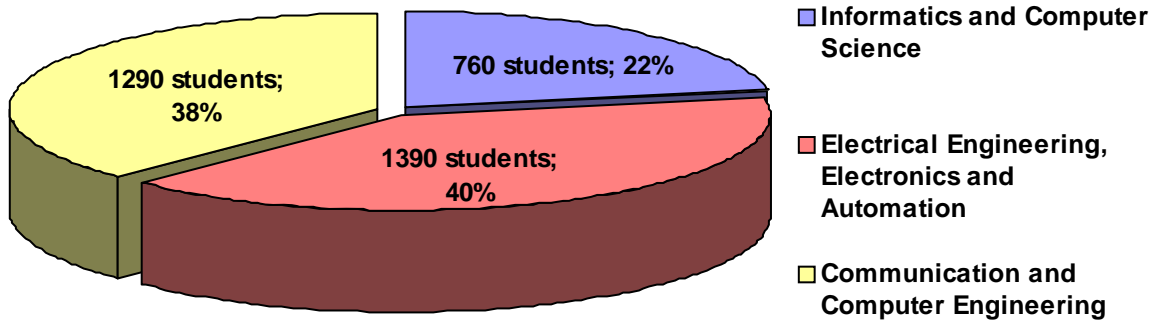
2006/2007

full time students

- ■ Informatics and Computer Science
- ■ Electrical Engineering, Electronics and Automation
- □ Communication and Computer Engineering
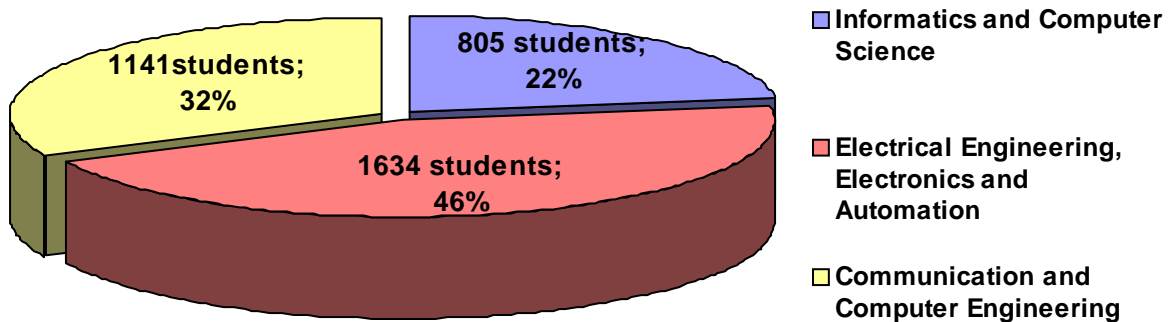
N	High Education Schools 2006/07	Teaching form M.sc+ Bach		EIE Students M.sc+ Bach		
		Full time	Part time	Code	Full time	Part time
1	University of Sofia "Sv.Kliment Ohridski"	4360	778	4.6	360	
2	"Paisij Hilendarski"University of Plovdiv	1830	340	4.6	110	25
3	"Cyril i Methodius"University of Veliko Tarnovo	1355	325	4.6	60	
4	University of Shoumen " Ep.Konstantin Preslavski	860	260	4.6	85	15
5	South-West University "Neofit Rilski", Blagoevgrad	1268	145	4.6 5.3	45 50	
6	University of Rousse "Angel Kantchev"	1104	225	4.6 5.2 5.3	35 155 136	25 30 25
7	Technical University – Sofia	2763	30	5.2 5.3	885 600	30
8	Technical University – Varna	860	85	5.2 5.3	265 180	20 25
9	Technical University – Gabrovo	630	160	5.2 5.3	160 135	35 30
10	University of Mining and Geology- Sofia	412	112	4.6 5.2	45 64	34
11	Chemical Technology & Metallurgy University-Sofia	635	90	5.2	70	10
12	Higher School of Transport "Todor Kableshkov", Sofia	260	85	5.2 5.3	35 40	10 15
13	University of Economics, Varna	1437	200	4.6	65	
				4.6 5.2 5.3	805 1634 1141	65 135 95
	Total	17774	2835		3580	295

2.3. Degrees in EIE in Bulgaria

The Diplomas in EIE are defined by two elements: *the concrete title* and **the direction**:

2.3.1 Specialist level

➢ **Specialist** - 3 years after the secondary school for full-time students and 3,5 years for part-time students;
   1) *Informatik*, **Informatics and Computer Science** (code 4.6), Natural Sciences, Mathematics and Informatics (code 4). => this degree is not, exactly, an "engineering" degree but is close to the border of "Electrical and Information Engineering"

2) *Electrical Engineer*, **Electrical Engineering**, **Electronics and Automation** (5.2), **Communication and Computer Engineering** (5.3), Technical Science (5)
3) *Electrical Engineer*, **Electrical Engineering**, **Electronics and Automation** (5.2), Technical Science (5)

2.3.2 Bachelor level

➢ **Bachelo**r – 4 years after the secondary school for full-time students and 5 years for part-time students;
1) *Informatik*, **Informatics and Computer Science** (code 4.6), Natural Sciences, Mathematics and Informatics (code 4). => this degree is not, exactly, an "engineering" degree but is close to the border of "Electrical and Information Engineering"
2) Electrical Engineer, **Electrical Engineering**, **Electronics and Automation** (5.2), **Communication and Computer Engineering** (5.3), Technical Science (5)
3) *Electrical Engineer*, **Electrical Engineering**, **Electronics and Automation** (5.2), Technical Science (5)

Distribution of the general areas in EIE training for Bachelors

Title and code of the speciality in EIE **Keywords**	*5.2.1. (PSRE)*	*5.2.2. (E)*	*5.2.3. (AICT)*	*5.3.1. (CST)*	*5.3.2. (CTT)*
Basic Training					
Mathematics/ Physics	11 %	12 %	12 %	12 %	12 %
Electrical Engineering/ Instrumentation& Measurement	7 %	10 %	12 %	6 %	8 %
Electronics	4 %	38 %	7 %	12 %	10 %
Computers/ Informatics	3 %	9 %	24 %	35 %	11 %
Networks				4 %	9 %
Control Engineering		6 %	24 %		2 %
Communication, radio and video systems					29 %
Power Systems	40 %				
Mechanical Technology/ Systems	9 %				
Additional Training					
Foreign Language	4 %	4 %	4 %	4 %	4 %
Projects	2 %	1 %	4 %	8 %	1 %
Industrial Practice	3 %	4 %	4 %	3 %	4 %
Technical Documentation	1 %	2 %	2 %	3 %	3 %

Economics/ Management	1 %	5 %	3 %	3 %	2 %

Codes and abbreviations of the specialities:

5.2.1.Power Supply and Power Engineering (PSRE)
5.2.2.Electronics (E)
5.2.3.Automation and Information Control Engineering (AICT)
5.3.1.Computer Systems and Technologies (CST)
5.3.2.Communication Systems and Technologies (CTT)

2.3.3 Master/Magister level

➢ **Master/Magister** – no less than 5 years after the secondary school for the non-bachelor specialities and for full-time students, 2 semesters after the bachelor level for full-time students or 3 semesters for part-time students);
  1) *Informatik*, **Informatics and Computer Science** (code 4.6), Natural Sciences, Mathematics and Informatics (code 4). => this degree is not, exactly, an "engineering" degree but is close to the border of "Electrical and Information Engineering"
  2) Electrical Engineer, **Electrical Engineering**, **Electronics and Automation** (5.2), **Communication and Computer Engineering** (5.3), Technical Science (5)
  3) *Electrical Engineer*, **Electrical Engineering**, **Electronics and Automation** (5.2), Technical Science (5)

2.4. List of degrees

In Bulgaria, the academic fields are numbered (see part 2 of the monograph for more information). The references of the fields of Electrical and Information Engineering are the following:
5.2. Electrical Engineering, Electronics and Automation
5.3. Communication and Computer Engineering

The professional direction "**4.6** Informatics and Computer Science" is not classified as engineering yet.

City	Institution	4.6	5.2.	5.3.
Blagoevgrad **Благоевград**	South-West University "Neofit Rilski" **Югозападен университет "Неофит Рилски"**	X		X
Gabrovo **Габрово**	Technical University – Gabrovo **Технически университет – Габрово**		X	X
Plovdiv **Пловдив**	"Paisij Hilendarski"University of Plovdiv **Пловдивски университет "Паисий Хилендарски"**	X		
Rousse **Русе**	University of Rousse "Angel Kantchev" **Русенски университет "Ангел Кънчев"**	X	X	X
Shoumen **Шумен**	University of Shoumen " Ep.Konstantin Preslavski" **Шуменски университет "Еп. Константин Преславски"**	X		
Sofia **София**	Technical University – Sofia **Технически университет- София**		X	X

Sofia **София**	University of Sofia "Sv.Kliment Ohridski" **Софийски университет "Св. Климент Охридски"**	**X**		
Sofia **София**	University of Mining and Geology – Sofia **Минногеоложки университет - Сопфия**	**X**	**X**	
Sofia **София**	Chemical Technology & Metallurgy University – Sofia **Химикотехнологичен и металургичен университет**		**X**	
Sofia **София**	Higher School of Transport "Todor Kableshkov", Sofia **Висше транспортно училище "Тодор Каблешков"**			**X**
Varna **Варна**	Technical University-Varna **Технически университет Варна**		**X**	**X**
Varna **Варна**	University of Economics, Varna **Икономически университет - Варна**	**X**		
Veliko Tarnovo **Велико Търново**	"Cyril i Methodius"University of Veliko Tarnovo **Великотърновски университет "Кирил и Методий"**	**X**		

2.5. References

The information given in this monograph is based on the following documents and web links:

1. Decision № 337 of Council of Ministers to confirm the number of students and doctoral students admitted for education in higher schools and research institutions in the Republic of Bulgaria for the academic year 2996/2007, AZ-Buki, 20/2006
2. Statute No 86 from 12th of March 1997 for the validation of the government register of the education-qualification degrees in Higher Schools of the Republic of Bulgaria
3. Statistical Yearbook, 2002, 2003, 2004, 2005, 2006

Doctoral
Studies

2.5 Doctoral Studies in Bulgaria

2.5.1 Supervision

Scientific Board or Supervisor

The Scientific board is composed by twenty members elected by the Department. The student, in most cases, has the same personal supervisor during its thesis work, on an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Any professor or lecturer in the department with PhD.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

Duration

Four years.

2.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units.

2. Extension: 120 hours in the first year.

3. Credit system: no credit system.

4. No monitoring of the doctoral student. In case of failure the student must retake the exam.

Contribution to Teaching

Supervision of undergraduate laboratory work.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

2.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. <u>Language</u>: Bulgarian. Alternative language: English.

2. <u>No credits</u> allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1. <u>Language</u> normally used: Bulgarian. Alternative language: English.

2. Oral presentation with oral examination for an open/public audience.

3. <u>Duration</u>: typical duration of 2 hours including examination with no upper time limit.

2.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: twelve to fifteen internal examiners and five to eight external examiners to compose a twenty member examination board.

2. <u>Selection</u> by the Department's Council.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with no grading system.

2. <u>If the student fails</u>, he/she may not resubmit for doctorate.

2.6. Questionnaires

Bulgaria

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	Approx. 20
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	N
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

Y

3.1.7.2 After a specified period of coursework?

N

3.1.7.3 Other. Please specify:

N

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

Y

3.1.8.2 Any researcher in the department?

N

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3 Any researcher in another institution?

N

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

N

3.1.8.4 Other methods. Please specify:

N

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

Y

3.1.9.2 Other methods. Please specify:

N

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
80 hrs	**hrs**	**hrs**	**hrs**

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.

Yes

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2- COURSE WORK

3.2.2.3	Is the coursework assessed by examinations? If not, please give details:	Y

3.2.3 **Credit system**

3.2.3.1	Is the coursework in your institution described by a credit system?	N
3.2.3.2	Is it the ECTS system?	N
	If not, what is the relationship with ECTS?	
3.2.3.3	How many credits are allocated to coursework?	**credits**

3.2.4 **Monitoring**

3.2.4.1	Do you monitor the performance of the doctoral student taking coursework?	N
3.2.4.2	**What regulations apply in case of failure in one or more course units?**	
	- Retake the exam.	Yes
	- Take a different course unit.	

3.3- PRESENTATION OF WORK RESULTS:

3.3.1	In the department.	Yes
3.3.2	At national conferences.	Yes
3.3.3	At international conferences.	Yes

3.4- CONTRIBUTION TO TEACHING:

3.4.1	Supervision of undergraduate laboratory.	Yes
3.4.2	Teaching undergraduate courses.	No

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Bulgarian
4.1.2	Are alternative languages used for the thesis? Please Specify: **English.**	Y
4.1.3	Which language is normally used for the oral presentation and/or examination?	Bulgarian
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English.**	YES
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Yes
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	12-15
4.2.2.2	External examiners.	5-8
4.2.2.3	TOTAL.	20

*3 to 4 among whom two "rapporteurs" who should comment deeply on the content of the thesis.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify: Yes

          By the Department's Council.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   Y

4.2.4.2   The oral presentation of the thesis work.   Y

4.2.4.3   Both.   Yes

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if
          applicable?   2 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   N

4.2.5   Is the oral part of the examination taken behind closed doors?   N

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   Y

4.2.6.2   May resubmit revised thesis.   N

4.2.6.3   May do further work as specified by examination board.   N

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   N
          Please specify:

4.2.7   Is there a grading system for the doctoral degree based on the quality of the   N
          work?

3. CZ: Česká republika (Czech Republic)

Coordinating author: Lenka Lhotská (Czech Technical University, Praha, llhotska@ctu.cz)
Review: Josef Jasenek (EAEEIE, University of Bratislava, Slovakia)

3.1. General information

Higher education is provided by university type institutions ("*vysoká škola univerzitní*" in Czech language) and non-university type institutions ("*vysoká škola neuniverzitní*" in Czech language). The non-university higher education institutions are not divided into faculties and offer mainly bachelor study programmes. Higher education institutions of university type offer bachelor, master and doctoral study programmes.
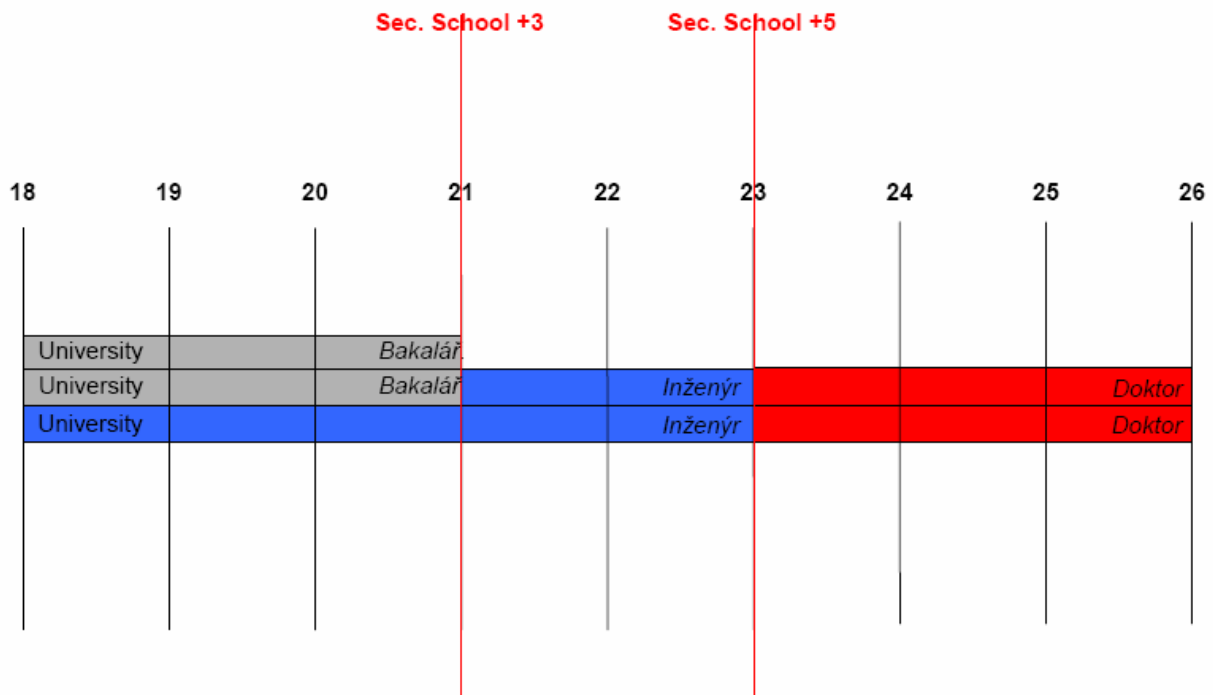
Figure 3.1: Czech Higher Education System in EIE disciplines

Higher education institutions offer courses in the humanities, social sciences, natural sciences, engineering, medicine and pharmacy, theology, as well as in economics, veterinary medicine, and agriculture, teacher training and arts. There are 45 higher education institutions: 24 public, 17 private and 4 state institutions. The majority of higher education institutions are public institutions.

There are 6 higher education institutions in the field of EIE; all of them are public university type institutions. Public institutions are financed by the state budget by the Ministry of Education, Youth and Sports. The private higher education institutions could be partially financed by the state. In addition, the Czech higher education system includes 4 state higher education institutions. There are three military higher education institutions and a police academy. These institutions are financed by the Ministry of Defence and the Ministry of the Interior. All higher education institutions provide accredited study programmes which are assessed by the Accreditation Commission.

There are three university level studies:

• **Bachelor studies** *(Bc. = "Bakalář"):*

The standard length of study including practical training is at least three years and at most four years. According to the Higher Education Act there is no difference between bachelor studies at university and non-university type institutions. The bachelor study programmes cover all main disciplines, except in medicine, veterinary medicine, pharmacy, architecture and law. It is conceived either as an independent course whose graduates are fully qualified for particular professions or as the first stage of longer studies whose graduates can continue towards the *magistr* degree. This cycle leads to the academic degree of "*Bakalář*" (Bc.) or "*Bakalář umění*" (BcA.) in the field of arts which was introduced in January 1999. Students must sit for a final state examination, part of which is also the defence of the bachelor thesis.

• **Master studies** (Mgr. = "*Magistr*"):

The standard length of study is at least four and at most six years. Master study programmes may represent a continuation of bachelor study programmes; should this be the case, the standard length of study is at least two and at most three years. The master study programmes in the humanities, education and social sciences, natural sciences, pharmacy, theology, law and art last for five years and lead to the title of "*Magistr*" (Mgr). In economics, agriculture and chemistry, studies last for five years and lead to the academic degree of "*Inženýr*" (Ing.). In engineering, studies last between five and five-and-a-half years and also lead to the degree of "*Inženýr*" (Ing.). In architecture, veterinary medicine and medicine, studies last for six years. Graduates in medicine obtain the degree of "*Doktor medicíny*" (MUDr) and of "*Doktor veterinární medicíny*" (MVDr) in veterinary medicine. According to the 1998 Act, graduates of master programmes in architecture are awarded the title of "*Inženýr architekt*" (ing. arch.) and graduates in the arts the academic degree of "*Magistr umění*" (MgA). The new Act enables holders of the title of *magistr* to sit for a state examination in the same field and defend a dissertation to acquire the academic degree of Doktor followed by the name of the field "*Doktor práv*" (JUDr), "*Doktor filosofie*" (PhDr), "*Doktor přírodních věd*" (RNDr), "*Doktor farmacie*" (Phar.Dr.) and "*Doktor teologie*" (ThDr).

• **Doctoral studies** *(Dr. = "Doktor"):*

> The standard length of study is three years. The third and highest level of higher education consists in studies for the doctorate which take place <u>under the guidance of a tutor</u>. The programme is aimed at scientific research and independent study. Holders of the master's degree may apply. Studies last for three years (four to five years part-time) and lead to the academic degree of "*Doktor*" (PhD) or "*Doktor teologie*" (Th.D.) in the field of theology. Studies end with the state doctorate examination and the defence of a dissertation.

3.1.1 *Electrical and Information Engineering in Czech Republic, boundaries of the field of study*

EIE in the Czech Republic covers the whole spectrum of electrical and information disciplines, i.e. instrumentation and measurement, control systems, robotics and automation, telecommunications, dielectrics and insulation, antennas and propagation, engineering in medicine and biology, power engineering, power electronics as well as information engineering. There is usually one common faculty for both electrical and information engineering, since 2002 there has been a special faculty for information engineering at Brno University of Technology and it is probable that the same will happen at the other universities.

3.1.2 *Content, degrees and accreditations*

Pedagogical content is proposed by each university. The proposal must be approved by the Ministry of Education; still there is no common programme at national level.

3.1.3 *Implementation of the Bologna-BMD system in Czech Republic*

The Bologna-BMD system has been implemented since the school year 2002/2003 at the following institutions:

> • Faculty of Electrical Engineering and Communication and the Faculty of Information Technology of Brno University of Technology
> • Faculty of Informatics of the Masaryk University Brno,
> • Faculty of Electrical Engineering of the University of West Bohemia in Pilsen
> • Faculty of Electrical Engineering of Czech Technical University in Prague

It will be implemented at the Faculty of Electrical Engineering and Informatics of the Technical University of Ostrava in the school year 2003/2004. The Department of Informatics of the University of Pardubice provides only bachelor level studies.

3.2. Figures on the weight of EIE in the Czech Republic

All the data below concerns the school year *2001-2002*. Detailed data for technical disciplines is available only for bachelor and master study level.

The total number of students in higher education institutions: 238 578

Bachelor and master studies
> *Total number of students:* 219 514
> *Number of students in technical disciplines:* 54 421
> *Number of students in EIE disciplines:* 11 875
> *Total number of graduates:* 28 657
> *Number of graduates in technical disciplines:* 6279
> *Number of graduates in EIE disciplines:* 1445

Doctoral studies
> *Total number of students:* 19 064
> *Total number of graduates:* 1 062

3.3. Degrees in EIE in the Czech Republic

- Bachelor (*Bakalář – Bc.*): three years of higher education studies after the end of secondary school.
- Master (*Inženýr – Ing.*): five years of university studies after the end of secondary school or – when the Bologna-BMD model is applied – two years of university studies after the end bachelor studies.
- Doctor (*Doktor – Ph.D.*): three years of university studies after the end of master studies.

3.3.1 Bachelor level

Standard length of studies is six semesters, which represents 180 credits (ECTS) with the following average distribution of subjects:
- Fundamentals (mathematics, physics etc.): 35 %
- Computer and information systems: 15 %
- Specialized courses in a given EIE field: 40 %
- Languages (mainly English and German): 5 %
- Projects: 5 %

3.3.2 _Master level_

Standard length of studies is four semesters (358 model), which represents 120 credits (ECTS) with the following average distribution of subjects:

- Fundamentals (mathematics, physics, etc.): 7 %.
- Computer and information systems: 14 %.
- Specialized courses in a given EIE field: 60 %.
- Languages (mainly English and German): 7 %.
- Projects: 12 %.

3.4. References

The information given in this monograph is based on the following documents and web links:

- http://www.msmt.cz/ (Ministry of Education, Youth and Sports)
- http://www.msmt.cz/Files/vysokeskoly/Legislativa/HigherEduAct.htm

(Higher Education Act)

- http://www.csvs.cz/_en/ (Centre for Higher Education Studies)
- http://www.czso.cz (Czech Statistical Office)

Doctoral
Studies

3.5. Doctoral Studies in the Czech Republic

3.5.1. Supervision

Scientific Board or Supervisor

The Scientific board is composed by 32 members elected by the Department. The student, in most cases, has the same personal supervisor during its thesis work on an active research area of the supervisor.

Subject Assignment

Students interested in doctoral studies choose one subject before they apply for admission, by agreement between the student and the supervisor.

Who can be a Supervisor

1.   Only persons having rank of professor and assistant professor are eligible to serve as supervisors without further conditions.

2.   Persons with lower qualification must be approved by the dean.

3.   There can be external supervisors without the need of a 2nd supervisor.

Tasks of Scientific Board/Supervisor

1.   General management   YES

2.   Deciding/advising layout of course   NO

3.   Assigning a thesis subject   NO

Duration: the standard length of study is three years (four to five years in part-time).

3.5.2. Development

Courseware?

Yes.

Course Work

1.   The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units.

2.   Extension: 120 hours in the first year and 60 hours in the second year.

3.   Credit system: no credit system.

4.   Monitoring of the doctoral student. In case of failure the student must retake the exam or take a different course unit.

Contribution to Teaching

Supervision of undergraduate laboratory work.

Presentation of Work

1.   In the department.

2.   At national conferences.

3.   At international conferences.

3.5.3 Thesis Work

Submission of Doctoral Written Thesis

1. <u>Language</u>: Czech. Alternative language: English.

2. <u>No credits</u> allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1. <u>Language</u> normally used: Czech. Alternative language: English.

2. Oral presentation with oral examination for an open/public audience.

3. <u>Duration</u>: typical duration of 1 hour including examination with an upper time limit of 2 hours.

3.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: four internal examiners and four external examiners (eight members).

2. <u>Selection</u> by the person responsible for the general organization of studies in a given study field. The board must be then approved by the dean.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with no grading system.

2. <u>If the student fails</u>, he/she may not resubmit for doctorate. The students pass a final examination (generally) at the end of the second year of their doctoral studies, passing this examination is compulsory for being eligible to submit the thesis and the examination is valid for five years, if a student does not finish his studies within this period, he must restart the studies from the very beginning.

3.6. Questionnaires

Czech Republic

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	32
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	N
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	Y
	Members of the Scientific Board are chosen by the dean of the faculty, and then the Scientific Board must be approved by the Academic Senate.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	N
3.1.4.4	Assigning the thesis subject.	N
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

Y

3.1.7.2   After a specified period of coursework?

N

3.1.7.3   Other. Please specify:

N

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

N

3.1.8.2   Any researcher in the department?

N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

N

3.1.8.4   Other methods. Please specify:

Y

Only persons having rank of professor and assistant professor are eligible to serve as a supervisor without further conditions, persons with lower qualification must be approved by the dean; there can be external supervisors without the need of a second supervisor.

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

N

3.1.9.2   Other methods. Please specify:

Y

Thesis subjects are proposed by the supervisor and published, students interested in doctoral studies chose one subject before they apply for admission.

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2- COURSE WORK

3.2.2   Extension and assessment.

3.2.2.1	What is the number of contact hours spent in coursework in each year?	Year 1	**Year 2**	**Year 3**	**Year 4**
		120 hrs	**60 hrs**	**0 hrs**	**0 hrs**

3.2.2.2   In which form is this coursework offered?

- As specialist graduate course units.

Y

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?
If not, please give details:

Y

3.2.3.1 Is the coursework in your institution described by a credit system?

N

3.2.3.2 Is it the ECTS system?

If not, what is the relationship with ECTS?

3.2.3   Credit system

3.2.3.3 How many credits are allocated to coursework?

credits

3.2.4   Monitoring

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?

Y

3.2.4.2   What regulations apply in case of failure in one or more course units?

- Retake the exam.

Y[1]

- Take a different course unit.

Y[1]

[1] Retake the exam or take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1	In the department.	Y
3.3.2	At national conferences.	Y
3.3.3	At international conferences.	Y

3.4- CONTRIBUTION TO TEACHING:

3.4.1	Supervision of undergraduate laboratory.	Y
3.4.2	Teaching undergraduate courses.	Y

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Czech
4.1.2	Are alternative languages used for the thesis? Please Specify: **English.**	Y
4.1.3	Which language is normally used for the oral presentation and/or examination?	Czech
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English.**	YES
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Y
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	4
4.2.2.2	External examiners.	4
4.2.2.3	TOTAL.	8

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify: Y

The examination board is chosen by the person responsible for general organization of studies in a given study field, the board must be then approved by the dean.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   Y

4.2.4.2   The oral presentation of the thesis work.   Y

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   1 hour

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   Y[2]

[2] According to the regulations, the duration should not exceed 2 hours.

4.2.5   Is the oral part of the examination taken behind closed doors?   N

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   N

4.2.6.2   May resubmit revised thesis.   Y

4.2.6.3   May do further work as specified by examination board.   N

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   Y
Please specify:
Students pass a final examination (generally) at the end of the second year of their doctoral studies, passing this examination is compulsory for being eligible to submit the thesis and the examination is valid for five years, if a student does not finish his studies within this period, he must restart the studies from the very beginning.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   N

4. DE: Deutschland (Germany)

Coordinating author: Michael Hoffmann (EAEEIE, University of Ulm, michael.hoffmann@uni-ulm.de)
Other contributors: Otto RÖSCH, H. ROTH (Universität Gesamthochschule Siegen, roth@rst.e-technik.uni-siegen.de)

4.1. General information

In Germany the curriculum is slightly different at each University. In some Universities the electrical engineering and the computer science departments are combined and in other Universities they are separated.
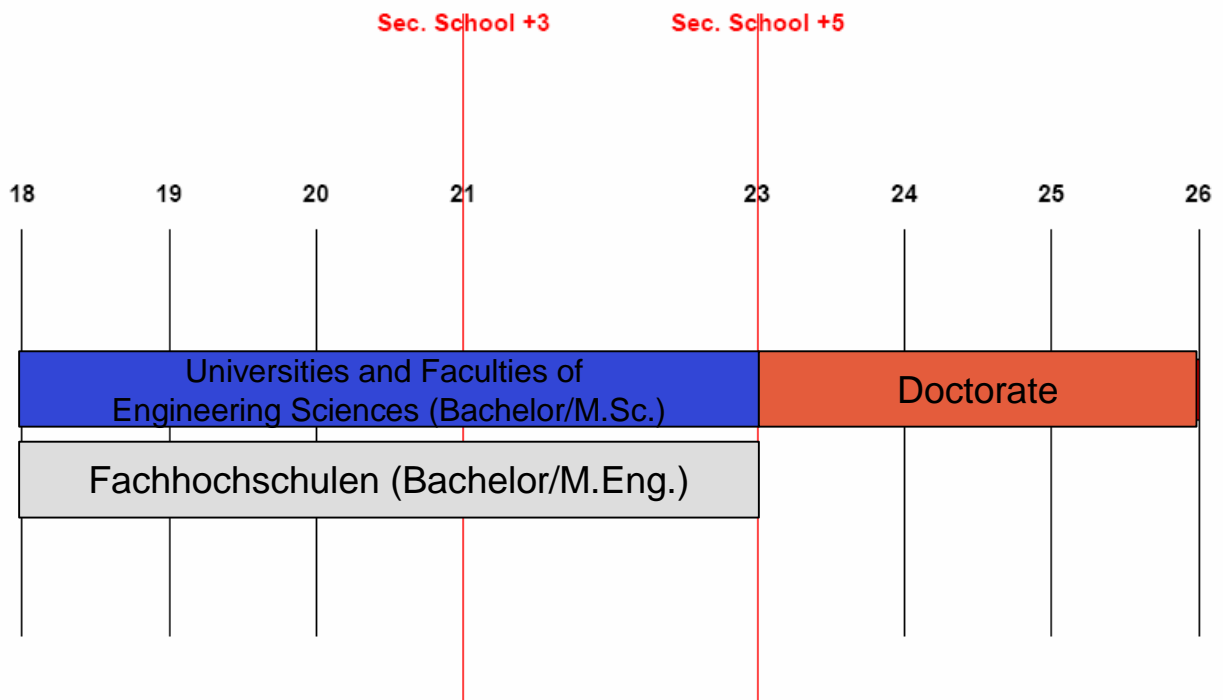
Figure 4.1: German Higher Education System in EIE Disciplines

4.1.1 Electrical and Information Engineering in Germany, boundaries of the field of study

List of general EIE subjects:
- Computer Sciences
- Medical Computer Sciences
- New Communication Technologies
- Business Informatics
- Electrical Engineering
- Microelectronics
- Microsystems Engineering
- Communications and Information Technology
- Optoelectronics

4.1.2 Content, degrees and accreditations

The curriculum of the degrees is defined by a committee in each department in each University and certified by the ministry of education in the federal states (*Länder*).

4.1.3 Implementation of the Bologna-BMD system in Germany

In Germany, we found traditionally:
- **Diplom-Ingenieur**, the title that is awarded by German universities and technical universities for the successful completion of a scientific course program of nominally five years;
- **Diplom-Ingenieur** *(FH)*, the title that is awarded by German *Fachhochschulen* (universities of applied sciences) for the successful completion of a practice oriented course program of nominally four years.

Bologna-BMD system is being introduced in the Germany federal schemes since 1998 in parallel with the traditional degree "*Diplom-Ingenieur*".

In some federal states, the encouragement to switch to the Bologna-BMD is stronger than in others. Some Universities propose "bachelor" and "master" curricula, in addition to traditional curricula. Some "masters" are proposed in English language, mainly for foreign students.

The Bachelor level is very similar to the *Fachhochschule* level (only a bit shorter). The Master level is closely aligned to the current University *Diplom-Ingenieur* programme. It is science orientated at Universities, and application oriented in Fachhochschulen.

4.2 Figures on the weight of EIE in Germany

Students in the first Semester in Different Universities 2001 / 2002

■ 11137
German Academies of Business
and Administrationt

■ 117433
University of Applied
Sciences

■ 6367
College of Art

□ 651
Theological Universities

□ 4801
Colleges of Education

■ 38110
Comprehensive
Universities

■ 296039
Universities

Number of Students in each Subject in the first semester 2001 / 2002

■ 17059
Art,
Sciences of Art

□ 1396
Additional
Subjects

■ 69788
Engineering Sciences

□ 8501
Agrarian-, Forest- and
Nutrientsciences

■ 1468
Veterinary Medicine

■ 14706
Human Medicine

■ 88398
Mathematik, Natural
Sciences

■ 114261
Language- und
Cultural Sciences

■ 5572
Sport

□ 153389
Law-, Economic- and
Social Sciences

Students in Germany in the first semester 2001/2002

Students in Germany in 2001/2002

☐ 484315, 26%
University of Applied Sciences

■ 30646, 2%
Art-Colleges

☐ 1345737, 72%
Universities

Total Number of Students 1860698

Students in Electrical Engineering in Germany in 2000

26 771
Students at
Universities

33 508
Students at Universities
of Aplied Sciences

Total amount of Students in Electrical Engineering: 60279

Students in Electrical Engineering in Germany

Number of Students

100 000
90 000
80 000
70 000
60 000
50 000
40 000
30 000
20 000
10 000
-

1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000

Year

4.3. Degrees in EIE in Germany

Relevant awards are made in 355 different Universities in Germany:

• Technician in various engineering disciplines (2 years)

• Diplom Degrees in various engineering disciplines and informatics (7 to 9 Semesters)

• Bachelor (6 Semesters), Master (+ 4 Semesters) (introduced only recently)

4.3.1 Before bachelor (technician level)

This level is not considered as a University level, and not developed in the following.

4.3.2 Fachhochschul-level:

Automatic Control Engineering:

- Control Systems 28%
- Real-Time Data Processing 17%
- Computer Engineering 17%
- Process Measuring 15%
- Drive Control 13%

Electrical Energy Engineering:

- Electrical Machines and Drives 25%
- Power Electronics 23%
- Control Systems 17%
- Drive Regulation 13%
- Electrical Power Supply 12%

Communications Technology:

- Networks, Signals, Systems 28%
- Computer Engineering 23%
- High-Frequency Engineering 17%
- Analogue Circuit 12%
- Cryptographic Procedures and Applications 10%

Technical Data Processing:

- Real-Time Data Processing 25%
- Computer Engineering 22%
- I/O Interfaces and Peripheral Devices 18%
- Cryptographic Procedures and Applications 15%
- Digital Image Processing 10%

4.3.3 *University-level*:

General Electrical Engineering:
- Theoretical Electrical Engineering 25%
- Semiconductor Electronics 18%
- General Communications Engineering 13%
- Data Processing 12%
- Electrical Machines and Power Electronics 12%
- Control Engineering 10%

Automatic Control Engineering:
- Control Engineering 25%
- Electrical Machines and Power Electronics 17%
- Data-Acquisition and Data-Processing 15%
- Real-Time Data Processing 13%
- General Communications Engineering 10%
- Theoretical Electrical Engineering 10%

Electrical Engineering:
- Electrical Plants and Networks 25%
- Electrical Machines and Power Electronics 17%
- Data-Acquisition and Data-Processing 15%
- High Voltage Engineering and Insulation Material 13%
- Real-Time Data Processing 10%
- Control Engineering 10%

Microelectronics:
- Microelectronics 25%
- Design of Integrated Systems 18%
- Semiconductor Electronics 17%
- Signal and System Theory 10%
- General Communications Engineering 10%
- Data Processing 10%

Communications Engineering:
- General Communications Engineering 25%
- Communication Transfer Technology 17%
- Signal and System Theory 15%
- Fields and Waves 13%
- Radio-frequency and microwave technology 10%
- Data Processing 10%

Technical data processing:

- Data Processing 25%
- Algorithms and Data Structures 15%
- I/O Interfaces and Peripheral Devices 15%
- Real Time Programming 12%
- Design of Integrated Systems 12%
- Technical Computer Science 11%

The remaining 10% of the subjects, defined by each University, are general subjects, like Project management, English as a foreign language, Communications, Rhetoric and Public Relations.

4.4. References

- "Studying in Germany", DAAD. 6th Edition 1999,
- Federal Ministry of Education and Research.

Doctoral
Studies

4.5. Doctoral Studies in Germany

4.5.1. Supervision

Scientific Board or Supervisor

There are both an appointed supervisor and a Scientific board. The latter includes 3 to 7 members depending on the university and is elected by the Faculty/Department. The student has the same personal supervisor during the thesis work on an active research area.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between the student and the supervisor. The subject might be changed slightly.

Who can be a Supervisor: only professors in university department have the right to supervise doctoral students.

Tasks of Scientific Board/Supervisor

The Scientific board has only formal tasks (decision on whether a student is admitted, who will be the second reviewer of the work, whether dates have been met). The supervisor has the following tasks:

1.   General management   YES

2.   Deciding/advising layout of course   NA [1]

3.   Assigning a thesis subject   YES

4.   Discuss with doctoral student on his/her progress on a regular basis, mediate contacts to other research institutions for discussion.

Duration: three to five years.

---

[1] Not available.

4.5.2. Development

Courseware?

Yes.

Course Work

1.   In most cases, there is no course program. The doctoral thesis is exclusively research-based.

2.   Extension: not applicable.

3.   Credit system: not applicable.

4.   Monitoring: not applicable.

Contribution to Teaching

1.   Supervision of undergraduate laboratory work.

2.   Teaching undergraduate students only in "problem-solving" sessions. In few cases proxying the supervisor for a lecture.

Presentation of Work

1.   In the department.

2.   At national conferences.

3.   At international conferences.

4.   In cooperation with industry.

4.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   Language: German. Alternative language: English. Further languages depending on the university.

2.   No credits allocated to the doctoral thesis.

3.   The doctoral thesis is a previously unpublished substantial written report. Pre-publications possible.

Oral Presentation of Thesis Work

1.   Language normally used: German. Alternative language: English.

2.   Oral presentation for an open audience with one part of the oral examination public and another part of the oral examination that is not public.

3.   Duration: typical duration of 1,5 hours with an upper time limit.

4.5.4. Examination

Thesis Examination Board

1.   Composition: four or three internal examiners and none or one external examiner (4 members: 4+0 or 3+1).

2.   Selection by the scientific committee of the institution.

Evaluation

1.   Result based on the reading of the thesis and the oral presentation of the thesis work, with a grading system.

2.   If the student fails, he/she may resubmit a revised thesis not earlier than one year after the rejection of the first thesis. The student may also resubmit for doctorate but only once more.

4.6. Questionnaires

Germany

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1   Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.   YES

3.1.2   **How many members are in the Scientific Board?**   3 to 7

There are both an appointed supervisor, and a scientific board. The latter includes 3 to seven members, depending on the individual university.

3.1.3   How are the members of the Scientific Board chosen?

3.1.3.1   Elected by the Faculty, Department?   Y

3.1.3.2   Chosen by the student?   Y/N

3.1.3.3   Chosen in another way? Please specify: Y/N

3.1.4   Which are the main tasks of the Scientific Board/ Supervisor?

The Scientific board as only formal tasks (decision on whether a student is admitted to be a doctoral student, who will be second reviewer of the work, whether dates have been met etc. There is NO course program. Doctoral thesis is exclusively research-based. The following answers are concerning the supervisor.

3.1.4.1   General management of the doctoral studies.   Y

3.1.4.2   Deciding the layout of the course, advising the students on their coursework.   NA

3.1.4.4   Assigning the thesis subject.   Y

3.1.4.5   Other. Please specify:

Discuss with doctoral student on his progress on a regular basis, prevent him/her from going into wrong directions, mediate contacts to other research institutions for discussion

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y
3.1.7	The doctoral thesis subject is normally assigned:	
3.1.7.1	At the beginning of the doctoral studies?	Y
3.1.7.2	After a specified period of coursework?	N
3.1.7.3	Other. Please specify:	Y/N

If necessary, the subject might be changed slightly due to novel results and/or aspects showing up during research work.

3.1.8	The thesis supervisor of a doctoral student can be:	
3.1.8.1	Any professor or lecturer in the department?	(Y)[1]
3.1.8.2	Any researcher in the department?	N
3.1.8.2.1	In this case, is there a need for a second supervisor who is a professor or lecturer in the department?	
3.1.8.3	Any researcher in another institution?	N
3.1.8.3.1	In the latter case, is there a need for an internal supervisor?	NA
3.1.8.4	Other methods. Please specify:	N

[1] **Only professors!**

3.1.9	The thesis subject is assigned by:	
3.1.9.1	Agreement between the student and the proposed supervisor?	Y
3.1.9.2	Other methods. Please specify:	N

3.2- COURSE WORK

3.2.1	Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.				N

3.2.2 **Extension and assessment.**

		Year 1	**Year 2**	**Year 3**	**Year 4**
3.2.2.1	What is the number of contact hours spent in coursework in each year?				
		hrs	**hrs**	**hrs**	**hrs**

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3	Is the coursework assessed by examinations? If not, please give details:	Y/N

3.2.3 **Credit system**

3.2.3.1	Is the coursework in your institution described by a credit system?	Y/N
3.2.3.2	Is it the ECTS system?	Y/N
	If not, what is the relationship with ECTS?	
3.2.3.3	How many credits are allocated to coursework?	
		credits

3.2.4 **Monitoring**

3.2.4.1	Do you monitor the performance of the doctoral student taking coursework?	Y/N

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

                                                                          YES

3.3.2   At national conferences.

                                                                          YES[2]

3.3.3   At international conferences.

                                                                          YES[2]

[2] YES, normally.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

                                                                          YES

3.4.2   Teaching undergraduate courses.

                                                                          YES[3]

[3] Only so-called "problem-solving sessions".

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	German
4.1.2	Are alternative languages used for the thesis? Please Specify: **English.**	Y
4.1.3	Which language is normally used for the oral presentation and/or examination?	German
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English.**	Y
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	YES
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	NO
4.1.6.3	Other. Please specify:	NO

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	4 to 3
4.2.2.2	External examiners.	0 to 1
4.2.2.3	TOTAL.	4 (four)

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   NO

4.2.3.2   By the scientific committee of the institution.   YES

4.2.3.3   By the rector or equivalent.   NO

4.2.3.4   By the national ministry.   NO

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   Y

4.2.4.2   The oral presentation of the thesis work.   Y

4.2.4.3   Both.   YES

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if   1.5 hours
applicable?

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   Y

4.2.5   Is the oral part of the examination taken behind closed doors?   [4]

[4] One part public, other not.

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   Y[5]

4.2.6.2   May resubmit revised thesis.   N

4.2.6.3   May do further work as specified by examination board.   N

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   Y
Please specify:
Not earlier than 1 year after rejection of first thesis.

   [5] Yes, but only once.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the   Y
work?

5. EE: Eesti (Estonia)

Coordinating author: Gert JERVAN (Tallinn University of Technology, gerje@pld.ttu.ee)
Other contributors: Raimund UBAR, Ennu RÜSTERN, Margus KRUUS (Tallinn University of Technology)

5.1. General information

There are 52 registered higher-education institutions including state and private universities and colleges in Estonia for 1.5 million inhabitants. One third of students pay for their studies by themselves.
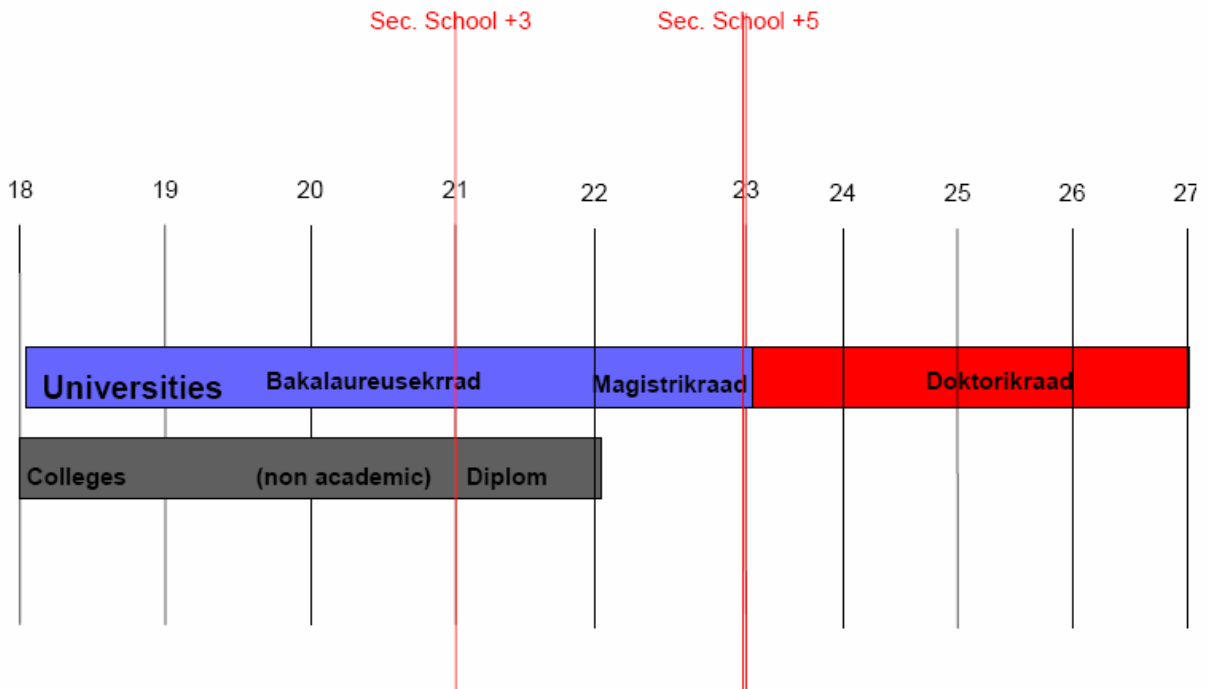

Figure 5.1: Estonian Higher Education System in EIE disciplines.

- The Estonian higher education system is binary:
  - Universities (ülikool);
  - Applied higher education institutions (*rakenduskõrgkool*) - colleges.
- The system also incorporates some vocational higher education (*kutsekõrgharidus*) programmes at post-secondary vocational institutions (*kutseõppeasutus*).
- The higher education institutions can be state, public or private institutions.
- The right to award diploma or degree lies with the state college and the public university recognised by the state.
- Diplomas awarded by the private higher education institutions are recognised after the accreditation.

Organisation of a course of study

- Academic year is divided into two semesters: the autumn and spring semester.
- Academic year begins in September and ends in the first half of June. In general, it contains 40 weeks of lectures, seminars, practical training and two examination periods.
- The capacity of studies is measured in credits. One credit corresponds to forty hours (one study week) of studies performed by a student in whatever way. The nominal academic year consists of 40 credits (60 ECTS credits).

5.1.1 *Electrical and Information Engineering in Estonia, boundaries of the field of study*

In Estonia, the EIE specialities are specialities of very high priority. The largest educational institution in this area is Tallinn Technical University, where most EIE specialists are taught. The graduates of TTU have contributed to bringing the economy of Estonia to a high technology level and many of them occupy high places in Estonian banking and economics, in industrial, energy and ICT companies. The list of specialities in Tallinn Technical University is quite wide: in the field of Information Technology: Informatics, Computer and Systems Engineering, Telecommunication, Electronics, Business Information Technology and Computer Science; in the field of Electrical Engineering: Electrical Drives and Power Electronics and Electrical Power Engineering. Altogether, TTU accepts about 650-700 students in EIE specialities every year, about 400 of them receive government scholarships. Some EIE specialities are also taught in Tartu University and in Tallinn University. The applied programmes are offered in several colleges, most of which are connected to a university. Estonian Information Technology College (EITC, founded in 2000) is the largest educational institution of that kind in the IT field. EITC prepares the specialists of "IT Systems Development" and "IT Systems Administration" specialities. The most part of study plans of EITC is developed by professors of TTU, and the study process is conducted in close co-operation with IT faculty of TTU.

5.1.2 *Content, degrees and accreditations*

General requirements for studying and teaching are set by the Standard of Higher Education (SHE, adopted by the Government 13.08.2002). The SHE is a set of regulations instituted by the Government of the Republic. It specifies the purpose of a given programme of instruction leading to a certification of trade, vocational, or professional competence; the list of trades and occupations to which its regulations apply; and the general requirements that curricula must meet, also the list of study fields and specialities.

The content of the curricula of all specialities is approved by a curricula committee of the faculty, consisting of professors and industry experts and by the Council of University (TTU, TU, etc.). The curricula pass regular obligatory accreditation, during which independent international experts evaluate the curricula. Based on the reports of the expert committees, the Higher Education Quality Assessment Council decides on accreditation of the curriculum. The accreditation is valid for 7 years, in case of conditional accreditation the accreditation procedure has to be repeated in 2 years. Curricula which are not approved are terminated. The educational contents of the degrees given in Estonia are presented in the following.

Non-academic higher education qualifications
- Vocational higher education diploma (*kutsekõrghariduse diplom*)
  - One-stage higher education offered by secondary education based on vocational education institutions (kutseõppeasutus) or colleges.
  - The length of study is from three to four years, the total capacity of studies 120 – 160 credits.
  - Vocational higher education programme includes practical training, accounting for at least 35% of the total capacity.
  - The graduates who have completed their studies are awarded a diploma with an indication of their speciality.
- Diploma (*Diplom*)
  - One-stage non-academic applied higher education. The length of study is from three to four years, 120 – 160 credits.
  - *Diplom*-study is a specialised higher education study, consisting of the studying and acquisition of practical knowledge and skills.
  - Acquisition of practical skills, including training, must have a total capacity of no less than 10 credits.
  - The graduates who have completed their studies will be awarded a diploma (with no academic degree).
  - *Diplom*-study can be performed at universities (up to 2002) and colleges.
  - The study programme of *diplom*-study at university and that of *bakalaureus*-study may have common courses.

Academic higher education qualifications

• *Bakalaureusekraad* (Bachelor)

- First stage of academic study, the main purpose of which is to increase students' level of general education and develop theoretical knowledge and professional skills for the selected area of employment and further study.

- *Bakalaureus*-level study is conducted in universities, and the length of study is 3 – 4 years (up to 1999 – 4 years, since 2002 – 3 years).

- *Bakalaureus*-study is a theory-based wide-range study.

- Research, professional or creative work, including final thesis, shall have a capacity of not less than 20 credits.

- The graduates who have completed their studies will receive a diploma, certifying the obtained *bakalaureusekraad*.

• *Magistrikraad* (Master)

- Second stage of academic study, the main purpose of which is to deepen theoretical and specialist knowledge and develop proficiency in research, professional or other creative work for individual use of knowledge and skills.

- Admission requirement is the *bakalaureusekraad* or an equivalent level of academic education.

- The length of study is 1 – 2 years (up to 1999 and since 2002 – 2 years).

- The study will be completed with the defence of a thesis.

- The degrees are divided into research and professional degrees. The graduates who have completed their studies will receive a diploma, certifying the obtained *magistrikraad*.

• *Doktorikraad* (PhD)

- Third stage of academic study, consisting of comprehensive research, professional or other creative work and related studies.

- Admission requirement for *doktor*-study is the *magistrikraad* or an equivalent level of academic education.

- The nominal length of study is four years.

- The degrees are divided into research and professional degrees.

- The graduates who have completed their studies will receive a diploma, certifying the acquired *doktorikraad*.

5.1.3 *Implementation of the Bologna-BMD system in Estonia*

Up to year 2001 the 4-6-10 study system was used in Estonian high education. The Government of Estonia has fixed the goal to be achieved for higher educational institutions, taking into account the tasks related to the accession of Estonia to the European Union. All substantial features of the Bologna mainframes were built into the SHE. In accordance with SHE the revision of curricula was conducted and in year 2002 new 3-5-9 curricula were introduced. Doctoral programmes were also substantially renewed and brought up to date, but they still remain mostly 4-year programmes. The number of different programmes was brought down to a minimum. For example, in TTU there are only

two doctoral programmes in the area of EIE: "Information and Communication Technology" and "Power Engineering and Geotechnology". Since 2002 the applied higher education and diploma studies have taken place only in colleges.

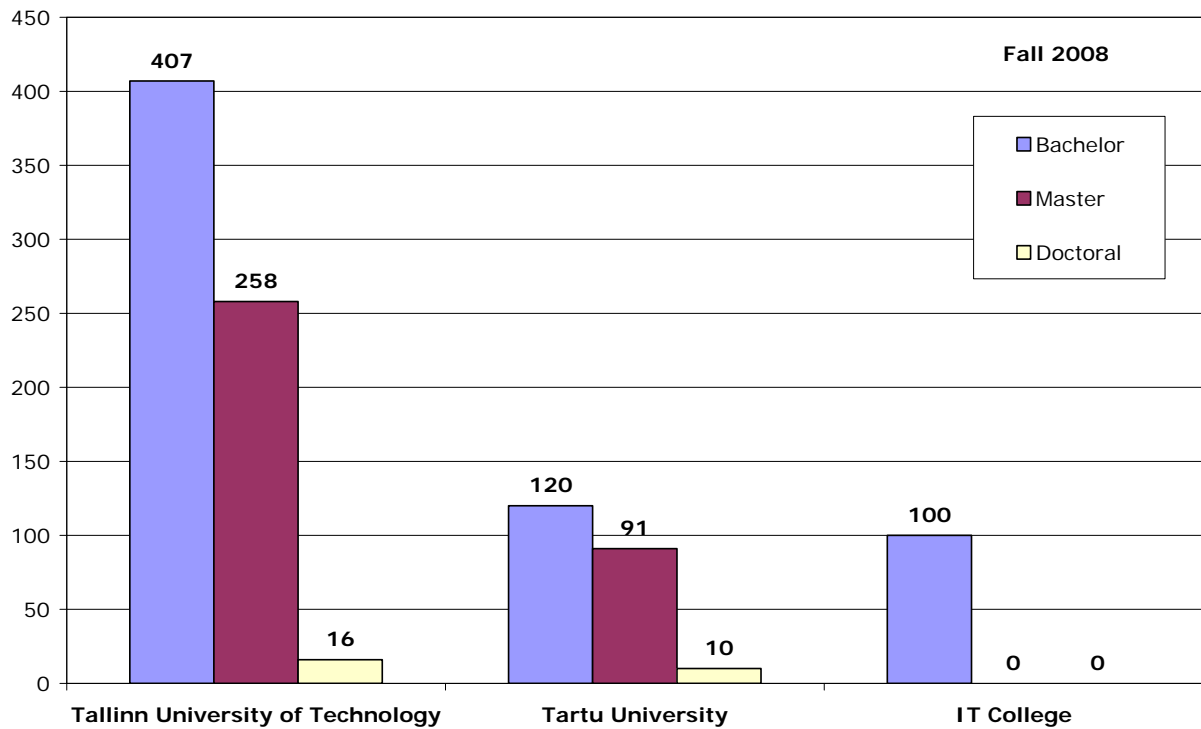## *5.2. Figures on the weight of EIE in Estonia*

Figure 5.2: Admission to the ICT studies (state-commissioned education, 2008)
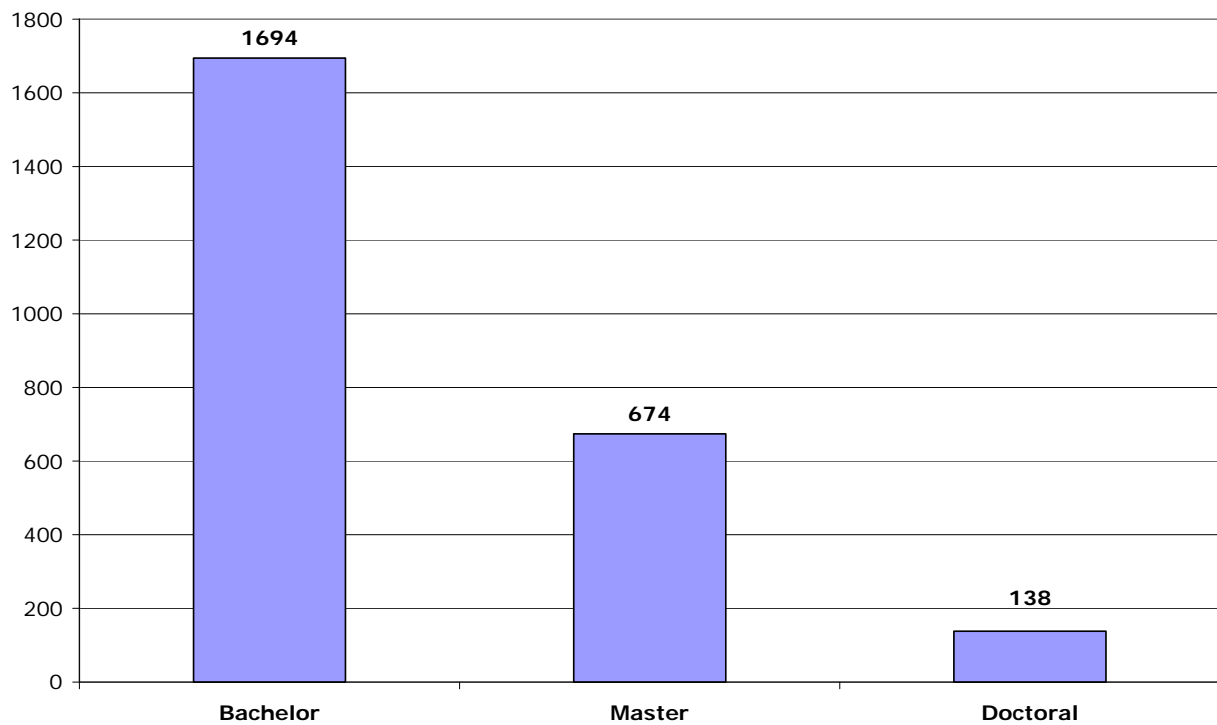

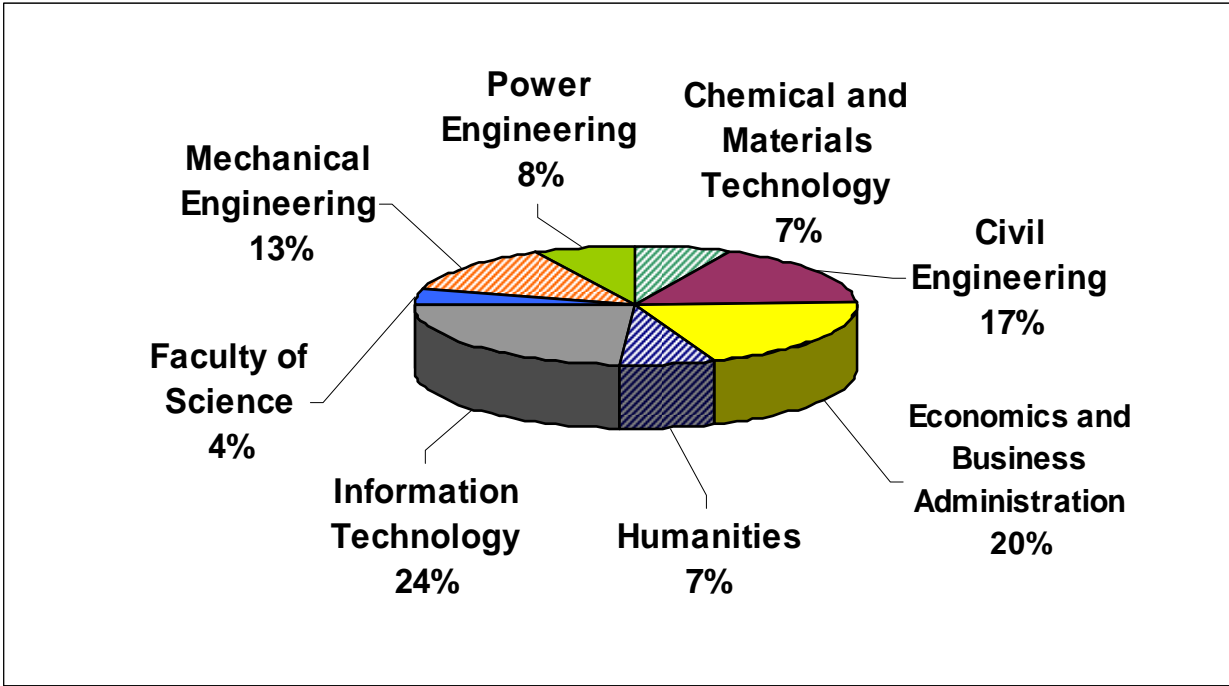*Figure 5.3: Number of students in ICT areas (2007/2008)*

Figure 5.4: Number of students by faculty at Tallinn University of Technology in 2005/2006
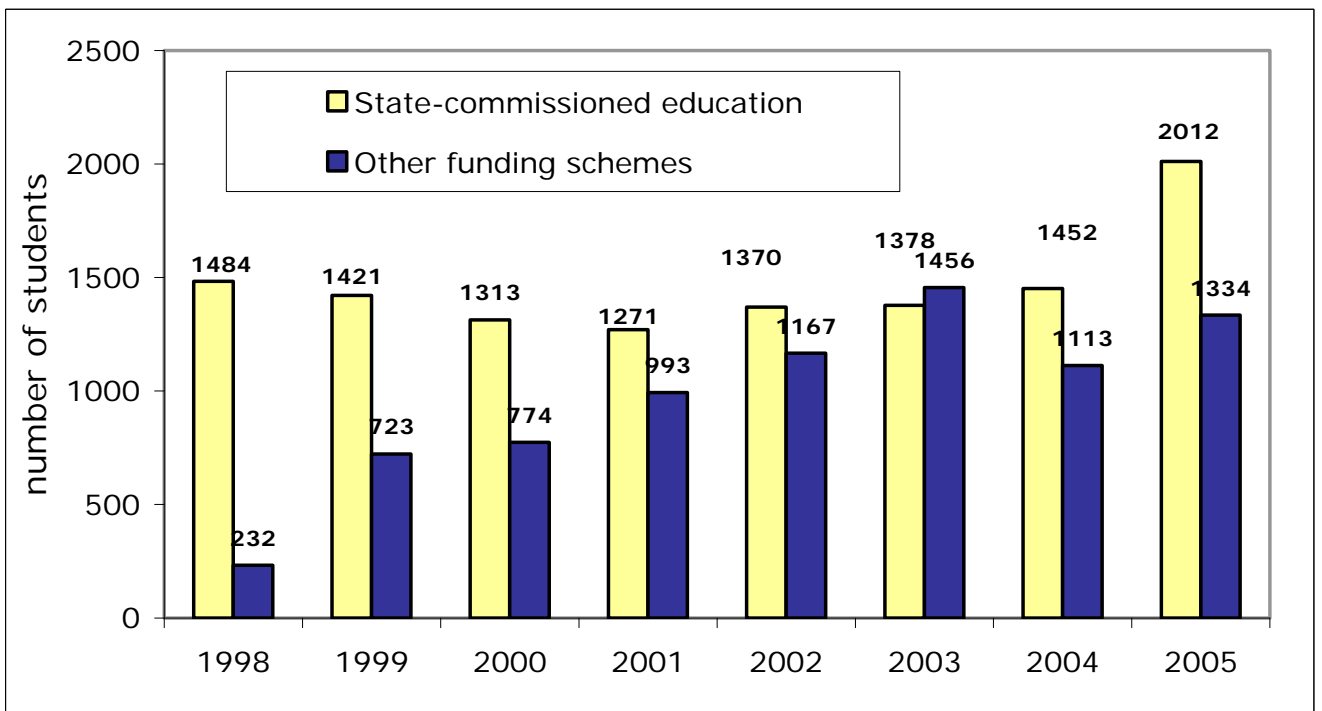

Figure 5.5: Admission, based on funding schemes at Tallinn University of Technology

5.3. Degrees in EIE in Estonia

Non-academic higher education qualifications

- Vocational higher education diploma
- Diploma

Academic higher education qualifications

- Bakalaureusekraad (Bachelor)
- Magistrikraad (Master)
- Doktorikraad (PhD)

5.3.1 Before bachelor (Vocational higher education)

IT Systems Administration

> **Specialities**: Computers & Networks –10%, Programming – 15%, IT Systems: Analysis, Design& Programming – 17.5 %, IT Systems Administration - 10 %, Diploma Thesis – 8%.
>
> **Fundamentals:** Mathematics & Physics - 9%, Humanities & Economics – 11%, English – 4.5%, Industrial Training – 15%.

IT Systems Development

> **Specialities**: Computers & Networks –13%, Programming – 15%, IT Systems: Analysis & Design – 10.5 %, IT Systems Development - 10 %, Diploma Thesis – 8%.
>
> **Fundamentals:** Mathematics & Physics – 13%, Humanities & Economics – 11% , English – 4.5%, Industrial Training – 15%.

Information Technology

> **Specialities**: Computers –12%, Programming -12%, Special Software – 20%, Hardware - 8%, Diploma Thesis – 5%.
>
> **Fundamentals:** Mathematics & Physics - 8%, Humanities & Economics – 15% , English – 5%, Industrial Training – 15%.

Telecommunication Equipment

> **Specialities**: Computers & Networks - 8%, Electronics & Telecommunication Basics –14%, Programming -5%, Telecommunication Hardware & Software – 21%, Diploma Thesis – 5%.
>
> **Fundamentals:** Mathematics & Physics - 10%, Humanities & Economics – 13%, English – 5%, Industrial Training – 15%

5.3.2 *Bachelor level*

Bachelor in Electronics:

Specialities: Electronics – 21% , Informatics – 12,5% , Telecommunications – 10%, Networks – 7,5%, Control – 9%.

Fundamentals: English – 2%, Expression-communication – 2%, Humanities – 8%, Industrial training – 2.5%.

Bachelor in Telecommunications:

Specialities: Electronics – 5%, Informatics – 16% , Telecommunications – 27% , Networks – 10%, Control – 6%.

Fundamentals: English – 2%, Expression-communication – 2%, Humanities – 8%, Industrial training – 2.5%.

Bachelor in Computer and System Engineering

Specialities: Electronics – 5%, Informatics – 33% , Telecommunications – 3% , Networks – 8%, Control – 12%.

Fundamentals: English – 2%, Expression-communication – 2%, Humanities – 8%, Industrial training – 2.5%.

Bachelor in Informatics

Specialities: Introduction to Informatics - 10 %, Signals, Circuits& Systems – 8 %, Computers & Networks - 9 %, Programming – 20.5 %, Information Systems or Network Applications – 12 %, Bachelor Thesis - 4 %.

Fundamentals: Mathematics & Physics - 22.5 %, Humanities & Economics – 9.5 %, English - 2 %, Industrial Training – 2.5 %.

Bachelor in Business Information Technology

Specialities: Introduction to Information Technology - 7 %, Computer& Network – 6 %, Information Systems – Analysis, Design, Programming and Development – 37.5 %, Network Applications – 6 %, Organization Management – 7.5 %, Bachelor Thesis - 4 %.

Fundamentals: Mathematics & Physics - 16 %, Humanities& Economics – 11.5 %, English - 2 %, Industrial Training – 2.5 %.

Bachelor in Electrical Drives and Power Electronics

Specialities: Informatics – 4%, Measurements – 4%, Microprocessors& Electronics – 10 %, Robots – 6%, Control – 9 %, Electrical Engineering – 21.5 %, Electrical Drives – 18 %.

Fundamentals: Mathematics & Physics – 17%, Humanities & Economics – 6%, English – 2%, Industrial Training – 2.5 %.

5.3.3 Master level

Master in Computer and System Engineering

Specialities: Embedded systems - 10 %, Computer architectures – 5 % , Fault tolerance and reliability – 20%; Advanced programming – 10 %, Microelectronics – 10%, Master Thesis - 25 %

Fundamentals: Humanities & Economics – 6 %, English – 2.5 %, Industrial Training – 4 %.

Master in Telecommunications

Specialities: Electronics – 5%, signal processing – 10% , Telecommunications – 25% , Networks – 10%, Control – 5%, Master Thesis - 25 %

Fundamentals: Humanities & Economics – 6 %, English – 2.5 %, Industrial Training – 4 %.

Master in informatics

Specialities: Advanced Programming - 11 %, Data Security – 9 % , Information Systems – Analysis, Design, Programming and Development -21%; Network Applications – 12.5 %, Network Administration - 9 %, Master Thesis - 25 %

Fundamentals: Humanities & Economics – 6 %, English – 2.5 %, Industrial Training – 4 %.

Master in Informatics (for those whose Bachelor degree was not Informatics)

Specialities: Programming – 12 %, Data Security – 5 % , Information Systems –Analysis, Design, Programming and Development –33.5 %; Network Applications – 12 %, Project Management - 6 %, Master Thesis - 25 %.

Fundamentals: English – 2.5 %, Industrial Training – 4 %.

Master in Business Information Technology

Specialities: Data Security – 9, Information Systems – Analysis, Design, Programming and Development – 23 %, Network Applications – 6 %, Intelligent and Agent Systems – 11.5%, IT Projects Management - 19 %, Master Thesis - 25 %.

Fundamentals: English – 2.5 %, Industrial Training – 4 %.

Master in Electrical Drives and Power Electronics

Specialities: Electrical Engineering – 6 %, Programming – 6 %, Automation – 9%, CAD – 9%, Electrical Drives – 11%, Robots –6%, Power Electronics –6%, Master Thesis – 25%.

Fundamentals: Mathematics – 4.5 %, Humanities & Economics – 15%, English – 2.5%.

5.3.4 Doctoral level

Doctor in Information and Communication Technology

List of specialities: Informatics, Information Technology, Computer and Systems Engineering, Electronics, Telecommunication.

Specialities - 19%, **Fundamentals** - 6%, **Doctoral Thesis** - 75%.

Doctor in Power Engineering and Geotechnology

Specialities - 21%, **Fundamentals** - 4%, **Doctoral Thesis** - 75%.

5.4. References

The information given in this monograph is based on the following documents and web links:

http://www.smartestonia.ee/ (Information Portal of Estonian Higher Education and Research)

http://www.hm.ee/ (Estonian Ministry of Education);

http://www.ekak.archimedes.ee/ (Higher Education Quality Assessment Council);

http://www.ttu.ee/index_eng.html (Tallinn Technical University);

http://www.ut.ee/english/ (Tartu University);

http://www.itcollege.ee/inenglish/index.php (Estonian Information Technology College);

Doctoral Studies

5.5 Doctoral Studies in Estonia

5.5.1. Supervision

Scientific Board or Supervisor

Supervisor: the student, in most cases, has the same personal supervisor during its thesis work not necessarily on an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies or after a specified period of coursework. The thesis subject is assigned by agreement between the student and the supervisor.

Who can be a Supervisor

1. Any professor or lecturer in the department.

2. Any researcher in the department.

3. There can be external supervisors with the need of a second supervisor who is professor or lecturer in the department.

Tasks of Scientific Board/Supervisor

1. General management   YES

2. Deciding/advising layout of course   YES

3. Assigning a thesis subject   YES/NO

Duration

Four years.

5.5.2. Development

Course Work

1. The students have to take courses during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units.

2. Extension: not available.

3. Credit system: 1 EST CP = 1.5 ECTS CP.

4. Monitoring of the doctoral student. In case of failure the student must retake the exam.

Contribution to Teaching

Supervision of undergraduate laboratory work.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

Courseware?

Yes.

5.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. <u>Language</u> normally used: English. In some special occasions in Estonian or Russian.

2. There <u>are</u> credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report or a collection of individual or co-authored scientific papers with an introduction.

Oral Presentation of Thesis Work

1. <u>Language</u> normally used: English. Alternative language: Russian and Estonian (10%).

2. Oral presentation with oral examination for an open/public audience.

3. <u>Duration</u>: typical duration of 3 hours including examination with no upper time limit.

5.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: five internal examiners and two to three external examiners (8 members).

2. <u>Selection</u> by the supervisor and approved by the scientific committee of the institution.

Evaluation

1. <u>Result</u> based on the reading of the thesis, the oral presentation and the examination of the thesis work, with no grading system.

2. <u>If the student fails</u>, he/she may not resubmit for doctorate. The students may resubmit a revised thesis with no time limit, or he/she may do further work as specified by the examination board.

5.6. Questionnaires

Estonia

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1   Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.

YES (supervisor)

3.1.2   **How many members are in the Scientific Board?**

3.1.3   How are the members of the Scientific Board chosen?

3.1.3.1   Elected by the Faculty, Department?

NO

3.1.3.2   Chosen by the student?

YES

3.1.3.3   Chosen in another way? Please specify:

3.1.4   Which are the main tasks of the Scientific Board/ Supervisor?

3.1.4.1   General management of the doctoral studies.

YES

3.1.4.2   Deciding the layout of the course, advising the students on their coursework.

YES

3.1.4.4   Assigning the thesis subject.

YES/NO

3.1.4.5   Other. Please specify:

3.1.5   Does the student need a personal supervisor during her/his studies?

YES

3.1.5.1   Does the same person supervise her/his thesis work?

YES

3.1.6   Must the subject of the doctoral thesis be an active research area in the department?

NO

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

YES

3.1.7.2 After a specified period of coursework?

YES

3.1.7.3 Other. Please specify:

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

YES

3.1.8.2 Any researcher in the department?

YES

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

NO

3.1.8.3 Any researcher in another institution?

YES

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

YES

3.1.8.4 Other methods. Please specify:

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

YES

3.1.9.2 Other methods. Please specify:

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

YES

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?	Year 1	**Year 2**	**Year 3**	Year 4
	hrs	**hrs**	**Hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2 **In which form is this coursework offered?**

    - As specialist graduate course units.   YES

    - As course units taken from the undergraduate programme.   NO

    - Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?   YES
If not, please give details:

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?   YES

3.2.3.2 Is it the ECTS system?   NO

If not, what is the relationship with ECTS?   1 EST CP = 1.5 ECTS CP

3.2.3.3 How many credits are allocated to coursework?   40 EST CP **credits**

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?   YES

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

    - Retake the exam.   YES

    - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1 In the department.   YES

3.3.2 At national conferences.   YES

3.3.3 At international conferences.   YES

3.4- CONTRIBUTION TO TEACHING:

3.4.1 Supervision of undergraduate laboratory.   YES

3.4.2 Teaching undergraduate courses.   YES/NO

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	English
4.1.2	Are alternative languages used for the thesis? Please Specify: **Estonian, Russian (both less than 10%)**	YES
4.1.3	Which language is normally used for the oral presentation and/or examination?	English
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **10% on Russian or Estonian.**	YES
4.1.5	Are credits allocated to the doctoral thesis?	YES
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	YES
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	YES
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work or an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	5
4.2.2.2	External examiners.	2 or 3
4.2.2.3	TOTAL.	8

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

YES

4.2.3.2   By the scientific committee of the institution.

YES

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.

YES

4.2.4.2   The oral presentation of the thesis work.

YES

4.2.4.3   Both.

YES

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?

3 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

NO

4.2.5   Is the oral part of the examination taken behind closed doors?

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

NO

4.2.6.2   May resubmit revised thesis.

YES

4.2.6.3   May do further work as specified by examination board.

YES

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:

NO

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?

NO

EIE-Surveyor

6. ES: España (Spain)

Coordinating author: José V. BENLLOCH-DUALDE (EAEEIE, Universidad Politécnica de Valencia, jbenlloc@disca.upv.es)

Other contributors: Angel GARCÍA (EAEEIE, Universidad de Málaga, angelg@ic.uma.es)

Review: Juan Carlos Burguillo (EAEEIE, Universidad de Vigo, Spain)

6.1. General information

The access to University is dependent on the passing of an examination called "*Selectividad*", which takes place right after the completion of the "*Bachiller*" (at the age of 18). A general view of the Spanish higher educational system is depicted in A general view of the Spanish higher educational system is depicted in figure 6.1. As of 2008, most of the degrees still follow the general schema represented in the upper part of the figure. However, some Universities have started to implement the new Bologna schema, depicted in blue. In particular, the 240 credit Bachelor degrees and the 60-120 credit Master degrees, following the *Real Decreto 1393/2007 of 29th October* that regulates the organization of the official Higher Education degrees.
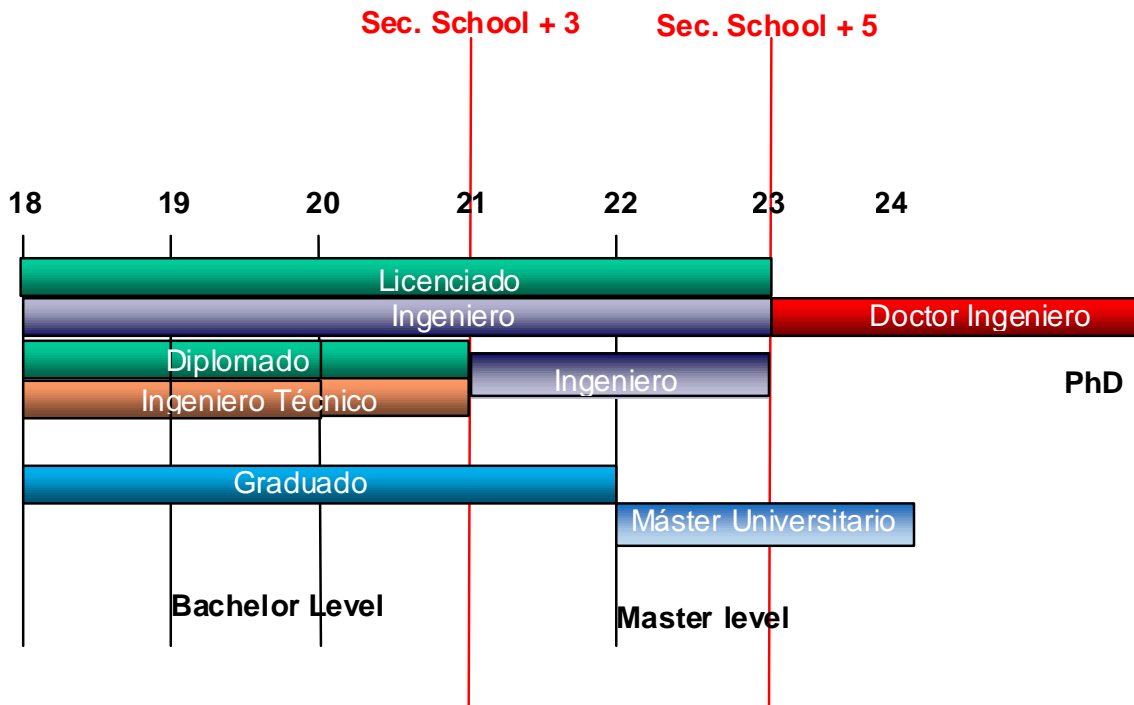

Figure 6.1: Spanish Higher Education System in EIE disciplines.

6.1.1 *Electrical and Information Engineering in Spain, boundaries of the field of study*

Basically, EIE consists of three major areas:

1. *Telecommunication engineering*: devoted to information and communications technologies;
2. *Informatics*, which can correspond to computer engineering in Anglo-Saxon countries;
3. *Electro-mechanics* and *Automation*: the part of electromagnetism concerned with the generation and distribution of power as well as systems control.

The obtainable diplomas are issued in accordance with the division above, although the so-called "boundaries" are occasionally fuzzy (see 7.3).

6.1.2 *Content, degrees and accreditations*

The content of the degrees must be compliant with:

a. *Directrices generales comunes*, or general common guidelines, which define the general structure of the studies.
b. *Directrices generales propias*: or specific guidelines for a given diploma (more at http://www.mec.es/consejou/titulos/boestitu.html).

The guidelines above establish the minimum requirements necessary in order to obtain a particular diploma. These directions are set by an expert's commission; this commission consists of members of the academic community appointed by the *Consejo de Coordinación Universitaria* (University Council).

The *Consejo de Coordinación Universitaria* is a board under the *Ministerio de Educación, Cultura y Deporte* for the improvement of teaching and research, the co-ordination of universities and the planning of higher education. It consists of a president (the minister of the government responsible for university education), the *Consejeros de Educación* (education ministers) of the *Comunidades Autónomas* (the 17 autonomous regions of Spain), the rectors of all the public universities of the country and fifteen people of acknowledged qualification, ten of which are elected by the national parliament and five by the government.

In addition to the above, the syllabi may optionally comply with the:

c. *Directrices universitarias*, which are guidelines specifically set by each university.

Each university periodically releases the syllabi of its studies; since these are often updated, a web search in the site of each institution is probably the best way to obtain them.

6.1.3 Implementation of the Bologna-BMD system in Spain

At present two systems coexist:

1.A **"5-7"** system: 5 years, divided in two cycles of 3 and 2 years respectively, for getting a master (Ingeniero); afterwards a third cycle of two years and a thesis for the doctorate (Doctor Ingeniero).

2.A **"3-5-7"** system: 3 years for becoming a bachelor (Ingeniero Técnico), then joining the second and third cycles above for getting the master (Ingeniero) and the doctorate (Doctor Ingeniero).

3.A **"4-5/6- "** system: 4 years for becoming a Bachelor (Graduado), then joining the second and third cycles above for getting the Master (Máster Universitario) and the Doctorate (Doctor). This system represents the adopted Bologna model.

The design of the new curricula is quite different from the previous ones. In particular, they must contain more elements than the mere description of the formative contents. This new model conceives the curriculum as a project of implantation of a higher education degree. Thus, in order to obtain the corresponding approval, the curriculum should include:

- Justification
- Objectives
- Students' Admission
- Contents
- Planning
- Resources
- Expected Results
- Quality Assurance System

Universities should propose the assignment of the new degrees to a particular knowledge branch. In our case, EIE degrees will lie in the Engineering and Architecture branch. Moreover, some basic subjects have been defined for each of the each knowledge branches. In our case, these subjects are: Business, Graphic Expression, Physics, Computing, Mathematics and Chemistry.

There is currently a great controversy over the implementation of the Bologna-BMD model, particularly concerning those degrees that enable to practice regulated professions (Industrial Eng. and Telecommunication Eng.). In these cases, in addition to the definition of the corresponding curriculum, some competences files have to be included.

6.2. Figures on the weight of EIE in Spain.

A few general statistics about education in Spain are presented in order to provide some context to the information on EIE.

The following table summarizes the most relevant figures concerning EIE education in the academic year 2005-2006;

Academic year 2005-2006	No. of registered students			No. of graduated students		
	Total	% Male	% Female	Total	% Male	% Female
INGENIERÍAS TÉCNICAS **(Bachelor level)**						
Ingeniería Técnica Industrial (EIE) (Industrial Engineering)	29.674	85,6	14,4	3.734	76,2	23,8
Ingeniería Técnica Informática (Computer Engineering)	61.208	81,5	18,5	5.704	75	25
Ingeniería Técnica de Telecomunicación (Telecommunications Engineering)	19.046	77,5	22,5	2.072	70,8	29,2
INGENIERÍAS (Master level)						
Ingeniería Industrial (EIE) (Industrial Engineering)	21.273	80,4	19,6	2.903	76,1	23,9
Ingeniería Informática (Computer Engineering)	30.033	82,5	17,5	3.059	75,5	24,5
Ingeniería de Telecomunicación (Telecommunications Engineering)	19.139	73,2	26,8	1.824	68,9	31,1

(Source: *'Ministerio de Ciencia e Innovación. Estadística Universitaria. Resultados detallados. Curso 2005-2006'*
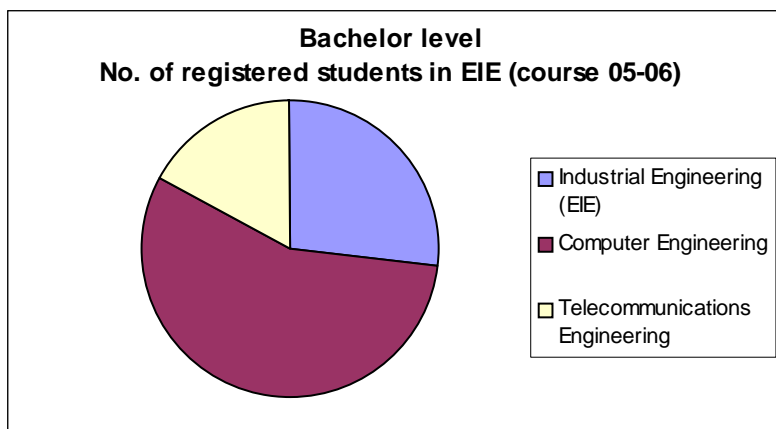

Figure 6.2a: Distribution of students enrolled in EIE Bachelor according to their character.
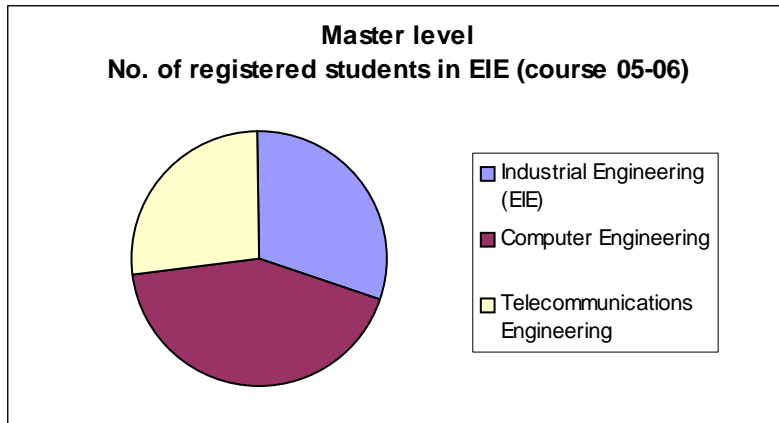
Figure 6.2b: Distribution of students enrolled in EIE Master studies according to their character.
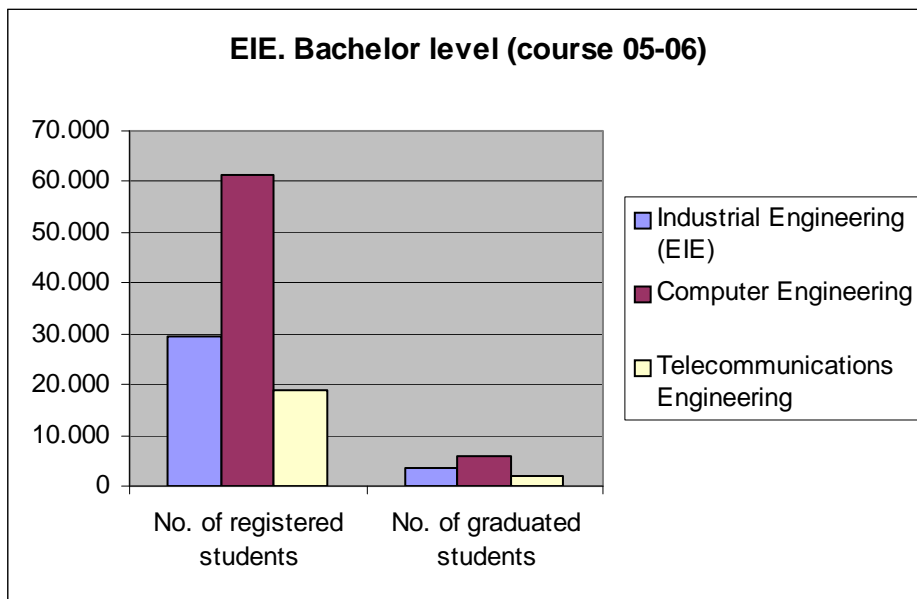

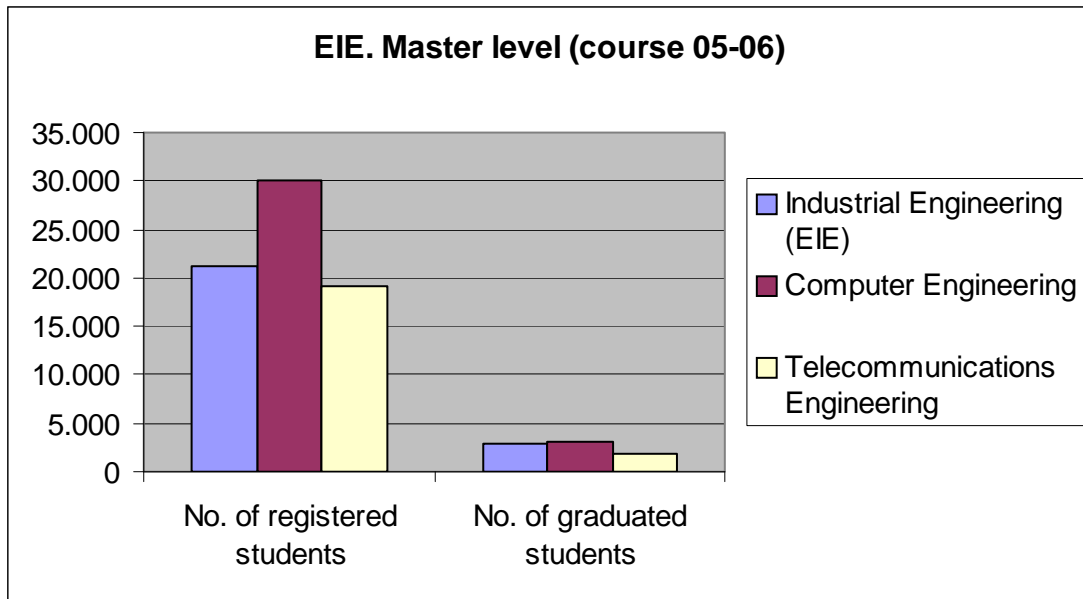*Figure 6.3: Detail of the figures concerning EIE Bachelor students.*

Figure 6.4: Detail of number of students pursuing an EIE Master.

6.3. Degrees in EIE in Spain

The degrees related to EIE are listed below, more or less in correspondence with section 7.1.1, as well as the level achieved. The links below define their core contents (main subjects), as provided in a wide but *mandatory* sense by the Ministry. Along with them, *obligatory* as well as *optional* subjects, both ruled by each Centre, complete the degree syllabus. These latter subjects (obligatory and optional) must comply with each particular University's regulations, as already mentioned in epigraph 7.1.2.c, and, due to the large amount of institutions, they are not linked in this document.

The doctoral study (*Doctores Ingenieros* or PhD) is only possible after the master degree.

6.3.1 Before bachelor (Formación Profesional or technician level)

There are two levels for a technician degree. The lower, or *Formación Profesional Específica de Grado Medio*, runs parallel to the *Bachillerato* (high school), while the upper, or *Formación Profesional Específica de Grado Superior* can only be obtained afterwards. We will only refer here to the latter.

The duration of these studies is 2000 hours, and the specialities related to EIE are:

T1. Development of electronic products (*Desarrollo de Productos Electrónicos*)

T2. Electrotechnical installations (*Instalaciones Electrotécnicas*)

T3. Regulation and automatic control systems (*Sistemas de Regulación y Control Automáticos*)

T4. Telecommunications and informatic systems (*Sistemas de Telecomunicación e Informáticos*)

T5. Informatic applications development (*Desarrollo de Aplicaciones Informáticas*)

T6. Informatic systems management (*Administración de Sistemas Informáticos*)

More information can be obtained from the web of the Ministry.

6.3.2 Bachelor level (Ingeniero Técnico)

B1. Ingeniero Técnico de Telecomunicación. There are four different specialities:

• Telecommunications systems *(Sistemas de Telecomunicación)*

• Electronic systems *(Sistemas Electrónicos)*

• Sound and Image *(Sonido e Imagen)*

• Telematics *(Telemática)*

B2. Ingeniero Técnico en Informática de Gestión

B3. Ingeniero Técnico en Informática de Sistemas

B4. Ingeniero Técnico Industrial, with only two specialities related to EIE:

• *Electricidad*

• *Electrónica Industrial*

B5. Diplomado en Radioelectrónica Naval

6.3.3 Master level

6.3.3.1 *Ab initio* master

M1. Ingeniero de Telecomunicación

M2. Ingeniero en Informática

M3. Ingeniero Industrial (some specialities only)

6.3.3.2 Master level (Bachelor level + 2nd cycle)

These diplomas may only be awarded after a bachelor degree, enrolling for a second cycle of two years.

M4. Ingeniero en Automática y Electrónica Industrial

M5. Ingeniero en Electrónica

M6. Licenciado en Radioelectrónica Naval

6.4. References

The information given in this monograph is based on the following documents and web links:

• La integración del sistema universitario español en el Espacio Europeo de Enseñanza Superior. Documento-Marco. Ministerio de Educación, Cultura y Deporte. Febrero, 2003.

• El grado en el Espacio Europeo de Educación Superior (EEES). Grupo de trabajo de la Conferencia de Rectores de las Universidades Españolas (CRUE) sobre Espacio Europeo de Educación Superior. 16 de marzo de 2003.

• Ministerio de Educación y Ciencia. Real Decreto 1393/2007, de 29 de octubre. BOE núm 260.

• Ministerio de Ciencia e Innovación. Estadística Universitaria. Resultados detallados. Curso 2005-2006:

http://www.micinn.es/univ/jsp/plantilla.jsp?id=E125&area=ccuniv&contenido=/ccuniv/html/estadistica/curso2005-2006/Resultados_detallados/index.html

• Datos y Cifras del Sistema Universitario Español. Curso 05-06

• Web of the Ministry for Science and Innovation at:

http://www.micinn.es

Doctoral

Studies

6.5. Doctoral Studies in Spain

6.5.1. Supervision

Scientific Board or Supervisor

The <u>Scientific board</u> is composed by three members elected by the Faculty or the Department. The student, <u>in most cases,</u> has the same personal supervisor during its thesis work on an <u>active</u> research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Any professor or lecturer in the department with PhD.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

Duration

Three to four years.

6.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as special doctoral courses.

2. Extension: 200 hours of theory, 20 hours per course unit, depending on the course CP.

3. Credit system: no ECTS system. Twenty credits allocated to course work (2 per unit).

4. No monitoring of the doctoral student. In case of failure the student must retake the exam or take a different course unit.

Contribution to Teaching

Supervision of undergraduate laboratory work

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences and journals.

6.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.	Language: Spanish. Use of alternative language only in case of European PhD thesis.

2.	No credits allocated to the doctoral thesis.

3.	The doctoral thesis is a previously unpublished substantial written report

Oral Presentation of Thesis Work

1.	Language normally used: Spanish. No alternative languages.

2.	Oral presentation with oral examination for an open/public audience.

3.	Duration: typical duration of 1 hour including examination with an upper time limit of 1,5 hours.

6.5.4. Examination

Thesis Examination Board

1.	Composition: two internal examiners and one external examiner (three members).

2.	Selection by the supervisor.

Evaluation

1.	Result based on the reading of the thesis and the oral presentation of the thesis work, with a grading system not specified.

2.	If the student fails, he/she may resubmit a revised thesis or do further work as specified by the examination board.

6.6. Questionnaires

Spain

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/**supervisor**? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	3
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y
3.1.3.2	Chosen by the student?	Y/N
3.1.3.3	Chosen in another way? Please specify:	Y/N
3.1.4	Which are the main tasks of the Scientific Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
	Supervision of the research work.	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

Y

3.1.7.2 After a specified period of coursework?

Y/N

3.1.7.3 Other. Please specify:

Y/N

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

Yes

3.1.8.2 Any researcher in the department?

Y/N

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3 Any researcher in another institution?

Y/N

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4 Other methods. Please specify:

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

3.1.9.2 Other methods. Please specify:

Y/N

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y/N

3.2.2 **Extension and assessment.**

According to course CP, f doctoral studies 3 years or 4 years for part-time (working) students.

3.2.2.1	What is the number of contact hours spent in coursework in each year?	Year 1	**Year 2**	Year 3	Year 4
		hrs	**hrs**	**hrs**	**hrs**

200 hours, in theory. 20 hours per course. PhD work between 3 and 4 years.

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.   Y

Special doctoral courses.

3.2.2.3   Is the coursework assessed by examinations? If not, please give details: Y

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?   Y

3.2.3.2   Is it the ECTS system?   N

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?

credits

20 Credits in total – 2 credits/course. 12 crds. research work, different from PhD.

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   Y

Not the courses. The supervision involves the 12 credits in research work and the PhD research only.

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

Either is possible.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

3.3.2   At national conferences.

3.3.3   At international conferences.

National and international magazines and conferences.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

YES

3.4.2   Teaching undergraduate courses.

NO

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1   Which language is normally used for the thesis?

Spanish

4.1.2   Are alternative languages used for the thesis?
Please Specify:
Only in case of European PhD Thesis.

4.1.3   Which language is normally used for the oral presentation and/or examination?

Spanish

4.1.4   Are alternative languages used in the oral presentation and examination?
Please Specify:

No

4.1.5   Are credits allocated to the doctoral thesis?

No

4.1.6   **The doctoral thesis is:**

4.1.6.1   **A previously unpublished substantial written report**.

4.1.6.2   A collection of individual or co-authored scientific papers with an introduction and/or commentary.

4.1.6.3   Other. Please specify:

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1   Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?

YES

4.2.2   Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1   Internal examiners.

2

4.2.2.2   External examiners.

3

4.2.2.3   TOTAL.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   Yes

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   Y

4.2.4.2   The oral presentation of the thesis work.   Y

4.2.4.3   **<u>Both.</u>**

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   1 hour

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

               1.5 hours.

4.2.5   Is the oral part of the examination taken behind closed doors?   Open

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   Y/N

4.2.6.2   May resubmit revised thesis.   Y

4.2.6.3   May do further work as specified by examination board.   Y

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify: Y/N

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   Y

7. FI: Suomi/Finland

Coordinating author: Antti LUUKKO (EAEEIE, Lappeenrannan teknillinen yliopisto, Antti.Luukko@lut.fi)

Other contributions: Pentti LAPPALAINEN (EAEEIE, Oulun Yliopisto, pl1@ees2.oulu.fi)

Review: Gert JERVAN (Tallinn University of Technology)

7.1. General information

Finland has nine years of compulsory schooling. Comprehensive schools are primarily run by local authorities, with the exception of a few private schools. The government contributes to the financing of all of the schools. After compulsory schooling, young Finns can choose between general and vocational upper secondary education. Half of them opt for the upper secondary school (*lukio*). The upper secondary school ends in a national matriculation examination. The matriculation certificate provides eligibility for university education.
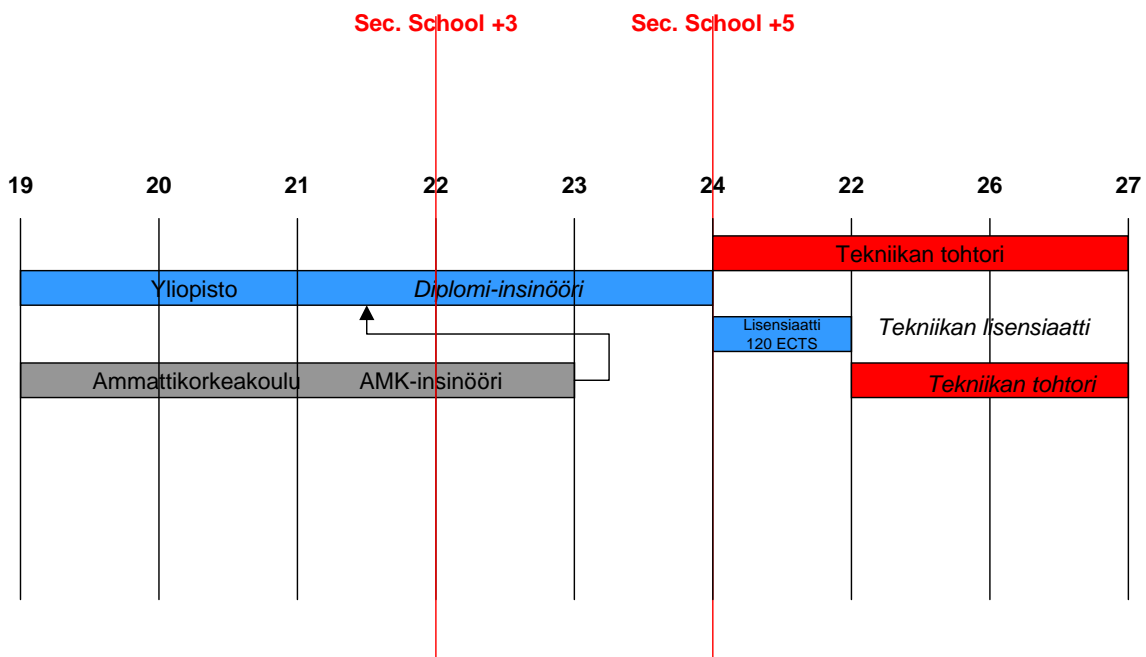

Figure 7.1: Finnish Higher Education System in EIE disciplines.

In upper secondary vocational education the study programmes (*ammattikoulu*) take from two to three years to complete. All three year study programmes provide eligibility for institutions of higher education. Students who have passed the matriculation examination or have a basic vocational qualification are eligible for admission. The system is currently being reformed: eventually, all higher vocational education will be provided at polytechnics (*ammattikorkeakoulu*, AMK, in Swedish *yrkeshögskola*, YH).

	Common Education System		Middle Level Education System	Higher Education System in EIE Disciplines			
					Bachelor	Master	Doctor
Age	7	13	16	19	23	24	
	6 years of Peruskoulu lower level common to all children	3 years of Peruskoulu upper level common to all children	**Ammattikoulu (practical, qualify for AMK)**	**4 years of Ammatti-korkeakoulu (AMK, Fachhochschule)**			
			3 years of Lukio universally oriented (theoretical,qualify for universities and AMK)	**Route to university pro-grams (33% compensa-tion from AMK degree**			
			3 years of Erityis-lukio with emphasis on some topics e.g. • music • athletics • technology **(qualify for universi-ties and AMK)**	**5 years of Yliopisto (University)**		**Doctoral studies**	

Figure 7.2: Finnish Education System.

The Finnish higher education system comprises two parallel sectors: universities and polytechnics.

There are altogether 20 universities in Finland: ten multifaculty universities, three universities of technology, three schools of economics and business administration, and four art academies. Geographically, the network covers the whole country.

The basic mission of universities is to carry out research and provide education based on it. The underlying principle in university education is the freedom of research and university autonomy, which gives them extensive latitude for independent decisions. All Finnish universities are state -run, with the government providing some 70 % of their funding. Each university and the Ministry of Education conclude a three-year agreement on target outcome to determine the operational principles.

Universities select their own students, and the competition for openings is stiff. All fields apply "*numerus clausus*", in which entrance examinations are a key element. Universities offer openings for about one third of the age group. The annual number of new students is 23,000. The aim is to offer a place in universities and polytechnics to 60-65% of the age group, which will be achieved soon.

In the semesters 2001/2002 there were 162,785 university students in Finland, of whom 21,008 were postgraduate students. The share of engineering students was 21 %.

In March 1998, the Government adopted a programme to increase education relating to the information industry between 1998 and 2002. The programme has strongly increased student enrolment in electrical and information engineering curricula. Around 50 % of new university students in engineering will be in the EIE sector.

All universities engage in both education and research and have the right to award doctorates. Master´s degree can generally be attained in five years of full-time study.

The polytechnics were established during the reform process of the 1990s, and now a network of 29 polytechnics covers the entire country. Most of these AMK institutions are multisector establishments. Former Technical institutes set up the basis for the Engineering Departments at the polytechnics. The number of students in the polytechnics in 2002 was 126,206. The share of engineering students was 33 % (42,088).

7.1.1 Electrical and Information Engineering in Finland, boundaries of the field of study

Electrical and Information Engineering has traditionally included all disciplines at Departments of Electrical Engineering (*Sähkötekniikka*). It means Power Engineering, Electronics, Automation and Systems Control, and Communications Engineering. In 1980's new Departments of Information Technology (*Tietotekniikka*) were launched. They mostly concentrate on Computer Science and Engineering, Communications Engineering and Software Engineering.

7.1.2 Content, degrees and accreditations

The extent of the degree programmes taken by the students is given in credit units (*opintoviikko*). One credit unit refers to an input of approximately 40 hours of work, which consists of lecture hours, exercises and other forms of instruction as well as independent work. The extent of a *diplomi-insinööri* degree is 180 credit units including M.Sc. thesis (20 credits). One credit unit equals 1,5 ECTS.

Each University has full autonomy to decide on the contents of each degree. The contents in EIE degrees have many options at each University. Study programmes consist of basic studies, general subject-related studies, advanced professional studies, personal studies and a Master's thesis.

Basic studies in engineering include mathematics, basic sciences and computer technology. After two years the studies become more subject-related. Students can choose specific study options within the degree programme. A Master's thesis is written during the final year of the studies.

Details of the contents of the study programmes are available on the websites of the Universities (see the list of References).

7.1.3 Implementation of the Bologna-BMD system in Finland

The new structure of degrees will be implemented by 1.8.2005.

Technical Universities and Engineering Faculties have appointed a working group to prepare the modifications needed for new degrees. There is some controversy regarding introducing the three year degree. However, the working group proposes a new degree of *Tekniikan kandidaatti* (Bachelor of Science in Technology) of 3 years duration. It is not considered a professional degree because of doubts to get professional recognition in industry. No changes are proposed for the content and time frame of the degree of *Diplomi-insinööri* (MSc in Engineering). Anyway the transfer from Finnish credits "*opintoviikko*" to ECTS will be implemented. The working group makes no recommendations on doctoral degrees.

In Polytechnics the only degree is the 4-year degree of *insinööri (AMK)*. The opinion of the Ministry of Education is that at present there exists no urgent need for the change to the Bologna-BMD system. The industries are satisfied with the 4-year degree as well.

7.2. Figures on the weight of EIE in Finland

In 2001/2002 there were 162,785 university students in Finland, of whom 21,008 were postgraduate students. The number of students in engineering was 34,190 (21 %).

The annual number of new students is 23,000. The aim is to offer a place in universities and polytechnics to 60-65% of the age group, which will be achieved soon.
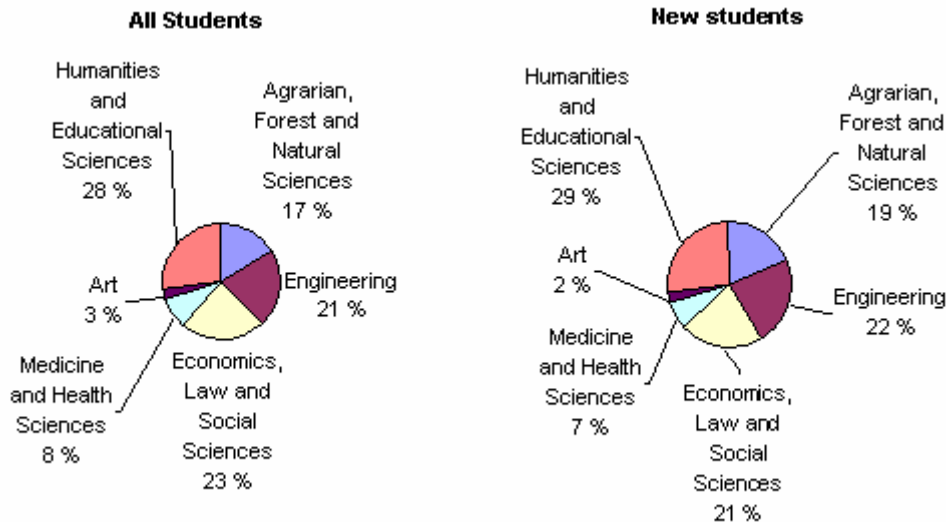
Figure 7.2: University students in 2001/2002.

7.3. Degrees in EIE in Finland

All Technical Universities and Faculties of Technology offer Master's programmes in EIE of five years duration. The title of the degree is ***diplomi-insinööri (diplomingenjör)**.*

There is also an optional pre-doctoral postgraduate degree of **tekniikan lisensiaatti (*teknologie licentiat*)**, which can be completed in two years of full-time study after the Master's degree. Full-time studies for a doctorate (***tekniikan tohtori, teknologie doktor***) take approximately four years following the Master's degree.

Polytechnic degrees are Bachelor-level higher education degrees with a professional emphasis and take 4 years to complete. The title of the degree is ***insinööri (AMK)*** or ***ingenjör (YH)*** in Swedish language *yrkeshögskola* institutions.

At present no higher-education degrees before the Bachelor-level exist.

7.4 References

The information given in this monograph is based on the following documents and web links:

http://www.minedu.fi/minedu/education/

http://www.hut.fi/English

http://www.lut.fi/english/

http://www.tut.fi/public

http://www.ttk.oulu.fi/English/

http://www.abo.fi/aa/engelska/

Doctoral
Studies

7.5. Doctoral Studies in Finland

7.5.1. Supervision

Scientific Board or Supervisor

Scientific board or Supervisor depending on the convention of the organisation. The Scientific board has two to three members. The student has the same personal supervisor during its thesis work on an active research area of the department. In the latter there are no strict limitations.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, or after a specified period of coursework. The thesis subject is assigned by agreement between the student and the supervisor or by a resolution of the scientific board taking into account the preferences of the student.

Who can be a Supervisor

The supervisor is normally a professor or docent with an official position at the University. There might be other tutors to help the official supervisor.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

Duration

Four years.

7.5.2. Development

Courseware?

Yes.

Course Work

1.   The students have to take course work during their doctoral degree preparation and is offered as specialist graduate course units, book studies and seminars. The course work in <u>some cases</u> can be assessed by examinations and/or by projects. If the student fails in the course work, he/she can retake the exam, or develop non-course-work activities.

2.   Extension: not available.

3.   Credit system: ECTS. 70 credits are allocated to the course work: 40-45 ECTS in the major subject and 25-30 ECTS in supportive studies.

4.   Monitoring of the doctoral student.

Contribution to Teaching

1.   Supervision of undergraduate laboratory work.

2.   Tutoring of undergraduate groups.

3.   Marking of undergraduate assessments/homework.

4.   All normal teaching activities, totalling 2-4 hours per week.

Presentation of Work

1.   In the department.

2.   At national conferences.

3.   At international conferences.

7.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. <u>Languages</u> normally used: English. Although permitted, alternative languages are rarely used: Finnish (5%).

2. There <u>are</u> credits allocated to the doctoral thesis.

3. The doctoral thesis can be a previously unpublished substantial written report (monograph), or a collection of individual or co-authored scientific papers with an introduction and/or commentary .

Oral Presentation of Thesis Work

1. <u>Languages</u> normally used: English. Although permitted, alternative languages are rarely used: Finnish (20%).

2. Oral presentation with oral examination for an open/public audience.

3. <u>Duration</u>: typical duration of 3 hours including examination with an upper time limit of six hours.

7.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: one to three internal examiners and at least two external examiners.

2. <u>Selection</u> by the supervisor or the scientific committee of the institution.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with a grading system (Failed, passed, passed with honours).

2. <u>If the student fails</u>, he/she may resubmit a revised thesis<u>.</u> The student may not resubmit for doctorate.

7.6. Questionnaires

Finland

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	<u>YES</u>/NO
3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES and NO [1]
3.1.2	How many members are in the Scientific Board?	2-3

[1] It depends on the convention of the organisation. Post graduate could have a steering group of 2-3 members.

3.1.3	How are the members of the Scientific Board chosen?
3.1.3.1	Elected by the Faculty, Department?
3.1.3.2	Chosen by the student?
3.1.3.3	Chosen in another way? Please specify:

3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	YES
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	

3.1.5	Does the student need a personal supervisor during her/his studies?	YES [2]
3.1.5.1	Does the same person supervise her/his thesis work?	YES

[2] Supervisor is a professor in department where doctoral student is aiming to do his thesis.

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.6 Must the subject of the doctoral thesis be an active research area in the department?

YES [3]

[3] Supervisor is professor leading research in some area. Doctor students are coming to do research on area of his supervising professor. Of course there are no strict limitations.

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

YES

3.1.7.2 After a specified period of coursework?

YES [4]

3.1.7.3 Other. Please specify:

[4] Sometimes after 1 or 2 years of research dealing with thesis it might be necessary to trim the subject of thesis..

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

NO [5]

3.1.8.2 Any researcher in the department?

NO

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

NO

3.1.8.3 Any researcher in another institution?

NO

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

NO

3.1.8.4 Other methods. Please specify:

[5] The official supervisor, who is responsible for the guidance of the doctoral student, must have an official position at the university. The supervisor is normally a professor or docent. There could be other tutors to help the official supervisor in guiding the doctoral student.

3.1 - SUPERVISION OF DOCTORAL STUDIES

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

YES [6]

3.1.9.2 Other methods. Please specify:

YES [6]

A resolution of the Scientific Board, taking into account the preferences of the student.

[6] The scientific board of the faculty gives the permit to publish the thesis. At this phase the final name of the thesis is given if it is not clear already. The scientific board also nominates two reviewers for the thesis from other organisations. Reviewers give their statement about the scientific quality of thesis and propose the permit for publication or not. After the permit for publication there is a public defence of the thesis. The doctor candidate defends his thesis against the opponent. The opponent is also nominated by the scientific board and he has to be from other organisation. After the public defence of the thesis the opponent gives his statement about the defence. If it is passed then the scientific board will accept the thesis and give the grade to the candidate about his thesis.

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

YES

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?

Year 2	**Year 2**	**Year 2**	**Year 2**
Year 2	**Year 2**	**Year 2**	**Year 2**

Post graduate scientific studies: 40-45 ECTS in major subject, 25-30 ECTS in supportive studies. These are specialist post graduate courses, book studies and seminars. Assessments are done by exams and/or by projects.

3.2.2.2 In which form is this coursework offered?

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2- COURSE WORK

| 3.2.2.3 | Is the coursework assessed by examinations?
If not, please give details: | YES and NO |

3.2.3   Credit system

3.2.3.1	Is the coursework in your institution described by a credit system?	YES
3.2.3.2	Is it the ECTS system?	YES
	If not, what is the relationship with ECTS?	
3.2.3.3	How many credits are allocated to coursework?	**Total of 70 credits**

3.2.4   Monitoring

3.2.4.1	Do you monitor the performance of the doctoral student taking coursework?	YES
3.2.4.2	What regulations apply in case of failure in one or more course units?	
	- Retake the exam.	YES [7]
	- Take a different course unit.	YES [7]

[7] Normally this isn't a problem.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1	In the department.	YES [8]
3.3.2	At national conferences.	YES [9]
3.3.3	At international conferences.	YES

[8] YES, methods vary; [9] YES, if any. Other: by publishing papers in international scientific magazines, in national papers and research reports at our university.

3.4- CONTRIBUTION TO TEACHING:

| 3.4.1 | Supervision of undergraduate laboratory. | YES |
| 3.4.2 | Teaching undergraduate courses. | YES |

Tutoring undergraduate groups, marking of undergraduate assessments/homework, and all normal teaching activities. Total of 2-4 h per week.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1 Which language is normally used for the thesis?

English[10]

[10] English is the most preferred.

4.1.2 Are alternative languages used for the thesis? Please Specify:

YES

English: 95 %; Finnish: 5 %.

4.1.3 Which language is normally used for the oral presentation and/or examination?

[11]

4.1.4 Are alternative languages used in the oral presentation and examination? Please Specify:

YES

English: 80 %; Finnish: 20 %.

[11] It depends on the opponent. If the opponent is non Finn then the language used is English. Otherwise the used language is Finnish.

4.1.5 Are credits allocated to the doctoral thesis?

YES

4.1.6 **The doctoral thesis is:**

4.1.6.1 A previously unpublished substantial written report.

YES [12]

4.1.6.2 A collection of individual or co-authored scientific papers with an introduction and/or commentary.

YES

[12] Yes, it is a monograph in this case.

4.1.6.3 Other. Please specify:

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1 Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?

YES [13]

[13] Yes, it is a public defence.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.2   Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1   Internal examiners.

1-3 [14]

4.2.2.2   External examiners.

2[15]

4.2.2.3   TOTAL.

[14] 1-3 (supervisor + others). Others: at least one opponent in public defence.

[15] There must be at least two (2) external examiners or reviewers. Opponent or opponents (there might be several) can act also as reviewers.6

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

YES [16]

4.2.3.2   By the scientific committee of the institution.

YES [17]

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

YES

Yes, the candidate can give his suggestion as well.

[16] Yes, he proposes reviewers and opponent(s).

[17] Yes, they nominate reviewers and opponent(s).

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.

YES

4.2.4.2   The oral presentation of the thesis work.

YES

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?

3 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

YES

Six hours.

4.2.5   Is the oral part of the examination taken behind closed doors?

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

YES [18]

4.2.6.2   May resubmit revised thesis.

MAYBE

4.2.6.3   May do further work as specified by examination board.

NO

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:

YES/NO

[18] Reviewers give their statement if the thesis has scientifically good quality to be published or not. In this phase the thesis is revised so that the scientific committee of the institution can give the permit to publish the thesis. That is why it is very rare the candidate failing in public defence.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?

YES [19]

[19] **Failed, passed, passed with honours.**

8. FR: France

Coordinating authors: Michel ROBERT (Université Henri Poincaré, Nancy), Olivier BONNAUD
(Université Rennes 1 & SUPELEC, Rennes),
Other contributors: Jean-Marie KAUFFMANN (Université de Franche-Comté, Belfort), Laurence PICHETTA
(Université des Sciences et des Techniques de Lille, Lille), Abdelaziz BENSRHAIR (INSA Rouen, Rouen), Valérie
LEMARQUAND (ENSIETA, Brest), Daniel PASQUET (ENSEA, Cergy Pontoise), Véronique PERDEREAU
(Université Pierre et Marie Curie, Paris), Hamed YAHOUI (Université Claude Bernard, Lyon), Christophe SIMON
(Université Nancy 2, Nancy), Gilles DESPAUX (Université Montpellier II), Jean-Marc THIRIET (Université Joseph
Fourier Grenoble) and all members of the Club EEA, International Relations WG

Review: Daniel PASQUET (Club EEA, EAEEIE, ENSEA)

8.1. General information
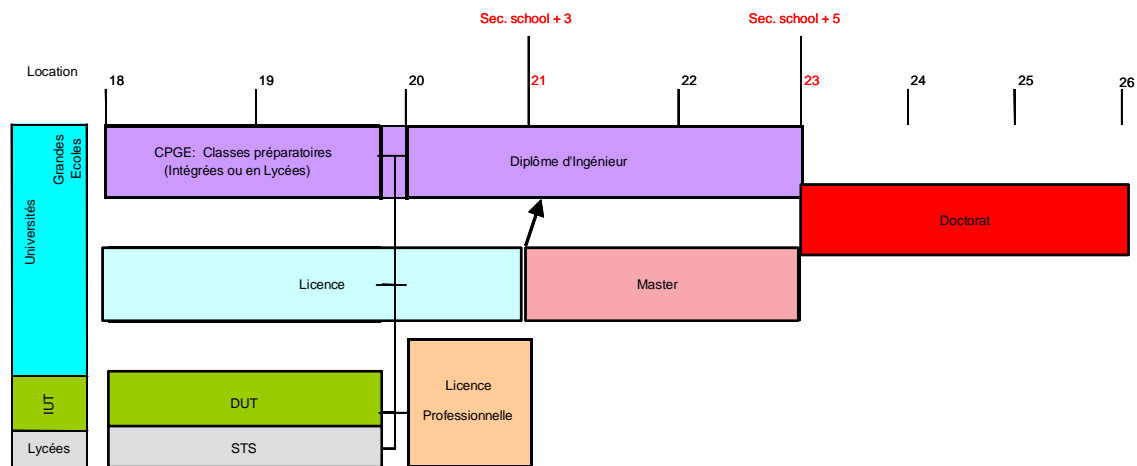
CPGE : Classe Préparatoire aux Grandes Ecoles
DUT : Diplôme Universitaire de Technologie   IUT: Institut Universitaire de Technologie
BTS : Brevet de Technicien Supérieur   STS: Section de Technicien Supérieur
Licence Prof. : Licence Professionnelle

Figure 8.1: French Higher Education System in EIE disciplines in 2008

FR: France	General information [REF 1], [REF 12] ''**France** has taken an important reform decision. A first outcome was the decision in 1999 to make the licence a genuine terminal degree relevant to the labour market, and to launch the "*licence professionnelle*". In April 2002 the government signed several legal texts, pertaining amongst other matters to the introduction of a 3+2 structure in the universities, with a Licence (Bachelor) and a Master, starting with the Academic Year 2002/03. In August 2006, the French Ministry achieved the BMD process, by publishing a new official text on doctoral studies that includes the merging of the two initial profiles of Masters – research Masters and professional Masters. Every university in France is nowadays ruled under the Bologna-process scheme.

Institutional point of view

In France, there are several kinds of academic institutions:

- Universities, which propose:
  - Classical curricula: *Licence* (bachelor), 3 years, followed by *Master*, 2 years. Generally the master is organised in the following way:
    - 1st year of *Master* which is quite general
    - 2nd year of *Master* which could be professional or research-oriented.

    After the master, it is possible to apply for a *Doctorat*, whose the normal duration is 3 years.
  - Professional curricula
    - ♦ Superior Technician level (*Diplôme Universitaire de Technologie - DUT)* prepared in Institut Universitaire de Technologie - IUT,
    - ♦ Industry-oriented bachelors ("*licence professionnelle*"), this is just the 3rd year after the 2 first years of *licence* or *DUT* or a *BTS*.
    - ♦ Graduate schools of engineering [2] which prepare engineering graduation (*Diplôme d'Ingénieur*); the *Master* grade is automatically associated with this degree.
- • Graduate schools of engineering [2]
  - Classical graduate schools of engineering, which offer 3 year courses. The students are selected, on the base of a contest, after a "*classe préparatoire*" curriculum (*Classe Préparatoire aux Grandes Ecoles - CPGE*); the duration of CPGE curriculum is usually 2 years.
  - Integrated graduate schools of engineering, in which most students spend five years in the same school in order to get their engineer qualification.
- Secondary schools

Secondary schools (in French *lycées*) offer two kinds of academic studies:
  - CPGE see above,
  - STS (*Section de Technicien Supérieur*) preparing students towards BTS (*Brevet de Technicien Supé*rieur), Superior Technician level.

These curricula prepared in "*lycées*" are not detailed in this study.

Degree points of view

- The degree mandatory to enter the Higher Education system is "***Baccalauréat***", which is delivered at the end of the secondary school.

  In France, this degree permits to apply to the academic system. Classical universities are open to any student, whereas *IUT*, *STS*, *CPGE* and *Ecoles d'ingénieurs* organise their own selection.

- undergraduate degrees, before Bachelor (sec. sch.+2) [3]

Degree (institution)	Selection to enter	Possibility to pursue studies
Classes préparatoires, not validated by a degree but only through ECTS	Yes	- Ingénieur, - licence 3rd year then master

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[2] graduate schools of engineering belong to different categories : under the aegis of ministry of Higher Education as department of universities or "independent" institutions, under the aegis of other ministries (Industry, Agriculture, Defence, ...) or supported by private consortia or foundations

[3] *BTS* and *DUT* are professional degrees, recognised by industry, but students may pursue studies in licence or licence professionnelle curricula.

		- Licence 3rd year
BTS, DUT	Yes	- Licence professionnelle

- Bachelor level (sec. sch.+3)

Degree (institution)	Selection to enter	Possibility to pursue studies
Licence	No	- master - Ingénieur
Licence professionnelle [4]	Yes	

- Master level (sec. sch.+5)

Degree (institution)	Selection to enter	Possibility to pursue studies
Master	Yes	Doctorat (3 years)
Ingénieur	Yes	Doctorat (3 years)

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[4] After a *licence professionnelle*, the students should get a professional position, it is the purpose of this curriculum. Nevertheless, some students pursue studies either in last year of classical licence or in master.

- Doctorate level (sec. sch.+5)

Degree (institution)	Selection to enter
Doctorat	Yes (by *Ecole Doctorale* – see below)

The doctoral studies are managed by an administrative structure, the doctoral school (*Ecole Doctorale*), called graduate or post-graduate school in some countries. This school based on the researchers of research laboratories is frequently common to several institutions (universities, graduate schools of engineering, etc.), because the attached laboratories are also frequently common. Indeed, depending of the place (very large city or smaller one), of the presence of several institutions able to prepare the PhD students in a geographic area, the structure may concern several laboratories or research departments of several institutions. The aim is to build a relatively light administrative structure able to manage and drive the doctoral studies and to prepare the future doctors the professional life.

- *Habilitation à Diriger les Recherches*

This degree is usually devoted to associate professor or researcher with public or private research organisms. It is mandatory to supervise PhD students and also to apply for "full professor" position. The HDR defense looks like a thesis one, but could be considered as a compilation of research activities in order to show that colleagues are able to manage a research team.

Degree (institution)
Habilitation à Diriger des Recherches - HDR

Electrical and Information Engineering in France, boundaries of the field of study

Historically in France, EIE is split in two disciplinary fields:

- EEA for *Electronique, Electrotechnique et Automatique* Electronics-Electrotechnics (power systems) - Automatic control (EEA) which corresponds to Electrical Engineering and Sciences,
- Informatics which corresponds to Computer Science and Engineering.

We could also notice that Embedded systems is a "new" field at the border between the two fields described above.

Within the *CNRS (Centre National de la Recherche Scientifique* / National Centre for Scientific Research), EIE is gathered with other disciplines in a department called *ST2I*[5] (*Sciences et Technologies de l'Information et de l'Ingénierie* / Information and Engineering Science and Technology).

Content, degrees and accreditations

Depending upon the kind of degrees, the pedagogical contents are:

- determined at a national level (national pedagogical programme) for the *DUT* and BTS for example,

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[5] http://www.cnrs.fr/st2i/

- determined by each university autonomously within a four-year contract with the French Government sometimes in partnership also with representative of the professional unions (*licence professionnelle, master*).

In France, the universities, which are autonomous, have to sign an agreement with the Ministry every four years, taking into account the whole set of curricula proposed within the university.

The graduate schools of engineering (*Grandes Ecoles*) have a specific system, in which they are relatively free concerning the organisation and the contents of the curricula. However, to be recognised as an engineering school, they have to comply with some rules coming from the *Commission des Titres de l'Ingénieur - CTI* (Commission for the engineer titles [6]). This *CTI* checks with periodic intervals whether each school respects the rules.

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[6] http://www.cti-commission.fr/

8.2. Figures on the weight of EIE in France

In this part, some global statistics on numbers of students in curricula in Electrical and Information Engineering are given. In the following part (9.3) of the document, there is a breakdown of these figures into specific degree specialities (see references in 9.4). The figures are issued from synthesis documents published in 1999 or 2000. To get more recent but partial results connect to the website of French Ministry[7]

	Level of the degree	Total number of students	Number of students in the field of EIE	Percentage
Sup. Technician	BTS	94892	12298	12.96 %
	DUT	46701	10768	23.06 %
Licence or Bachelor	Licence professionnelle[8]	New degree in 2001		
"	Licence		3909	
"sec. + 4 y."	Maîtrise		3201	
	Maîtrise-IUP	8761	2534	28.92 %
Master	DEA		2240	
"	DESS	28885	4466	15.46 %
"	Diplôme d'ingénieur		9673	
"	Other master degrees		2187	

Other figures

In 2001, there were:
- 43948 scholars in scientific *classes préparatoires aux grandes écoles (CPGE)*, both in 1st and 2nd year.
- 63446 students in first year of university (*sciences des structures et de la matière* / Structure and material science).

Some general statistics on students [Repères et références statistiques - édition 2001]
These figures are proposed per cycle:
- 1st cycle means 1st and 2nd year after secondary school (1st and 2nd year of bachelor)
- 2nd cycle means 3rd and 4th year after secondary school (3rd year of bachelor and 1st year of master)
- 3rd cycle means 2nd year of master
DUT and engineer schools are considered in these figures.

	1st cycle	2nd cycle	3rd cycle	Total
Materials science and structures (math -physics-chemistry)	63446	27555	12503	103504
Science and technology - science for engineers	14340	62012	16865	93217
Students in *IUT*	118829			118829
TOTAL (all fields)	705644	481089	218660	1405393

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[7] Site of French Ministry: http://www.education.gouv.fr/cid5498/les-etudiants.html

[8] This is a curriculum available since 2001. Most students come from DUT or BTS, some from Licence 1 and 2. Normally, this curriculum leads to industry. In 2001, there were **1100** students in these "*licences professionnelles*" (4400 students for all the "*licences professionnelles*").

CPGE all fields (2 years together)	43948		
			43948

Students in Electrical and Information engineering are made up of the students studying "Material science and structure" and students studying "Science and technology - science for engineers", as well as 23.06 % (see figures above) of students in IUT.

The following table is issued from 2007 data of French Ministry. In this new presentation, there is no longer difference between fundamental science and applications.

	Bachelor	Master	Doctorate	Total
Fundamental sciences and applications	83604	66180	15593	165377
Students in IUT	113769	-	-	113769
TOTAL of students (all fields)	878053	452886	68238	1399177
CPGE in scientific field	47772			47772
TOTAL *CPGE* (all fields)	76160			76160

8.3. Degrees in EIE in France

Before bachelor / Superior technician level (Sec. sch.+2)

Diplôme Universitaire de Technologie (D.U.T.) / Academic degree of technology

Specialities (French)	Specialities (English)	*DUT* (1999)	Number of geographical sites	Keywords (EIE)	Keywords (beh. Skills)	Keywords (others)
Génie Electrique et Informatique Industrielle (GEII)	Electrical Engineering and Industrial Computering	4307	55	Electrical engineering (bet. 22.6 and 26%), industrial computers: Local networks (bet. 22.6 and 26%)	Communication (6%), English (6.2%) project (12%), training period (15.6%)	Maths, physics (11.4%)
Réseaux et Télécommunications	Networks and Telecommunications	811	20	Electronics (10.4%), computers (12.8 %) Signal (1.6%) Telecommunications (9.2%) Networks (12.8%)	Communication (5%), English (5%), economy (2.4%) project (12%), training period (15.6%)	Maths, physics (13.2%)
Services et Réseaux de Communication *	Communications services and Networks	386	20	Networks and communication systems (14.5%) Informatics (10.8%)	Communication (11.1%), Foreign languages (11.1%), Projects (12%) Training period (15.6%)	Communication, new technologies, multimedia (24.7%)
Informatique	Computers	3668	40			
Qualité, logistique industrielle et organisation *	Quality, industrial logistics and organisation		22	Automatic control (4%), Production (30%) Computers (10%)	Communication (7%), English (7%), management (7%) project (10%), training period (18%)	Mechanics (7%)
Mesures physique option techniques	Physical measurement Option "instrument	1596	25	Electronics (8%), Metrology-Quality (3.6%) Automatic control (1%) Power systems (1%)	Communication (4%), English (4.4%), management (7%) project (7.2%), training period (15.6%)	Mechanics, therm., optics, chemistry, maths. (48.2%)

*instrumentales**	technics"					
*Génie mécanique et Productique**	Production and Mechanical engineering			Electronics (4%) Automatic control (4.5%) Computers (2%)	Communication (5.4%), Foreign languages (5.4%), Economy (1.6%), Projects (4.5%) Training period (17.5%)	Mechanics, Production, Maths. (55.1%)
*Génie industriel et Maintenance**	Industrial engineering and maintenance			Electronics, power systems, automatic control, computers (21.3%), maintenance, in EIE (8.6%)	Communication (4.8%), Foreign languages (4.3%), Projects (12%) Training period (15.6%)	Thermics, mechanics, applied mathematics and Maintenance in Mechanics, thermics, ... (33.4%)
TOTAL	**TOTAL (DUT in EIE)**	**10768**				
TOTAL DUT	TOTAL (total number of DUT)	46701				
%	%	23,06				

*: By their characteristics, these degrees are on the border of Electrical and Information Engineering.

Comment: the IUT is administratively dependent on classical universities.

Brevet de Technicien Supérieur (B.T.S.) / Superior technician degree

Specialities (French)	Specialities (English)	BTS (2000)	Number of geographical sites
Electronique	Electronics	1985	135
Electrotechnique	Power systems	3164	186
Domotique	Domotics	239	15
Génie optique option photonique	Optical engineering	133	9
Contrôle industriel et régulation automatique	Industrial control and automation	542	45
Informatique industrielle	Industrial computering	1343	104
Développeurs application	Software development	1745	148
Administrateur de réseaux locaux d'entreprise	Administration of industrial local networks	1368	150
Audiovisuel (image, son, montage, exploitation)	Audiovisual (image, sound, mounting, exploitation)	561	47
Communication visuelle	Visual communication		44
Technico-commercial (génie électrique et mécanique)	Technics and business (electrical and mechanical engineering)	1218	87
TOTAL	**TOTAL (BTS in EIE)**	**12298**	
TOTAL BTS	TOTAL (total number of BTS)	94892	
%	%	12,96	

Comment: the BTS is administratively dependent on high schools ("*lycées*").

Bachelor (sec. sch. +3) level

Licence scientifique / **Scientific bachelor** [9]

Specialities (French)	Specialities (English)	*Licence* (1999)	Number of universities
Electronique Electrotechnique Automatique (EEA)	Electronics- power systems - automatic control	841	17
Informatique, sciences cognitives	Computers, cognition sciences	2153	21
Ingénierie électrique	Electrical engineering	538	16
Physique et applications	Physics and applications	377	15
TOTAL	**TOTAL**	**3909**	

Comment: Most students come from DEUG, some come from DUT. Normally, most students continue in "*maîtrise*" or master.

Licence professionnelle / **Professional bachelor**

Specialities (French)	Specialities (English)	Licence professionnelle: number of universities
Informatique/Sciences et Technologies de l'Information et de la Communication/Télécoms réseaux	Computers/Information and Communication Science and Engineering / Telecommunications and networks	34
Electronique	Electronics	6
Commerce électronique	e-business	5
Automatique et informatique industrielle	Automation and industrial computering	4

This curricula were created in 2001. Most students come from *DUT* or *BTS*, some from *Licence* 2nd year. Normally, this curriculum leads to industry. In 2001, there were **1100** students in these "*licences professionnelles*" (4400 students for all the "*licences professionnelles*").

Master level

The following tables were established on the basis of the data and situation in 2000, including only the second year of the present master and making a difference between the specialities (professional or research oriented).
The more recent data are today only globalized.

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[9] Some universities (Bordeaux, Perpignan…) offered in 2001 Bologna-conformed three-year bachelor degrees. All the French Universities had followed after when renewing the four year contract with Ministry.

Former *Diplôme d'Etudes Approfondies (DEA)/* Degree of Endeepen studies

Specialities (French)	Specialities (English)	DEA	Number of universities
Automatique, informatique industrielle, énergie électrique	Automation, industrial computing, electrical energy	353	12
Electronique, traitement du signal	Electronics, signal processing	781	17
Informatique	Computer	621	16
Télécommunications, réseaux, télédétection	Telecommunication, networks, teledetection	124	5
Systèmes d'information, communication	Information and communication systems	361	10
TOTAL	**TOTAL DEA in EIE)**	**2240**	

Comment: this degree allows the student to follow with a Ph.D.
DEA was a one-year degree.
N.B.: In 2008, all the universities in France propose research-oriented master courses in Electrical and Information Engineering.

Former *Diplôme d'Etudes Supérieures Spécialisées (DESS)/* Degree of superior specialised studies

Specialities (French)	Specialities (English)	DESS	Number of universities
Automatique, électronique de puissance, informatique industrielle	Automation, power systems, industrial computering	521	13
Electronique, traitement du signal	Electronics, signal processing	494	14
Informatique	Computer	1843	21
Mathématiques appliquées, modélisation	Applied mathematics, modelling	504	
Télécommunications, réseaux	Telecommunication, networks	159	5
Systèmes d'information, communication	Information and communication systems	945	15
TOTAL	**TOTAL (DESS in EIE)**	**4466**	
TOTAL	TOTAL (total number of DESS)	28885	
%	%	15,46	

DESS was a one-year degree.
N.B.: In 2008, all the universities in France propose professionally-oriented master courses in Electrical and Information Engineering.

Diplôme d'ingénieur / Engineer degree

	Where the students come from?			
	CPGE[1]	*DEUG* (university), *CPGE, DUT[1]*	*Baccalauréat[2]*	TOTAL

Specialised school or department (in EIE)	3506	1637	2319	7462
Schools or departments with options (in EIE)	1645	36	530	2211
TOTAL	5151	1673	2849	**9673**

Comments:

1: classical graduate schools of engineering, a three-year curriculum after two years of fundamental studies spent in *CPGE* (*Classe préparatoire aux grandes écoles* / prepatory class for engineering schools), or sometimes in classical universities (formerly *DEUG Diplôme d'Etudes Universitaires Général* / General degree of academic studies and now: after the two second years of the bachelor's degree) or *DUT (Diplôme Universitaire de Technologie* / Academic degree of technology).

2: integrated graduate schools of engineering, a five-year integrated curriculum after the *Baccalauréat*.

Other comments: in France, the title of "*ingénieur*" is given by the "*Ecoles d'ingénieurs*". These schools have a specific agreement with the "*Commission des Titres de l'Ingénieur C.T.I.*" / Commission for the title of engineer. Some "*Ecoles d'ingénieurs*" depend on universities, others are independent and are considered as universities (ability to deliver the doctorate degree).

Other degree at the master level

Other degrees exist at the master level, in Electrical and Information Engineering but are marginal.

French name	English translation	Number of degrees given in 1999
Diplôme de Recherche Technologique (DRT)	Degree of technological research	**97**
Magistère	"Magistère"	**154**
Mastère spécialisé	Specialised "master"	**1236**
Other private schools (non -recognised engineers)		**700**

Globalized results in 2007 at master level

This new presentation takes into account the last year of the former second cycle (*maîtrise*) and a compilation of the both former *DESS* and *DEA* that correspond today to the second year of the master. Do not forget that, in parallel, graduate school of engineering deliver the master degree associated to the Engineer diploma.

	Master	Doctorate	Total
Fundamental sciences and applications	66180	15593	165377
TOTAL of students (all fields)	452886	68238	1399177

8.4. References

The information given in this monograph is based on the following documents and web links:

- Repères et références statistiques sur les enseignements, la formation et recherche - édition 2007,
  http://www.education.gouv.fr/pid316/reperes-references-statistiques.html
- Diplômes délivrés dans les spécialités Electrotechnique, Electronique, Automatique; Communication et Informatique, bacc+2 à bacc +5, années de référence 1999 et 2000, CEFI, FIEEC,
- Website of French Ministry:
  http://www.education.gouv.fr/cid5498/les-etudiants.html
- Website of CEFI : http://www.cefi.fr
- Repères et références statistiques - édition 2001

Doctoral

Studies

8.5. Doctoral Studies in France

8.5.1. Supervision

Scientific Board or Supervisor

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor. In some cases it could be an imposed subject. The supervisor must be attached to a research laboratory accredited by the Ministry of Higher Education. The director of the attached laboratory must validate the subject.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor. In some cases it could be an imposed subject.

Who can be a Supervisor

1. Any professor/lecturer in the department, with the "Habilitation à Diriger les Recherches or HdR" degree.

2. Any internal or external researchers but one of the supervisors should be a Full Professor or Associate Professor with HdR degree, or researcher from the CNRS (National Centre for Research) with HdR degree.

3. The supervisors are validated by the doctoral school and recorded in a list of supervisors.

Tasks of Scientific Board/Supervisor

1. General management   YES

2. Deciding/advising layout of course   NO

3. Assigning a thesis subject   NO

Duration

Three to four years. The average duration is about 3.5 years.

8.5.2. **Development**

Courseware?

Yes.

Course Work

1. In almost all the institutions accredited to deliver the doctorate diploma by the Ministry of Higher Education (Universities, Engineer Schools), the students have to take course work during their doctoral degree preparation. The total hours range between 50 hours and 150 hours for the duration of the doctorate; the effective amount is defined by the doctoral school.

2. The course work is not assessed by examinations. There are three types of courses: specialist courses, general education courses (languages, communications, etc...) and professional courses (patents, intellectual property, transfer towards industry, structure of companies, and contacts with industry).

3. Credit system: the course work is not usually described by a credit system. However, some doctoral schools define credits instead of number of hours.

4. Monitoring: no official monitoring of the doctoral student. However, some doctoral schools organize some milestones during the thesis work, for example, an intermediate defense by the student at midway.

Contribution to Teaching

1. This contribution is not mandatory. However, the future doctors who plan to apply to higher education positions must have a teaching experience.

2. For these doctoral students, they may supervise undergraduate laboratory works, depending on the courses. The registration institution of the student must manage this activity.

3. Some student may teach undergraduate course, depending on the courses.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences with published proceedings (this point should be achieved before the defense of the doctorate or PhD).

4. A publication in journal is not mandatory but is strongly requested.

8.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language: French. In some cases it is possible to use alternative languages (international juries, bi-national thesis). In this case, an extended abstract in French is asked and mainly mandatory.

2. No credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report. Some theses are published, but it is actually exceptional in the field of electrical engineering.

Oral Presentation of Thesis Work

1. Language normally used: French. In some cases it is possible to use alternative languages (international juries, bi-national thesis, co-tutorial supervision).

2. Oral presentation for an open audience with oral examination at open doors (unless there is a confidentiality issue of some works, for which a specific authorization is required).

3. Duration: typical duration of 1h45 to 2 hours with no formal upper time limit.

8.5.4. Examination

Thesis Examination Board

1. Composition: two internal examiners, three to four external examiners among whom two "rapporteurs or reviewers" who should comment in detail the content of the thesis. These external reviewers are external to the institution and to the doctoral school. The jury contains a minimum of 3 professors or equivalent function ("Research directors" attached to research organisms).

2. Selection by the supervisor and then assessed by the Scientific Board of the "École Doctorale" (Doctoral school or department for Doctoral Studies).

3. The composition of the jury must be validated by the director of the doctoral school and the president or director of the institution (University, Engineer school, etc.).

Evaluation

1. Result based on the reading of the thesis and the oral presentation of the thesis work, with no grading system for the doctoral degree. There was a grading system in the past but it has been suppressed.

2. If the student fails, he/she *may resubmit a revised thesis (only the manuscript) but* he/she *may not do further work if the authorization of presentation of the thesis has been given by the reviewer or "rapporteur"in the pre-evaluation of the written document* . If the thesis is to be re-submitted there is no time limit specification because this situation is very rare.

8.6. Questionnaires

France

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	30 to 40
	For example 30 to 40 for Automatic Control and Signal Processing in Nancy (common for Université Henri Poincaré Nancy 1 and Institut National Polytechnique de Lorraine).	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	N
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	Y
	Professors, Associate professors with HdR degree, some other co-opted associate professors.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	N
3.1.4.4	Assigning the thesis subject.	N
3.1.4.5	Other. Please specify: suggest publication in journals and conferences	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

Y

3.1.7.2   After a specified period of coursework?

N

3.1.7.3   Other. Please specify:

Y/N

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

Y

3.1.8.2   Any researcher in the department?

Y

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

Y/N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4   Other methods. Please specify:

Y

One of the supervisors should be a Full Professor or Associate Professor with HdR degree (Habilitation), or a Researcher with HdR degree from Research organisms such as CNRS (National Centre for Research). INSERM (Medical and Health research organism), INRIA (Computer science research organism)

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

Y

3.1.9.2   Other methods. Please specify:

Y/N

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2   **Extension and assessment.**

3.2.2.1	What is the number of contact hours spent in coursework in each year?	Year 1	Year 2	Year 3	Year 4
		20 to 50 hrs	20 to 50 hrs	10 to 50 hrs	0 hrs

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

         - As specialist graduate course units.

         - As course units taken from the undergraduate programme.

         - Other. Please specify.   Y

         Several specialist graduate courses, general and professional courses (English for Science, intellectual properties, Meetings with industrials).
These courses are usually organized by the doctoral school.

3.2.2.3   Is the coursework assessed by examinations? If not, please give details: N

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?   N

3.2.3.2   Is it the ECTS system?   Y/N

         If not, what is the relationship with ECTS? The eventual credits are not devoted for exchange. There are not ECTS.

3.2.3.3   How many credits are allocated to coursework? There is no rule. However there is a minimum of hours or equivalent credits.   __ **credits**

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   N

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

         - Retake the exam.

         - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.   Y

3.3.2   At national conferences.   Y

3.3.3   At international conferences.   Y[1]

     [1]This point should be achieved before the PhD can be passed.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   Y[2]

3.4.2   Teaching undergraduate courses.   Y[2]

     [2]It depends but generally Y.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	French
4.1.2	Are alternative languages used for the thesis? Please Specify:	Y

It could be in some specific cases (international juries, bi-national theses). In this case, an extended abstract in French is mandatory.

4.1.3	Which language is normally used for the oral presentation and/or examination?	French
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	YES

It could be in some specific cases (international juries, bi-national theses). In this case, an extended abstract in French is mandatory.

4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Y
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary. The thesis may be a synthetic presentation of already published works on the global subject. In this case, the student must give evidence of its personal invest in the results.	N
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	2
4.2.2.2	External examiners.	3-4[*]
4.2.2.3	TOTAL.	6

[*]3 to 4 among whom two reviewers or "rapporteurs" who should comment deeply on the content of the thesis. They write a report that must conclude by the acceptation of the defence.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1	By the supervisor.	Y[3]
4.2.3.2	By the scientific committee of the institution. I fact the doctoral school director must validate the proposed jury that must be in agreement with the ministry rules.	N
4.2.3.3	By the rector or equivalent. The Director or President of the Institution must validate the proposed jury after acceptation of the Director of the doctoral school.	Y
4.2.3.4	By the national ministry.	N
4.2.3.5	Other. Please specify:	

[3](4.2.3.1) Proposition and then assessed by the Scientific Board of the "Ecole Doctorale" (Department for Doctoral Studies).

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1	Reading the thesis.	Y
4.2.4.2	The oral presentation of the thesis work.	Y
4.2.4.3	Both.	
4.2.4.4	What is the typical duration of the oral part of the thesis examination, if applicable?	1h45 to 2 hours
4.2.4.5	Is there an upper limit to the duration of the thesis examination?	N[4]

[4] Not formally, but there is a "tradition".

4.2.5	Is the oral part of the examination taken behind closed doors?	N

Normally not, sometimes YES due to the confidentiality of some works (need specific authorization and correspond to patent in progress with an industrial partner). We call it ''a huis-clos''.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

Y/N

4.2.6.2   May resubmit revised thesis.

Y

4.2.6.3   May do further work as specified by examination board.

N[5]

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?
Please specify:

N[6]

[5] If the authorization of presentation of the thesis has been given by the reviewers ou "rapporteurs" (pre-evaluation, on the written document).
[6] This is very, very rare.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?

N

There was one in the past, but it has now been suppressed.

EIE-Surveyor

9. GR: Ελλάς (Greece)

Authors*:

Georgios TSIRIGOTIS (Technological Educational Institute of Kavala, tsirigo@teikav.edu.gr)

Giorgos PAPADOURAKIS (Technological Educational Institute of Crete,papadour@cs.teiher.gr)

*based on the first version by Gregory Zebekakis (Technological Educational Institute of Peiraias) and dedicated to his memory.

Review: Jean-Marc THIRIET (Université Joseph Fourier,Grenoble, France)

9.1. General information

Higher education system in Greece consists of two types of institutes: Universities which are oriented in theory and TEI which are oriented more in practical skills. National entrance examinations are required for access. Greece's 21 University institutions and its 16 Institutions of Technological Education (TEI) are self-governing and under the supervision of the Ministry of National Education and Religious Affairs which supports them financially and is responsible for educational policy concerning them.
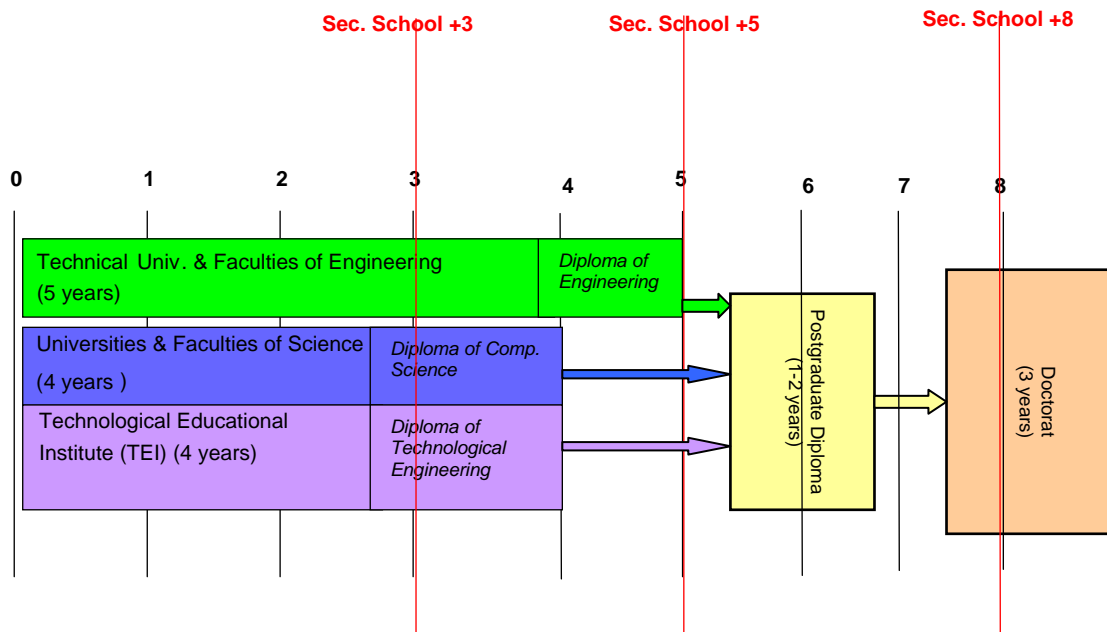

Figure 9.1: Greek Higher Education System in EIE disciplines.

Entrance requirements to the Institutions of Technological Education (TEI) are the same as for universities. Studies in TEI last for eight semesters, including the compulsory professional placement of one semester and the completion of a graduation project, and lead to the Degree of Technological Engineering. Subjects include general compulsory subjects, mandatory elective subjects and optional

subjects. The degree qualifies holders for immediate employment. It also allows them to continue their studies in a related university undergraduate course and, at postgraduate level.

Undergraduate degree programmes at universities normally last for four years (eight semesters) and lead to Degree in the relevant field. In Engineering studies last for ten semesters. The study programme contains compulsory and elective courses. Each semester, students are required to follow a number of compulsory courses consisting of the core programme and a number of elective courses. The total number of courses to be taken is decided by the respective course programme of the department. In some departments, the submission of a dissertation describing the final (graduation) project is required. For example, the 10th semester of all Engineering Departments is devoted to the preparation of a final year project and the submission of a dissertation and lead to Degree of Diploma in Engineering.

The first level of postgraduate studies, of duration of a minimum of two semesters, leads to (Postgraduate Diploma of Specialization Master Level). This study programme may be carried out and completed in a university or research institute outside Greece. The degree, however, is awarded in Greece. Furthermore, the TEI can deliver a masters program in collaboration with a Greek or foreign university. In this case the Master degree is awarded by the collaborating university.

Since 2008-09 academic year, TEI can deliver a master program, in condition to completed the evaluation procedure.

The studies for doctorate diploma, generally starts after obtaining Master degree and the duration is at least 3 years.

9.1.1 *Electrical and Information Engineering in Greece, boundaries of the field of study*

There are three categories of studies dealing with the broad area of Electrical and Information Engineering in Greece.

First are the 5 year universities (Politexneia) that are producing Engineers which in most cases receive their diploma in Electrical and Computer Engineering. In this case the departments start courses with common subjects Electrical and Informatics and in the middle of the studies specializations split in Electrical or Computer Engineering.

The second category is the TEI which are producing Technical Engineers. In this category there are called Electrical, Electronic, Informatics.

The third category is the Universities that are producing scientists in the area of Informatics or Computer Science.

The main orientations of Electrical and Information Engineering specialisations are: Electrical Engineering, Automation Engineering, Telecommunications, Informatics, Computer and Electronics.

9.1.2 *Content, degrees and accreditations*

Subjects taught are within the computer science, electrical and electronics fields. Subjects such as networks and telecommunications, programming languages, computer systems management,

operating systems, peripheral units, systems of development of microcomputers, systems of automatic control and digital systems, Microelectronics and Robotic systems.

Also general subjects are taught like mathematics, physics and others.

The duration of the studies is eight or ten semesters including the compulsory professional placement and the completion of a graduation project.

The Degrees of Electrical Engineers are also accredited by the Technical Chamber of Greece, only for 5 years diploma Engineers offered by universities.

9.1.3 *Implementation of the Bologna-BMD system in Greece*

All the institutes (Universities and TEI) conform in the ECTS (European Credit Transfer System) and can accept students from abroad to carry out subjects within their studies. The implementation of the courses and the operation of the institutes converge to the mean European status. Though the application of the Bologna BMD system in Greece finds some implementation difficulties and will need some time to be completed. There are departments that provide bachelor degree and the duration of studies varies from 4 years to 5 years.

9.2. Figures on the weight of EIE in Greece

Following, there are 2 tables concerning the number of students that study in relevant subjects compared to the total number of students that study in each university and each TEI. These figures where given by the ministry of Education and are updated until the academic year 2005-2006.

University/Department	Number of students in department	Total number of students of Institution	Percentage in total number of students
National and Kapodistrian University of Athens Dept of Informatics & Telecommunications	904	33981	2,7%
National Technical University of Athens Dept of Electrical and Computer Science	2216	9938	22,3%
Aristotle University of Thessaloniki Dept of Electrical and Computer Engineering Dept of Informatics	1538 601	36945	5,8%
Ionian University Dept of Informatics	97	1519	6,4%
University of Crete Dept of Computer Science	535	7615	7%
University of West Macedonia Dept of Computer Engineering and Telecomunicaltion	56	1813	3,1%
University of Patras Dept of Electrical and Computer	1246		

Engineering Dept of Computer Engineering and Informatics	1122	13501	17,5%
University of Ioannina Dept of Informatics	417	9426	4,4%
Democritus University of Thrace Dept of Electrical and Computer Engineering	716	11674	6,1%
Technical University of Crete Dept of Electronic and Computer Engineering	571	1772	32,2%
University of the Aegean Dept of Information & Communication Systems Engineering	352	6029	5,8%
University of Thessaly Dept of Computer & Communication Engineering	501	5337	9,4%
University of Peloponnese Dept of Computer Science and Technology Dept of Telecommunication Science and Technology	188 215	1335	30,2%
University of Central Greece Dept. of Informatics with application to biomedicine	139	203	68,5%
TOTAL	**11414**	**141088***	**8,1%**

*The total number refers to the number of students at all Greek Universities (some are not listed since they don't have related departments)

TEI/Department	Number of students in department	Total number of students of Institution	Percentage in total number of students
Technological Educational Institute of Athens Dept of Electronics Dept of Informatics	723 938	21291	7,8%
Technological Educational Institute of Crete Dept of Electronics Dept of Electrical Engineering Dept of Applied Informatics and Multimedia	836 633 1045	11159	22,5%
Technological Educational Institute of Thessaloniki Dept of Electronics Dept of Informatics Dept of Automation	580 903 571	15801	13%
Technological Educational Institute of Kavala Dept of Electrical Engineering Dept of Industrial Informatics	735 997	7219	24%
Technological Educational Institute of West Macedonia Dept of Electrical Engineering		13458	9%

Dept of Informatics and Computer Technology	1015 193		
Technological Educational Institute of Larissa Dept of Electrical Engineering Dept of Informatics and Telecommunications	682 1092	12767	13,9%
Technological Educational Institute of of Piraeus Dept of Computer Systems Dept of Electrical Engineering Dept of Electronics Dept of Automation	833 930 679 625	8898	34,5%
Technological Educational Institute of Patras Dept of Electrical Engineering	1183	12311	9,6%
Technological Educational Institute of Serres Dept of Informatics and Communication Dept of Geoinformatics and Topography	1052 753	6285	28,7%
Technological Educational Institute of Kalamata Dept of Information Technology and Telecommunications	85	5051	1,7%
Technological Educational Institute of Messolongh Dept of Telecommunication Systems and Networks	277	5557	5%
Technological Educational Institute of Chalkida Dept of Electrical Engineering Dept of Automation	1072 436	5710	26,4%
Technological Educational Institute of Lamia Dept of Electrical Engineering Dept of Electronics Dept of Informatics and Computer Technology	806 680 916	4876	49,3%
TOTAL	**21270**	**130383 ***	**16,3%**

9.3. Degrees in EIE in Greece

9.3.1 Before bachelor (technician level)

The Training College includes the following specialized departments: civil, mechanical, electrical and electronic engineering. Centres of Technical and Vocational Training (KETEK) offer short training courses (six to nine months) in over 20 fields. Specialized training is offered in certain areas. A recent Act of Parliament has established Institutes of Vocational Training (IEK). 14 have been set up in the major cities. They admit school leavers from Gymnasia, Technical-Vocational Schools and Lykeia. Training usually lasts for four semesters. A Certificate of Vocational Training which mentions the duration and specialization of the course is awarded following a final examination.

Technician level in Electronics: Radio and Television installations and maintenance, audio systems installation and repairs, electronic boards repair and installation, electronic appliances, automotive electronics, power electronics.

Technician level in Telecommunications: telephone systems installation and maintenance, radio communications, maritime communications, satellite communications, wireless communications, electronics.

Technician level in Automatic Control: Basic automation systems, industrial automation systems, automotive automation, marine automation systems, microcontrollers, PLCs.

9.3.2 Bachelor level

Bachelor degree programmes are designed to provide students with the knowledge and skills they will need to play a part in the future research, development and application of these technologies. The programmes are taught in Electronic, Electrical and Computer Engineering.

In the first two years students start with general topics in Mathematics and Physics learn about a range of computer programming languages, computer networks, microprocessor-based systems, electronics and systems engineering. The following years give students opportunities to study more deeply the areas that particularly interest them. They undertake a major project and study advanced technical options. Depending on which direction they choose, they can specialize in certain areas such as:

Informatics - Specialize in one of the areas of informatics or computer engineering, depending on the university or TEI taking courses such as computer systems, multimedia, artificial intelligence, pattern recognition, neural networks, human computer interaction, digital signal and speech processing, computer vision, computer security, game theory, advanced multimedia, web programming, medical informatics, FPGA design, VLSI, etc.

Electronics – Produces a multi-skilled with theoretical knowledge and practical experience

Topics: Electronics, Electrical and Electronic Principles, Experienced Methods, Engineering Applications, Systems Design, Microcontroller Systems, Power Electronics.

Telecommunications - course which will enable graduates to enter the telecommunications engineering profession. It is designed to give students a thorough understanding of the theoretical and practical aspects of telecommunications. The course will prepare for the challenge of a continually changing environment of new concepts, systems and telecommunication services.

Topics: Signals & Systems, Telecommunications networks, Analogue & Digital Electronics, Broadband Communications, Transmission Technology, Network Components, Wireless communications, Satellite Communications.

Automatic Control - The courses in Automatic Control have been developed to meet the need for professionals who are able to respond to a rapidly changing technological and commercial environment, as well as the continuing demand from industry for graduates with specialist knowledge of computer based control systems. Such systems are fundamental in our modern day way of life and arise in a variety of domestic, industrial, urban and natural environmental applications. Typical examples may be found in: aerospace, automotive and marine systems, refining, petroleum, chemical, food and pharmaceutical process industries, production lines, advanced automation, assembly and manufacturing industries, and in the optimization, logistics and scheduling of transportation systems.

Topics: Automation systems, Industrial Automation, Vehicle Automation Systems, Marine Automation Systems, Microcontrolers, PLCs, Control Systems Design and Implementation, Digital Control Systems, Industrial Control Networks, Engineering Systems Analysis, Non Linear Control Systems.

Electric Power Production – This study orientation gives to the student the knowledge in techniques of electric power production and distribution. Electrical installation, safety and international standards as well as electric motors are subjects.

Topics: Electric Power Production, Electrical Installations, Transformation, International standards, Installations safety.

9.3.3 *Master level*

There are different Master subjects around the following principal fields:

Master in Informatics: Information Systems, communication systems and technologies, multimedia, artificial intelligence, digital signal processing, data mining, electronic commerce, computer vision.

Master in Electronics: Audio Video Electronics, Power Electronics, Automotive Electronic Systems, Medical Electronic Systems, Microelectronics, Electronic Component Design.

Master in Telecommunications: Communication Networks, Data communications, Digital / Analog Communications, Management of Communication Networks, Telecommunication protocols, Standardisation, Telecommunications National Autorities policies and Strategies.

Master in Automatic Control: Industrial Automation, Aviation Automation, Marine Automation, Systems Design and Manufacturing, Telematics, Telematic Control Systems, Fuzzy Control Systems, Digital Signal Processing

9.3.4 Other levels (Doctor)

The doctoral degree is conferred after the public defence of a thesis. The research must be original and show advances in research and science. A doctoral thesis requires at least three years' study since the student was admitted to doctoral studies. Students can be admitted to a doctoral research programme when they hold an undergraduate degree or Diploma or an equivalent qualification obtained abroad and recognized by DOATAP (organisation for foreign Diploma recognition). In certain university departments, students must also hold a Diploma of Postgraduate Specialization. This is the case when the department offers a postgraduate programme that is relevant to the doctoral research.

9.4. List of degrees

Before bachelor (technician level)

City	Institution	Faculty or Department
Institutes of vocational training		
Thessaloniki	I.E.K of Thessaloniki	**Department:** Computer engineering
Xanthi	I.E.K of Xanthi	**Department:** Computer engineering and Informatics
Karditsa	I.E.K of Karditsa	**Department:** Automation and Informatics
Volos	I.E.K of Volos	**Department:** Computer engineering
Lamia	I.E.K of Lamia	**Department:** Automation and Informatics
Patra	I.E.K of Patra	**Department:** Automation and Computer engineering
Ioannina	I.E.K of Ioannina	**Department:** Informatics
Heraklion	I.E.K of Heraklion(Crete)	**Department:** Informatics and Computer enginnering
Kozani	I.E.K of Kozani	**Department:** Informatics
Veria	I.E.K of Veria	**Department:** Informatics
Ptolemaida	I.E.K of Ptolemaida	**Department:** Automation and Informatics
Larissa	I.E.K of Larissa	**Department:** Informatics

City	Institution	Department
Kavala	I.E.K of Kavala	**Department:** Automation and Informatics
Drama	I.E.K of Drama	**Department:** Automation and Informatics
Komotini	I.E.K of Komotini	**Department:** Informatics
Orestiada	I.E.K of Orestiada	**Department:** Informatics
Argolida	I.E.K of Argolida	**Department:** Informatics
Pirgos	I.E.K of Pirgos	**Department:** Informatics
Athens	I.E.K of Alimos	**Department:** Informatics and Computer engineering
Athens	I.E.K of Galatsi	**Department:** Automation and Informatics
Athens	I.E.K of Aigaleo	**Department:** Computer engineering
Athens	I.E.K of Kalamaki	**Department:** Computer engineering
Athens	I.E.K of Pallini	**Department:** Automation and Informatics

Bachelor level

Undergraduate studies (Bachelor): 10 semesters OR Undergraduate studies (Bachelor): 8 semesters

City	Institution	Faculty or Department
Universities		
Thessaloniki	Aristotle University of Thessaloniki	**Faculty**: Polytechnic Faculty **Department**: Electrical and Computer Engineering **Faculty**: School of Sciences **Department**: Informatics
Xanthi	Democritus University of Thrace	**Faculty**: Polytechnic *School* **Department**: Electrical and Computer Engineering
Samos	Aegean University	**Faculty**: Applied Sciences **Department**: Informatics and Communication Systems Engineering
Volos	University of Thessaly	**Faculty**: Polytechnic *School* **Department**: Computer, Telecommunication and Network Engineering
Thessaloniki	University of Macedonia	**Department**: Applied Informatics

Patra	University of Patras	**Faculty**: Polytechnic *School* **Department**: Electrical and Computer Engineering
		Faculty: Polytechnic *School* **Department**: Computing and Informatics Engineering
Ioannina	University of Ioannina	**Faculty**: Applied Sciences **Department**: Informatics
Heraklion	University of Crete	**Faculty**: Applied and Technological Sciences **Department**: Computer Sciences
Heraklion	Technical University of Crete	**Faculty**: Polytechnic *School* **Department**: Electrical and Computer Engineering
Athens	National & Capodistrian University of Athens	**Faculty**: Applied Sciences **Department**: Informatics and Communications
Athens	Athens University of Economics and Business	**Department**: Informatics
Piraeus	University of Piraeus	**Department**: Informatics
		Department: Technology and Digital Systems Didactic
Athens	Harokopio University	**Department**: Informatics and Telematics
Tripoli	University of Peloponnese	**Department**: Telecommunications Science and Technology
		Department: Computer Science and Technology
Technological Educational Institutes		
Athens	Technological Educational Institute of Athens	**Faculty**: Faculty of Technological Applications **Department:** Informatics
		Faculty: Faculty of Technological Applications **Department:** Electronic Engineering
		Faculty: Faculty of Technological Applications **Department:** Energy Technology
Piraeus	Technological Educational Institute of Piraeus	**Faculty**: Faculty of Technological Applications **Department:** Automation
		Faculty: Faculty of Technological Applications **Department:** Electronics
		Faculty: Faculty of Technological Applications **Department:** Electrical Engineering
		Faculty: Faculty of Technological Applications **Department:** Electronic Computing Systems

Arta	Technological Educational Institute of Epirus	**Faculty**: Management and Economy **Department**: Teleinformatics and Management
Thessaloniki	Technological Educational Institute of Thessaloniki	**Faculty**: of Technological Applications **Department**: Informatics
		Faculty: of Technological Applications **Department**: Automation
		Faculty: School of Technological Applications **Department**: Electronic Engineering
Kavala	Technological Educational Institute of Kavala	**Faculty**: School of Technological Applications **Department**: Industrial Informatics
		Faculty: School of Technological Applications **Department**: Electrical Engineering
		Faculty: School of Management and Economy **Department**: Information Managment
Kozani	Technological Educational Institute of Western Macedonia	**Faculty**: School of Technological Applications **Department**: Electrical Engineering
		Department: Informatics and Computer Technology
		Department: Informatics Applications in Management and Economy
Lamia	Technological Educational Institute of Lamia	**Faculty**: School of Technological Applications **Department**: Electrical Engineering
		Faculty: School of Technological Applications **Department**: Informatics and Computer Technology
		Faculty: School of Technological Applications **Department**: Electronic Engineering
Larissa	Technological Educational Institute of Larissa	**Faculty**: School of Technological Applications **Department**: Electrical Engineering
		Faculty: School of Technological Applications **Department**: Informatics and Telecommunications Technology
Chalkida	Technological Educational Institute of Chalkida	**Faculty**: School of Technological Applications **Department**: Electrical Engineering
		Faculty: School of Technological Applications **Department**: Automation
Mesologgi	Technological Educational Institute of Mesologgi	**Faculty**: School of Management and Economy **Department**: Informatics Applications in Management and Economy
		Department: Telecommunication Systems and Networks
Crete	Technological Educational Institute of	**Faculty**: School of Technological Applications **Department**: Applied Informatics and Multimedia

	Crete	**Faculty**: School of Technological Applications **Department**: Electrical Engineering
		Faculty: School of Technological Applications **Department**: Electronic Engineering
		Faculty: School of Technological Applications **Department**: Telecommunication Systems and Networks
Patra	Technological Educational Institute of Patra	**Faculty**: School of Technological Applications **Department**: Electrical Engineering
		Faculty: School of Management and Economy **Department**: Informatics Applications in Management and Economy
		Faculty: School of Management and Economy **Department**: Informatics and Media
Serres	Technological Educational Institute of Serres	**Faculty**: School of Technological Applications **Department**: Informatics and Communications

Master level

Postgraduate studies (Master): 5-6 years (Typical study program)
There are sometimes some interdepartmental post-graduate programme cooperations.

City	Institution	Faculty or Department	Degree
Universities			
Thessaloniki	Aristotle university of Thessaloniki	**Faculty**: Polytechnic **Department**: Electrical and Computer Engineering	M.Sc in Electrical and Computer Engineering M.Sc in Network Centred Computing M.Sc in Advanced Computing and Communications systems
		Faculty: School of Sciences **Department**:Physics	M.Sc in Electronic Physics (Radioelectrology)
		Faculty: School of Sciences **Department**: Mathematics	M.Sc in Theoretic Informatics and Control
		Faculty: School of Sciences **Department**: Informatics	M.Sc in Informatics and Communication Technology M.Sc in Informatics and Management M.Sc in Medical Informatics
		Faculty: School of sciences **Department**: Medicine	M.Sc. in Medical Informatics
Xanthi	Democritus University of Thrace	**Faculty**: faculty of Engineering **Department**: Electrical and Computer Engineering	M.Sc. in Engineering of the Department Electrical and Computer Engineering M.Sc. in Microelectronics and Informatics Technologies Systems M.Sc. in Communications and Satellite Telecommunication System Technologies
Lesvos, Chios, Samos, Syros and Rhodes	Aegean University	**Department**: Information and Communication Systems Engineering	M.Sc. in Technology and Management in Information and Communication systems
Thessaloniki	University of Macedonia	**Department**: Applied Informatics	Master's in Information Systems
			Master's in Applied Informatics
Patra	University of Patra	**Faculty**: Polytechnic **Department**:Electrical Engineering and Computer Technology	M.Sc. in Electrical Engineering and Computer Technology
		Faculty: Polytechnic **Department**: Computer Engineering and Informatics	MSc in Science and Computer Technology MSc in Hardware and Software Integrated Systems
		Faculty: Applied Sciences **Department**: Physics	M.Sc. in Physics
Ioannina	University of Ioannina	**Faculty**: Natural Sciences **Department** of Physics	M.Sc. in Applied Communications M.Sc. in Electronic Technology
		Faculty: Natural Sciences **Department** of Informatics	MSc in informatics

Heraklion	University of Crete	**Faculty**: School of Sciences **Department** of Physics	M.Sc. in Microelectronics and Optoelectronics M.Sc. in Advanced Physics
		Faculty: School of Sciences **Department** of Computer Science	M.Sc. in Information Systems M.Sc. in Computer Architecture and Digital Systems M.Sc. in Mechanical Vision and Robotics M.Sc. in Microelectronic System Architecture M.Sc. in Computer Networks and Telecommunications M.Sc. in Biomedical Informatics Technology M.Sc. in Electronic Commerce Technology M.Sc. in Multimedia
Heraklion	Technical university of Crete	**Department**: Electronics and Computer Engineering	M.Sc. in Electronics and Computer systems engineering
Athens	National & Capodistrian University of Athens	**Faculty**: School of Sciences (Interdepartmentals)	M.Sc. in Electronics, Radioelectrology and Automation M.Sc. in Logic and Theory in Algorithms Computation M.Sc. in Microelectronics M.Sc. in Medical Informatics M.Sc. in Economy and Management in Telecommunication Networks M.Sc. in Informatics Technology in Medicine and Biology
Athens	Athens University of Economics and Business	**Department**: Applied Informatics	M.Sc. in Information Systems M.Sc. in Computer Sciences
Technological Educational Institutes			
Athens	Technological Educational Institute of Athens	**Faculty**: Faculty of Technological Applications **Department:** Electronics	Master of Sciences in Data Communication Systems
		Faculty: Faculty of Technological Applications **Department:** Informatics	Master in Informatics and Sciences of Information and Communication
		Faculty: Faculty of Technological Applications **Department:** Energy Technology	M.Sc. in Science in Energy
Piraeus	Technological Educational Institute of Piraeus	**Faculty**: Faculty of Technological Applications **Department:** Automation	M.Sc. in Quality Management M.Sc. in Information Technology
		Faculty: Faculty of Technological Applications **Department:** Mathematics	M.Sc. in Electronic Commerce
		Faculty: Faculty of Technological Applications **Department:** Electronics	M.Sc. in Networking and Data Communications
Kozani	Technological Educational Institute of Western Macedonia	**Faculty**: Faculty of Technological Applications	M.Sc. in Applied Informatics M.Sc. in Mechatronics

Arta	Technological Educational Institute of Epirus		M.Sc. in Applied Telecommunications
Thessaloniki	Technological Educational Institute of Thessaloniki	**Faculty**: Faculty of Technological Applications	M.Sc. in Design of interactive and industrial products and systems
Heraklion	Technological Educational Institute of Crete	**Faculty**: Faculty of Technological Applications	M.Sc. in ICS-Intensive Program in Intelligent Computer Systems M.Sc. in Applied Informatics & Multimedia M.Sc. in Energy Systems M.Sc. in Computer Systems - Web Development Emphasis Υπολογιστικά Συστήματα με έμφαση στην Ανάπτυξη Διαδικτυακών Χώρων
Larissa	Technological Educational Institute of Larissa	**Faculty**: Faculty of Technological Applications **Department:** Informatics and Telecommunication Technology	Master in Computer Science
Chalkida	Technological Educational Institute of Chalkida	**Faculty**: School of Technological Applications **Department**: Automation	Master in Automation in Irrigations, in agricultural constructions and in agriculture automatization

9.5. References

The information given in this monograph is based on the following documents and web links:

Book:

"Higher Education – Universities and Technological Educational Institutes"

Hellenic Republic, Ministry of National Education and Religious Affairs Edition 2003, Athens ISBN 960-87088-1-8

Websites:

Ministry of National Education and Religious Affairs: http://www.ypepth.gr

  Euroeducation: http://www.euroeducation.net/prof/greece.htm

Doctoral
Studies

9.5. Doctoral Studies in Greece

9.5.1. Supervision

Scientific Board or Supervisor

The <u>Scientific board</u> is composed by three members, specified by the Faculty or Department, including supervisor, where can participate external professors.

The student, <u>in most cases,</u> has the same personal supervisor during its Thesis work on an <u>active</u> research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between the student and the supervisor.

Who can be a Supervisor

Any professor or associate or assistant professor in the department.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

Duration

Minimum: three years.

9.5.2. Development

Courseware?

Yes.

Course Work

1. The students in general have to take course work during their doctoral degree preparation and is offered as specialist graduate course units. The course work in some cases can be assessed by examinations. When it is not, it consists of personal work directly linked to the research. If the student fails in the course work, he/she can retake the exam, take a diff. course unit, or develop non-course-work activities.

2. Extension: 300 hours or more, in the first year and sometimes in the second year.

3. Credit system: It starts to adopt the ECTS. 3 to 4 credits/subject. 30 credits are allocated to course work.

4. Monitoring of the doctoral student when the course work is assessed by examinations.

Contribution to Teaching

1. Supervision of undergraduate laboratory work; tutoring of undergraduate groups; marking of undergraduate assessments/homework.

2. Supervision of final projects thesis work.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

4. At international journals.

9.5.3 Thesis Work

Submission of Doctoral Written Thesis

1. Language used: Greek (in general).

2. <u>No</u> credits are allocated to the doctoral thesis.

3. The doctoral thesis is a dissertation. Some of this work must be published in International Scientific Congress or Journals.

Oral Presentation of Thesis Work

1. Language used: Greek (in general).

2. Oral presentation with oral examination for open audience.

3. Duration: typical duration from 1 to 2 hours including examination

9.5.4. Examination

Thesis Examination Board

1. Composition: Five internal examiners and two external examiners. In totally must be seven members.

2. Selection by special scientific committee of the Department.

Evaluation

1. <u>Results</u> based on the reading of the thesis and the oral presentation of the thesis work, with grading system: Good, Very Good, Excellent.

2. <u>If the student fails</u>, he/she may resubmit a revised thesis within a few months or do further work as specified by the examination board. Normally, the Scientific Board only advises the faculty for the presentation of the thesis when she thinks the student is ready.

9.6. Questionnaires

Greece

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	Y
3.1.2	**How many members are in the Scientific Board?**	3
	3 members, specified by the Faculty or Department, including supervisor, where can participate external professors.	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Specified by the Faculty, Department?	Y
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	N
	Professors, Associate professors or Assistant professors.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?   N

3.1.7.2   After a specified period of coursework?   Y

3.1.7.3   Other. Please specify: Y

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?   Y

3.1.8.2   Any researcher in the department?   N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?   N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

3.1.8.4   Other methods. Please specify: Y

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?   Y

3.1.9.2   Other methods. Please specify: N

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.   Y

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

	Year 1	**Year 2**	**Year 3**	**Year 4**
	312hrs	**0**	**0**	**0**

3.2.2.2   **In which form is this coursework offered?**

    - As specialist graduate course units.   Y

    - As course units taken from the undergraduate programme.   N

    - Other. Please specify.   N

3.2- COURSE WORK

3.2.2.3   Is the coursework assessed by examinations?
If not, please give details: Y

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?
          N

3.2.3.2   Is it the ECTS system?
          N

          If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   Y

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

          - Retake the exam.   Y

          - Take a different course unit.   Y

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.   Y

3.3.2   At national conferences.   Y

3.3.3   At international conferences and Journals   Y[1]

          [1]This point naturally should be achieved before the PhD can be passed.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   Y

3.4.2   Teaching undergraduate courses.   N

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1 Which language is normally used for the thesis?

Greek

4.1.2 Are alternative languages used for the thesis? Please Specify:

Y

It could be in some specific cases (international juries, bi-national theses).

4.1.3 Which language is normally used for the oral presentation and/or examination?

Greek

4.1.4 Are alternative languages used in the oral presentation and examination? Please Specify:

Y

It could be in some specific cases (international juries, bi-national theses).

4.1.5 Are credits allocated to the doctoral thesis?

N

4.1.6 **The doctoral thesis is:**

4.1.6.1 A previously unpublished substantial written report.

Y

4.1.6.2 A collection of individual or co-authored scientific papers with an introduction and/or commentary.

N

4.1.6.3 Other. Please specify:

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1 Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?

Y

4.2.2 Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1 Internal examiners.

5

4.2.2.2 External examiners.

2

4.2.2.3 TOTAL.

7

4.2.3 How is the examination board chosen?

4.2.3.1 By the supervisor.

N

4.2.3.2 By the scientific committee of the institution.

Y

4.2.3.3 By the rector or equivalent.

N

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3.4	By the national ministry.	N
4.2.3.5	Other. Please specify:	

4.2.4	Do the examiners base their evaluation mark on:	
4.2.4.1	Reading the thesis.	Y
4.2.4.2	The oral presentation of the thesis work.	Y
4.2.4.3	Both.	Y
4.2.4.4	What is the typical duration of the oral part of the thesis examination, if applicable?	1 to 2 hours
4.2.4.5	Is there an upper limit to the duration of the thesis examination?	N[4]

[4] Not formally, but there is a "tradition".

4.2.5	Is the oral part of the examination taken behind closed doors?	N

4.2.6	What happens if the student fails?	
4.2.6.1	May not resubmit for doctorate.	[5]
4.2.6.2	May resubmit revised thesis.	Y[6]
4.2.6.3	May do further work as specified by examination board.	Y
4.2.6.4	If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:	N

[5] If he is allowed to proceed his oral session He never fails.
[6] Only for the manuscript.

4.2.7	Is there a grading system for the doctoral degree based on the quality of the work?	Y
	Only with mention Good, Very Good, Excellent.	

10. HU: Magyarország (Hungary)

Coordinating authors: Laszlo CSINK (EAEEIE, Polytechnics Budapest,
csink@nik.bmf.hu)

Review: Joseph Barsics (EAEEIE, Haute-École de Liège, Belgium)

10.1. General information

The closest concept to information engineering is *műszaki informatika* (technical informatics). This curriculum is closest to electrical engineering among all the informatics curricula. *Programozó matematikus* (programming mathematician) and *programtervező matematikus* (programme designing mathematician) curricula are also offered, mainly by Faculties of Natural Sciences, while the *műszaki informatika* (technical informatics) curricula are traditionally offered by technical universities and polytechnics.
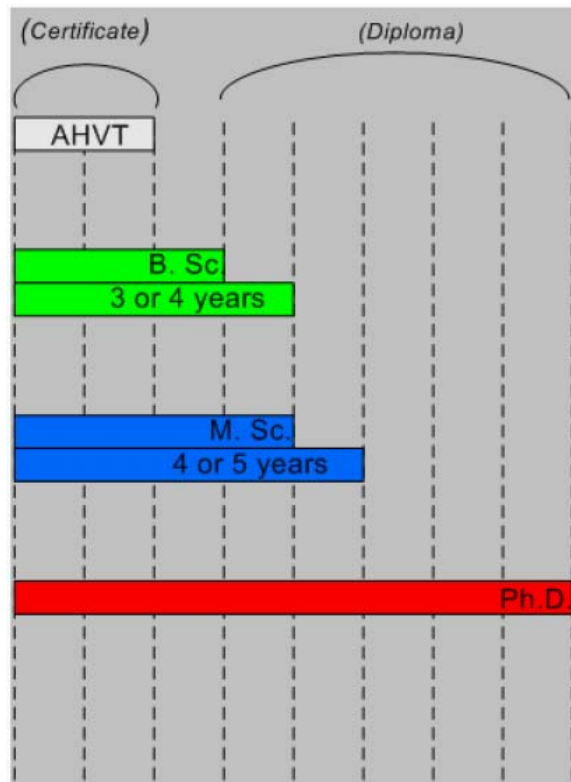
Figure 10.1: Hungarian Higher Education System in EIE disciplines.

The educational system of EIE in Hungary can be demonstrated most effectively by the comparison of the sequential and dual models (figure from Sima 2002):
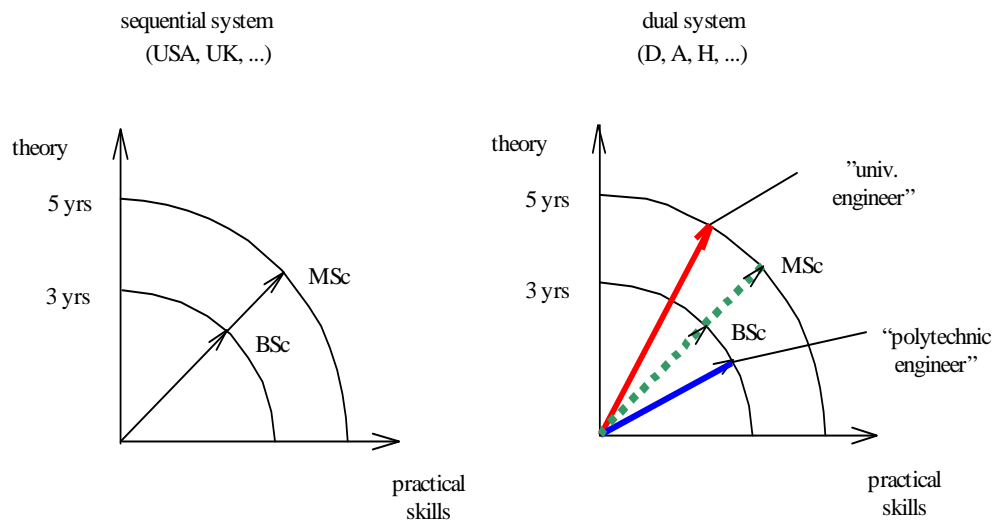
Figure 10.2: Hungarian sequential and dual systems.

The Hungarian higher education has 2 kinds of systems, there are colleges and universities (University entry = Competitive entry based on examination), some colleges are associated with universities as college faculties of the universities. A university can offer college level courses, too.

Percentage of population participants at universities and colleges in full-time education with respect to the corresponding age: 17.4 % (1999). Number of higher education institutions are 62 (30 state, 26 church and 6 foundation institutions).

The Hungarian dual-type system of higher education in technology was established in the 1960s. Several polytechnics were founded in Budapest and other cities in Hungary, one for electronics, one for light industry, one for machine industry etc. These institutions were similar to the German *Fachhochschulen*, but the distance in research activities between universities and polytechnics was smaller in the Hungarian model than in the German one.

Polytechnics typically offered 6/7 semester long courses with the degree "polytechnic engineer" (see figure 11.2) while universities had 10 semester long courses ending with the degree "university engineering". The type of course thus matched the type of institution.

The 1980s brought about significant changes. Some universities, in order to attract more students, introduced the two-cycle model. However, polytechnics did not have the option of starting "univ. engineering" courses; their students having obtained a "polytechnic degree" were usually unable to enter the fourth year of a university without previously passing of several extra examinations.

In the following decade a new law of higher education was accepted by the Parliament (in 1993, modified in 1996). This made it possible for a polytechnic to start the "university engineer" degree if the necessary conditions were fulfilled, which were checked by the Hungarian Accreditation Board (in Hungarian MAB). Another important factor was the higher education integration programme in 2000. As a result, the number and ratio of universities and polytechnics has changed. Before 2000 there were many small polytechnics and a few universities, now we have several integrated universities and not so many integrated polytechnics.

The current era regarding the Bologna process is that of discussions and preparations. Some people think that the two-cycle system can be introduced very simply by cutting the 5-year long university curriculum in two parts: the first three years would be the BSc part, and the extra two years the MSc part. However, after 3 years the students typically do not get the necessary training to be able to get jobs at the labour market (too much theory, not enough skills). However, after the 3 years of polytechnic training the students typically do not have the necessary theoretical foundations to further study for the MSc (not enough theory, too much skill work). In this respect, some convergence between the "university engineering" and "polytechnic engineering" arrows would be optimal.

10.1.1 *Electrical and Information Engineering in Hungary, boundaries of the field of study*

EIE is Electrical and Information Engineering
Main specialities : Electrical Engineering, Process Engineering (for Wood material), Engineering of processing technology, Material Engineering, Computing and Information Systems, Information Technology, Electrical Engineering and Informatics, Engineering Physics.

10.1.2 *Content, degrees and accreditations*

Higher education institutions must be recognised by the government (the parliament) and are under the supervision of the Ministry of Education. There are state universities and colleges, higher education institutions controlled by various churches (dominantly by the Catholic Church) and private colleges. The Hungarian Accreditation Committee (HAC) give opinions on the establishment or recognition of higher education institutions, establishment or abolition of fields of study (courses).

Standards of higher education and quality endorsement of the education are based on the operation of HAC and Scientific Council. The agreement of both structures is necessary for introduction of a new course. Qualification requirements, curricula, quality of the academic staff, financial aspects and regional distribution of the trainings are taken into account.

Academic year**:** The academic year consists of two semesters, the fall semester starts in September. The spring semester in February until the end of May (for 14-15 weeks) followed by a period of exams (generally 6 weeks). The number of weekly contact hours in engineering courses is nearly 40 hours/week.

10.1.3 *Implementation of the Bologna-BMD system in Hungary*

The government has fixed some goals to be achieved :

- Higher educational institutions take into account the tasks related to the inevitable consequences of the accession of Hungary to the European Union,
- Introduction of the credit system in all higher education institutions.

10.2. Figures on the weight of EIE in Hungary

In 2003, 62000 students will be admitted to first year studies to all higher education institutes in Hungary. This includes all faculties, all universities and colleges, but the number refers to places only that are state supported. Regarding places without support (this number is surely less than the previous one) it is difficult to get aggregate data.

In informatics there are 5000 places in the first year, 2000 at universities and 3000 at colleges. I have to point out that the two/cycle training has not yet been introduced, though the process is going on. Thus these 2000 are pursuing an MSc, the 3000 a BSc. In technical areas there are 3000 places for universities, 4500 for colleges. But these include all technical areas, special data just for electronics are not available in aggregate format, but you can have the details where the individual faculties are listed.

Source: Felsőoktatási felvételi tájékoztató, Oktatási Minisztérium, 2003. 06. 02.
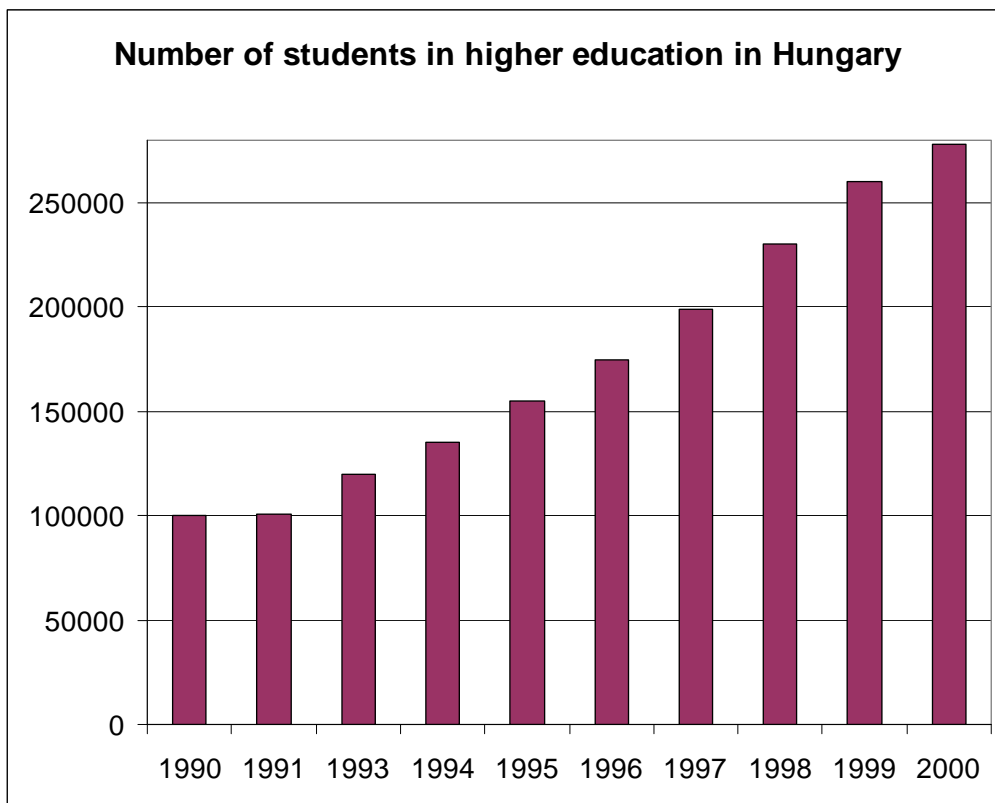
Figure 10.3: Number of students.
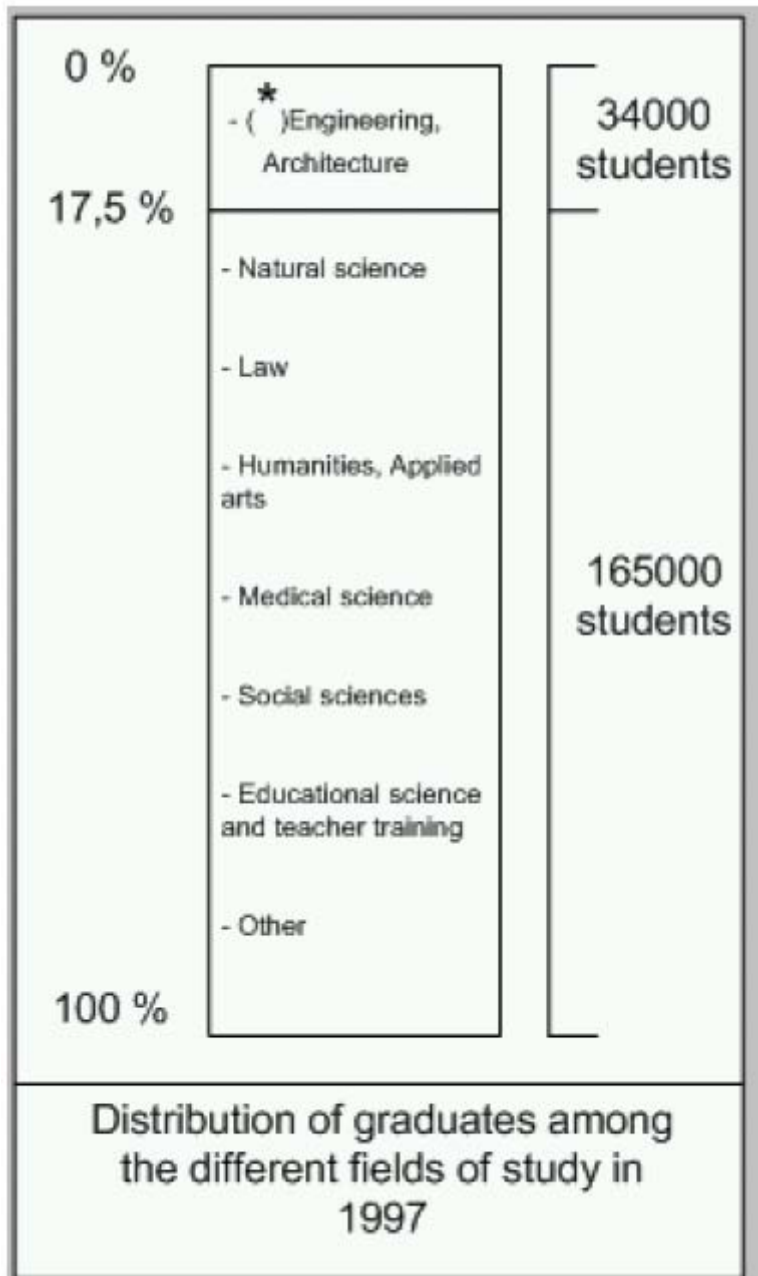
Figure 10.4: Weight of EIE.

* There are less than 10 % of students in the field of Electrical and information engineering among the total of students in Engineering and Architecture field.

10.3. Degrees in EIE in Hungary

Curricula at college level (corresponding to B. Sc. level) is a minimum of 3 years (undergraduate courses), maximum 4 years; Education at university level (corresponding to MSc. level) is minimum 4 years, maximum 5 years (graduate programmes). They are higher education institutions able to organise Ph.D. degree (post graduate) but their university professors should have Ph.D. degree and habilitation.

The higher education institutions can organise short-cycled courses in two year called Accredited Higher Vocational Training (AHVT). It is not a degree course, the graduates do not receive a diploma, but a certificate.

The entry to a curriculum requires an entrance exam whose result is combined (in a rather complicated way) with the results of the final examination at the secondary school forming points between 0 and 120. Additional points (up to 5) may be obtained if the applicant has a state-recognized language certificate of a foreign language. A minimum of 60 points must be reached for entry to any institution. The minimum entry requirement to a curriculum at a given institution depends on the number of available places and the quality of the applicants. If the minimum number is set at e.g. 100 it means that all applicants achieving 100 points or more are admitted and all applicants getting 99 or less are rejected. The minimum entry requirement in 2000 is listed after each curriculum to give an idea of its popularity among the students.

Only state-financed full-time curricula are listed which are offered as a first degree. The expression state-financed means that no tuition needs to be paid if a certain result is achieved by the student. Full-time means that the students typically do not have jobs during their studies. First degree means that the student does not yet have any degree from a higher educational institute.

10.3.1 <u>Bachelor level</u>

Degrees offered in *műszaki informatika szak* (technical informatics).

Institution code (min entry points)	No of semesters	No of 1st year students	Official name of institution
BMF-NIK (100)	6	330	Budapesti Műszaki Főiskola NIK
DE-MFK	6	60	Debreceni Egyetem MFK
DF (82)	6	300	Dunaújvárosi Főiskola
GDF (88)	6	400	Gábor Dénes Főiskola
KF-GAMFK (84)	6	324	Kecskeméti Főiskola GAMFK
ME-GÉK (95)	10	100	Miskolci Egyetem GÉK
PTE-PMMFK (82)	6	300	Pécsi Tudományegyetem PMMFK
SZE-MTK (87)	6	280	Széchenyi István Egyetem MTK
VE-MK (82)	6	60	Veszprémi Egyetem MK (Nagykanizsa)

Degrees offered in *programozó matematikus szak* (programming mathematician).

Institution code (min entry points)	No of semesters	No of 1st year students	Official name of institution
DE-TTK (73)	6	50	Debreceni Egyetem TTK
DE-TTK (73)	6	50	Debreceni Egyetem TTK
EKF-TTK (96)	6	40	Eszterházy Károly Főiskola TTK
ME-GÉK (73)	6	40	Miskolci Egyetem GÉK
SZTE-TTK (87)	6	80	Szegedi Tudományegyetem TTK

Degrees offered in *villamosmérnök szak* (electrical engineering).

Institution code (min entry points)	No of semesters	No of 1st year students	Official name of institution
BMF-KVK (77)	6	760	Budapesti Műszaki Főiskola KVK
DE-MFK (85)	6	30	Debreceni Egyetem MFK
ME-GÉK (79)	6	60	Miskolci Egyetem GÉK
PTE-PMMFK (78)	6	105	Pécsi Tudományegyetem PMMFK
SZE-MTK (81)	6	135	Széchenyi István Egyetem MTK
VE-MK (76)	6	65	Veszprémi Egyetem MK
ZMNE-BKMFK (60)	6	70	Zrínyi Miklós Nemzetvédelmi Egyetem BKMFK

10.3.2 *Master level*

Degrees offered in *műszaki informatika szak* (technical informatics).

Institution code (min entry points)	No of semesters	No of 1st year students	Official name of institution
BME-VIK (118)	10	460	Budapesti Műszaki és Gazdaságtudományi Egyetem VIK
PPKE-ITK (100)	10	150	Pázmány Péter Katolikus Egyetem ITK
SZTE-TTK (66)	10	100	Szegedi Tudományegyetem TTK
VE-MK (102)	10	160	Veszprémi Egyetem MK

Degrees offered in *programtervező matematikus szak* (programme designing mathematician).

Institution code (min entry points)	No of semesters	No of 1st year students	Official name of institution
DE TTK (79)	10	100	Debreceni Egyetem TTK
ELTE-TTK (62)	10	400	Eötvös Loránd Tudományegyetem TTK
SZTE-TTK (77)	10	100	Szegedi Tudományegyetem TTK

Degrees offered in *villamosmérnök szak* (electrical engineering).

Institution code (min entry points)	No of semesters	No of 1st year students	Official name of institution
BME-VIK (113)	10	413	Budapesti Műszaki és Gazdaságtudományi Egyetem VIK

10.4. References

The information given in this monograph is based on the following documents and web links: Sima, D.: On the the two-cycle higher education in technology (Gondolatok a kétlépcsős műszaki felsőoktatásról, in Hungarian), © Magyar Akkreditációs Bizottság, 2002,

Source: Felsőoktatási felvételi tájékoztató, Oktatási Minisztérium, 2003. 06. 02.
http://www.mab.hu/doc/bologna.doc

Data regarding entry points etc. http://www.felvi.hu
http://www.om.hu/english
http://www.usc.edu/dept/education/globaled/wwcu/background/Hungary.htm

Doctoral
Studies

10.5. Doctoral Studies in Hungary

10.5.1. Supervision

Scientific Board or Supervisor

University Doctoral Committee with: Head +1-2 members from each faculty +1-2 "external" professors/scientists from the scientific area of each faculty. These external members are not affiliated with the university in question. The members of the Doctoral Committee need to be members of the Hungarian Academy of Science, or university professors, or need to have a DSc degree. The Doctoral Committee members are selected by the University Council. The student, in most cases, has the same personal supervisor during its thesis work on Normally, an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between the student and the supervisor. The Doctoral Committee's acceptance of the thesis subject is necessary.

Who can be a Supervisor

1. In principle anyone with a PhD degree can be a supervisor. Usually a professor of the department, but exceptionally it can also be an external professor or expert with PhD.

2. The Doctoral Committee accepts or rejects the assignment of a supervisor

Tasks of Scientific Board/Supervisor

1. General management YES

2. Deciding/advising layout of course YES

3. Assigning a thesis subject YES

Duration: four years.

10.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units. The student can only start writing the thesis if a specified coursework has been done.

2. Extension: the number of hours may vary. The student should collect a certain amount of credits during the studies.

3. Credit system: ECTS compatible credit system for coursework.

4. Monitoring of the doctoral student. In case of failure the student must retake the exam.

Contribution to Teaching

1. Supervision of undergraduate laboratory work.

2. Teaching of undergraduate students.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

10.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. <u>Language</u>: Hungarian. Alternative languages: English, German or French.

2. There <u>are</u> credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report, but it is expected that the main results have been published in at least two referred journal papers.

Oral Presentation of Thesis Work

1. <u>Language</u> normally used: Hungarian. Alternative languages: English, German or French.

2. Oral presentation with oral examination for an open/public audience.

3. <u>Duration</u>: typical duration of 1 hour including examination with no upper time limit.

10.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: four-six internal examiners and one-two external examiners (five to seven members).

2. <u>Selection</u> by the University Doctoral Committee.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with a not specified grading system.

2. Before the oral defence, two examiners read the thesis and support or reject it. If both examiners reject the thesis, the student fails and the doctoral procedure is over. If one supports, one rejects, a third examiner is brought in. If both examiners support the thesis, the oral defence may take place.

10.7. Questionnaires

Hungary

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y/N
3.1.3.2	Chosen by the student?	Y/N
3.1.3.3	Chosen in another way? Please specify:	Y/N

The university has a University Doctoral Committee. This Committee comprises the following persons: Head +1-2 members from each faculty +1-2 "external" professors/scientists from the scientific area of each faculty. These external members are not affiliated with the university in question. The members of the Doctoral Committee need to be members of the Hungarian Academy of Science, or university professors, or need to have a DSc degree. The Doctoral Committee members are selected by the University Council.

3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.6 Must the subject of the doctoral thesis be an active research area in the department?

Y/N

Normally yes, but it is also possible that the supervisor is external, i.e. not a full time member of the department.

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

Y

3.1.7.2 After a specified period of coursework?

N

3.1.7.3 Other. Please specify:

Y/N

The topic of the thesis is assigned at the beginning of the doctoral studies as the supervisor is an expert of this topic and the supervisor is assigned at the beginning of the doctoral studies. However, the student can only start writing the thesis if a specified coursework has been done.

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

Y/N

3.1.8.2 Any researcher in the department?

Y/N

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

In principle anyone with a PhD degree can be a supervisor. Usually, this is a professor of the department, but exceptionally it can also be an external professor or expert as well (with a PhD of course). The Doctoral Committee accepts or rejects the assignment of a supervisor.

3.1.8.3 Any researcher in another institution?

Y/N

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

Y/N

See above.

3.1.8.4 Other methods. Please specify:

Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

Y

3.1.9.2 Other methods. Please specify:

Y/N

The Doctoral Committee's acceptance of the thesis subject is necessary.

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
30 hrs	**15 hrs**	**hrs**	**hrs**

The number of contact hours may vary. It is expected, however, that the student should collect a certain amount of credits during the studies.

3.2.2.2 **In which form is this coursework offered?**

- **As specialist graduate course units**.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?
If not, please give details:

y

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?

y

3.2.3.2 Is it the ECTS system?

Y/N

If not, what is the relationship with ECTS?

It is not ECTS, but it is compatible.

3.2- COURSE WORK

3.2.3.3   How many credits are allocated to coursework?

           __ credits

           This varies from university to university. Not only coursework can yield credits, but also undergraduate teaching assignments, publications etc. The computation of credits is a very complicated procedure.

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   y

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

        - **<u>Retake the exam</u>**.

        - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

3.3.2   At national conferences.

3.3.3   At international conferences.

        All of these are expected.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

3.4.2   Teaching undergraduate courses.

        All of these are expected.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Hungarian
4.1.2	Are alternative languages used for the thesis? Please Specify:	Y/N

The student is allowed to write the thesis in European languages, Typically English, German or French. This normally happens if it is a foreign student, but it may happen with a Hungarian student as well.

4.1.3	Which language is normally used for the oral presentation and/or examination?	Hungarian
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	YES/NO

See 4.1.2..

4.1.5	Are credits allocated to the doctoral thesis?	Y

4.1.6 **The doctoral thesis is:**

4.1.6.1 A previously unpublished substantial written report.

4.1.6.2 A collection of individual or co-authored scientific papers with an introduction and/or commentary.

4.1.6.3 Other. Please specify:

A combination of the above. The thesis has to be a scientific report, previously unpublished, but it is expected that the main results have been published in at least two refereed journal papers. This is difficult for some students.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	

4.2.2.1	Internal examiners.	4-6
4.2.2.2	External examiners.	1-2
4.2.2.3	TOTAL.	5-7

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

The Board is appointed by the Doctoral Committee.

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1	Reading the thesis.	Y/N
4.2.4.2	The oral presentation of the thesis work.	Y/N
4.2.4.3	**Both**.	
4.2.4.4	What is the typical duration of the oral part of the thesis examination, if applicable?	1 hour
4.2.4.5	Is there an upper limit to the duration of the thesis examination?	N

4.2.5	Is the oral part of the examination taken behind closed doors?	N

The examination, i.e. "Defence of the thesis" is open to the public.

4.2.6   What happens if the student fails?

4.2.6.1	May not resubmit for doctorate.	Y/N
4.2.6.2	May resubmit revised thesis.	Y/N
4.2.6.3	May do further work as specified by examination board.	Y/N
4.2.6.4	If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:	Y/N

Before the oral defence, two examiners read the thesis and support or reject it. If both examiners reject the thesis, the student fails and the doctoral procedure is over. If one supports, one rejects, a third examiner is brought in. If both examiners support the thesis, the oral defence may take place.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   Y

11. IE: Éire /Ireland

Author: Cyril BURKLEY (EAEEIE, University of Limerick, cyril.burkley@ul.ie)

11.1. General information

There are two main kinds of institutions in Ireland:

- Institutes of Technology,
- Universities.
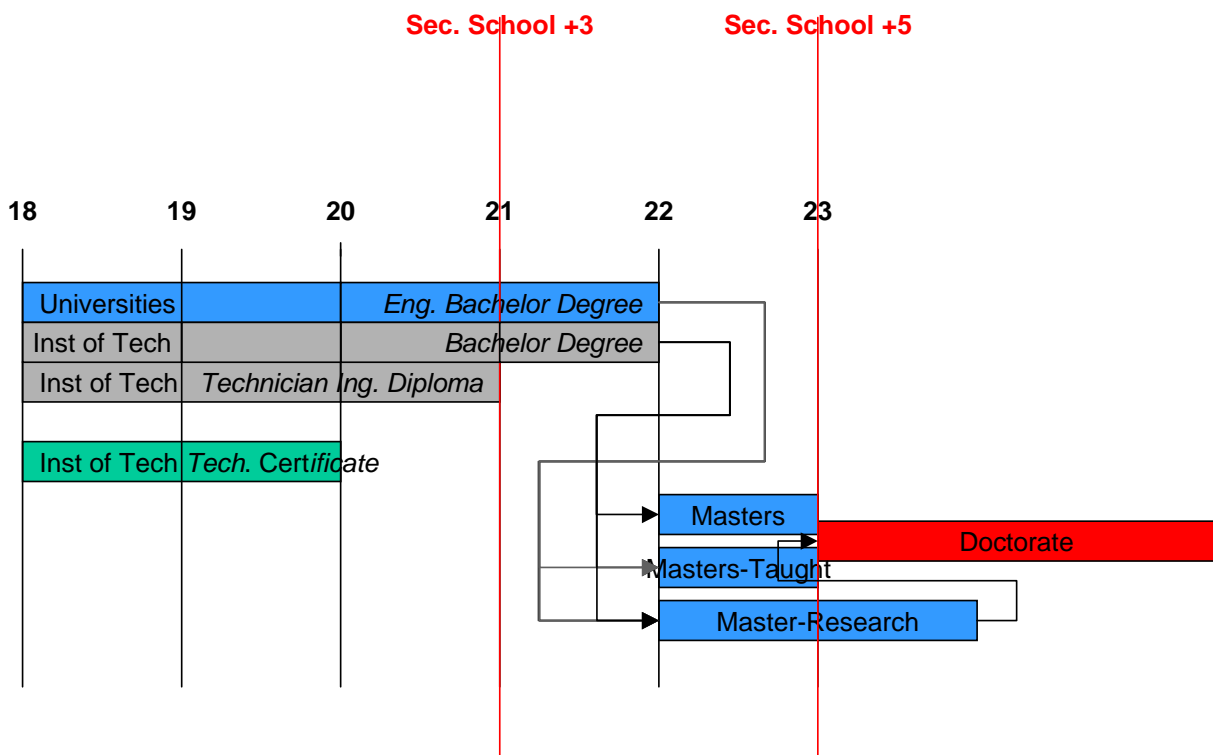
Figure 11.1: Irish Higher Education System in EIE disciplines.

11.1.1 *Electrical and Information Engineering in Ireland, boundaries of the field of study*

Engineers Ireland covers all engineering disciplines and therefore there are no specific EIE "boundaries". Bachelor of Engineering programmes currently accredited in the EIE area include: Electrical Engineering, Electronic Engineering, Computer Engineering, Microelectronic Engineering, Telecommunications, Software and Information Systems Engineering.

11.1.2 *Content, degrees and accreditations*

Engineers Ireland has been designated as the national authority competent to regulate the engineering profession in the Republic of Ireland. This includes responsibility for evaluating the education and training of engineers and in fulfilment of this obligation the Institution formally accredits engineering degree programmes in Ireland.

Engineers Ireland do not review programmes for accreditation until after the programme produces its first cohort of graduates. Thus there are a number of other EIE related programmes, which have commenced in the past few years and which, though not accredited at present, are likely to be accredited at the appropriate time in the future.

In addition there are a number of other B.Eng., B.Sc. and B.Tech. programmes in the EIE area offered by the Universities and particularly by the Institutes of Technology, which for a variety of different reasons have not been submitted for accreditation to the IEI.

Engineers Ireland gives some guidelines in relation to core content, which should include:
   (i) Foundation Studies
      Mathematics, basic sciences, basic engineering sciences and technology, computer technology
   (ii) Engineering Studies
      Engineering sciences and technology appropriate to the engineering discipline. Analysis, modelling, measurement, design and testing techniques in an appropriate range of subjects. Opportunities for specialisation and selected advanced study.
   (iii) Complementary Studies
       Communications skills, languages, industrial, social and environmental aspects of engineering.

However, even with these guidelines, the Universities still have a lot of freedom in defining the content and structures of their own programme. Details of the contents of each of the programmes can be obtained from the individual Universities, all of whom also have their own websites.

11.1.3 *Implementation of the Bologna-BMD system in Ireland*

The current Irish University education system is based on a four year primary degree. Therefore the current systems is a 4-5-8 (or possibility 4-6-9) system. The Universities are funded by the Government and currently students taking primary degrees pay no fees and therefore changing the Irish system to a Bologna-BMD system presents problems.

Reducing the primary degree to three years will significantly reduce the level achieved by the graduates, which will have a negative knock-on effect for employers in business and industry. It would also require the Universities to redesign all of their existing programmes.

An alternative option is to increase the duration of the primary degree to 5 years, but this would have major funding implications for the Government and therefore is a decision that would require much prior discussion.

Engineers Ireland has reviewed the Bologna Declaration and its impact on Engineering education in Ireland and submitted its finding to the Government. Various other groups are still discussing the possible implications of moving towards the Bologna-BMD system.

Meanwhile all the Universities and Institutes of Technology have adopted the ECTS credit system and all the programmes and individual modules have been assigned the appropriate ECTS credit weighting.

11.2. Figures on the weight of EIE in Ireland

Student number figures for the Irish Universities for the Academic Year 2005/2006 showed that 2959 students (4.6%) out of a total of 64,765 students were studying EIE related programmes.

11.3. Qualifications in EIE in Ireland

The National Qualifications Authority of Ireland developed the Irish National Framework of Qualifications in 2003. This is a ten level framework, which captures all the learning from the very initial stages to the most advanced. Qualification achieved in school, further education and training and higher education are all included in the framework. Sixteen major award- types have been established of which eight are higher education award-types:

- The Higher Certificate at level 6
- The Ordinary Bachelor Degree at level 7
- The Honours Bachelor Degree at level 8
- The Higher Diploma at level 8
- The Masters Degree at level 9
- The Post-Graduate Diploma at level 9
- The Doctoral Degree at level 10
- The Higher Doctoral Degree at level 10

Each of these eight award-types has a descriptor associated with it which describes the purpose, level, volume, learning outcomes, progression and transfer and articulation associated with it.

Honours Degree programmes (level 8) in Ireland are in general of four years duration. Students enter these programmes immediately after completing second level education at approximately 18 years of age. These programmes are offered by the Universities and in some cases by the Institutes of Technology.

Two and Three year programmes are also offered by the Institutes of Technology and other Third Level Colleges. These programmes include two year Higher Certificate programmes (level 6)(Technician Engineer level) and three year Ordinary Degree programmes (level 7)(Associate Engineer level) In some cases it is possible to progress from these programmes to Honours Degree programmes.

Taught Masters programmes (level 9), of one or two years duration, in a range of different subjects, are offered by most of the Universities. A Masters Degree can also be obtained by research and thesis (this typically takes 18 months to 2 years). Ph.D. degrees (level 10), which typically take a minimum of three years, are offered by all the Universities.

11.3.1 *Sub Honours Bachelor Degree Level*

In Ireland at Sub Honours Bachelor Degree level, there are two recognised qualifications, a Higher Certificate (level 6) and an Ordinary Degree (level 7).

(a) A Higher Certificate in Engineering is a two-year '*ab initio*' programme. The student effort required should be such as to merit 120 ECTS credits. On completion, the graduate is referred to as an Engineering Technician and should be competent to apply in a responsible manner proven techniques which are commonly understood by those who are expert in a branch of engineering or those techniques specially prescribed by professional engineers. He/she works under guidance within their allocated responsibility. National Certificate programmes are generally offered by the Institutes of Technology and programmes related to EIE currently on offer (see Section 11.1.1) include:

Electronics –
(Electronics 38%, maths 14%, telecommunications 7%, computers 8%, science 6%, technology 7%, projects and labs 8% and complementary studies 12%).

Electronic and Computer Engineering –
(Electronics 25%, maths 14%, computers 34%, telecommunications 5%, science 3%, technology 7%, projects and labs 7% and complementary studies 5%).

Electronics and Communications –
(Electronics 29%, maths 13%, computers 15%, telecommunications 18%, science 4%, technology 10%, projects and labs 7% and complementary studies 4%).

(b) An Ordinary Degree in Engineering is a three-year '*ab initio*' programme or a one year post Higher Certificate programme. The total student effort required should be such to merit 180 ECTS credits. On completion the graduate is referred to as an Associate Engineer and should be competent to apply in a responsible manner current engineering technologies in a chosen field. He/she exercises independent technical judgement and works with significant autonomy within his/her allocated responsibility. Ordinary Degree programmes are generally offered by the Institutes of Technology and programmes currently on offer, related to EIE (Section 11.1.1) include:

Electronic Engineering –
(Electronics 37%, maths 14%, telecommunications 6%, computers 12%, science 4%, technology 6%, project and labs 11% and complementary studies 10%).

Computer Engineering –
(Electronics 20%, computers 38%, maths 14%. Science 4%, technology 6%, project and labs 10%, and complementary studies 8%).

Mechatronics –
(Maths 17%, electronics 21%, mechatronics 9%, computers 12%, science 9%, manufacturing 23%, project 9% and complementary studies 2%).

11.3.2 *Honours Bachelor Level*

The following is the current list of Engineers Ireland accredited programmes in EIE:

- B.Eng Electronic Engineering (Cork IT, Dublin City University, University of Dublin, University of Limerick, NUI Galway, University College Dublin, IT Tallaght, NUI Maynooth)
- B.Eng Electrical/Electronic Engineering (Dublin IT, University College Cork, University College Dublin, IT Tallaght)
- B.Eng Electronic and Computer Engineering (University of Dublin, NUI Galway)
- B.Eng. Computer Engineering (University of Dublin, University of Limerick, DIT, NUI Maynooth)
- B.Eng. Information and communications Engineering (Dublin City University, NUI Maynooth)
- B.Sc. Computer Science (Dublin City University, University of Dublin, University of Limerick)
- B.Sc. Information Technology (NUI Galway, University of Limerick)

Course content:

Electronic Engineering –

(Maths 16%, science 5%, electronics 37%, computers 12%, telecommunications 10%, project 10% and complementary studies 10%).

Electrical/Electronic Engineering –

(Maths 12%, science 3%, electronics 38%, computers 11%, telecommunications 9%, mechanical 6%, project and design 10% and complementary studies 7%).

Electronic and Computer Engineering –

(Maths 16%, science 3%, electronics 6%, software 27%, computer systems 23%, project 10% and complementary studies 15%).

Computer Engineering –

(Maths 11%, science 5%, electronics 22%, software 15%, computer systems 18%, telecommunications 7% project 10% and complementary studies 12%).

Information and communications Engineering –

(Maths 12%, electronics 28%, telecommunications 23%, computers 20%, science 4%, project 10% and complementary studies 3%).

Computer Science/Info Technology –

(Maths 16%, software 20%, computer systems 18%, electronics 7%, science 3%, business 6%, telecommunications 8%, project 10% and complementary studies 12%).

Note – the individual Universities have the freedom to define and modify their own programmes and therefore the content percentages quoted above vary between the different Universities and also over time.

11.3.3 *Intermediate level, between honours bachelor and master*

In Ireland there is no formal level of qualification between the Honours Bachelors Degree and the Masters Degree. However, many of the Universities offer Higher Diploma or Graduate Diploma programmes. These are generally of one year's duration (60 ECTS credits) and tend to be at degree level for graduates who already hold a degree in a related discipline. Therefore they are sometimes referred to as conversion programmes or double degrees. They also tend to be quite specialised with the title accurately reflecting the content and are usually unique to the University offering the programme.

The following is a list of the EIE related Higher/Graduate Diplomas currently on offer :

    Higher Diploma in Microelectronics;
    Higher Diploma in Integrated Circuit Design – University College Cork;
    Graduate Diploma in Electronic Systems/Telecommunications Engineering – Dublin City University;
    Graduate Diploma in Software Engineering – University College Dublin;
    Graduate Diploma in Software Localisation – University;
    Graduate Diploma in Computer Engineering – University of Limerick;
    Graduate Diploma in Computing – University of Limerick;
    Higher Diploma in Information Technology – NUI Maynooth.

The individual Universities have the freedom to define and modify the contents of their programmes as opportunities arise and trends change.

11.3.4 *Master Level*

Masters Degrees can be obtained either by Research and Thesis or by means of a taught programme and typically takes one to two years. A wide range of research topics, which relate to the research interests of the faculty and ongoing research projects are available at each of the Universities.
Similarly the Taught Masters programmes tend to reflect the research strengths of the University offering the programme and therefore they tend to be quite specialized in their content.

The following is a list of the EIE related Masters programmes currently on offer at the Irish Universities:

    Microelectronic Engineering – University College Cork;
    Electronic Systems/Telecommunications Engineering – Dublin City University;
    Networks and Distributed Systems – Trinity College Dublin;
    Integrated Systems Design - Trinity College Dublin;
    Multimedia Systems – Trinity College Dublin;
    Computer Engineering – University of Limerick;

Computer and Communications Systems – University of Limerick;

VLSI Systems – University of Limerick;

Interactive Media – University of Limerick;

Software Engineering – NUI Maynooth, Athlone Institute of Technology;

Electronic Engineering – NUI Maynooth;

Information Technology – NUI Galway;

Software Design and Development – NUI Galway;

Software Engineering – University of Limerick, University College Dublin.

The individual Universities have the freedom to introduce new programmes or to modify existing programmes as opportunities arise and trends change.

11.3.5 *Doctorate Level*

The Doctorate or Ph.D. degree is the highest-level degree normally awarded by the Universities in Ireland. It is typically taken after the Masters degree and generally is of three years duration. In the EIE disciplines it is always taken by research and thesis and as with the Research Masters a wide range of research topics, which related to the research interests of the faculty and ongoing projects are available at each of the Universities.

11.4. References

The information given in this monograph is based on the following documents and web links:

• Engineers Ireland, which is the professional engineering body in Ireland. The web address is http://www.engineersireland.ie/.

Doctoral
Studies

11.5. Doctoral Studies in Ireland

11.5.1. Supervision

Scientific Board or Supervisor

Supervisor - same personal supervisor for the student's thesis work on an active/new research area of the department or the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

1. Any professor/lecturer in the department.

2. Internal or external researchers can be co-supervisors.

Tasks of Scientific Board/Supervisor

1. General management/monitoring   YES

2. Deciding/advising layout of course   NA

3. Assigning a thesis subject   YES

4. Responsible for monitoring student's progress. YES

Duration

Four years (typically), but usually with a minimum of three years.

11.5.2. Development

Courseware?

No. However the concept of a structured PhD programme, which will include coursework is currently being considered.

Course Work

1. The students don't have to take course work during their doctoral degree preparation. However, short training and induction programs for research students are usually provided. In addition where the student has a deficiency in a specific area some additional coursework might be prescribed.

2. Extension: not relevant.

3. Credit system: not relevant.

4. Monitoring: not relevant.

Contribution to Teaching

1. Supervision of undergraduate laboratory work (typically 4/6 hours per week).

2. In general, no teaching of undergraduate courses.

Presentation of Work

1. In the department.

2. At national conferences (actively encouraged).

3. At international conferences (dictated by availability of funding).

11.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language normally used: English. Alternative languages: Irish or other. Alternative language is subject to availability by faculty.

2. No credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

4. The possibility of the acceptance of a bound collection of previously published articles with an introduction and commentary is being considered.

Oral Presentation of Thesis Work

1. Language normally used: English. Alternative languages are possible, but subject to availability by the faculty.

2. Oral presentation to interested staff and/or a closed audience. There is an oral examination with only student and examiners present.

3. Duration: typical duration of 3 hours with no upper time limit.

11.5.4. Examination

Thesis Examination Board

1. Composition: one internal examiner, one external examiner, the Chair, supervisor and possible Assistant Dean (4 or 5 members).

2. Selection in consultation with the Head of Department, Assistant Dean and Dean.

3. Decision ratified by the Examination Board and the Academic Council.

Evaluation

1. Result based on the reading of the thesis and the oral presentation of the thesis work, with n grading system for the doctoral degree.

2. Possible outcomes: *(i) Award degree with no corrections needed; (ii) Award degree subject to minor corrections usually verified by internal examiner; (iii) Refer back to student for major corrections examined by internal and external examiners, oral at their discretion; (iv) Reject, but allow student do additional work and resubmit thesis within 12 months with full thesis and oral examination; (v) Reject.*

11.6. Questionnaires

Ireland

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	Superv. only
3.1.2	**How many members are in the Scientific Board?**	NA
3.1.3	How are the members of the Scientific Board chosen?	**NA**
3.1.3.1	Elected by the Faculty, Department?	NA
3.1.3.2	Chosen by the student?	NA
3.1.3.3	Chosen in another way? Please specify:	NA
	(Additional note: if the supervisor is an active member of specific research project or centre, other members of the project team may contribute to the supervision.)	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	NA
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	
	(Additional note: if the project is such that a supervisory team is involved, then the responsibility of the team would be to ensure the quality and rigour of the supervision process and the quality of the student experience.)	
3.1.5	Does the student need a personal supervisor during her/his studies?	YES
3.1.5.1	Does the same person supervise her/his thesis work?	YES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.6 Must the subject of the doctoral thesis be an active research area in the department?   YES

(Additional note: it may on occasions be a new research area, but one in which the supervisor would have expertise.)

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?   YES

3.1.7.2 After a specified period of coursework?   NA

3.1.7.3 Other. Please specify:

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?   YES[1]

3.1.8.2 Any researcher in the department?   YES[2]

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?   YES[3]

3.1.8.3 Any researcher in another institution?   YES[4]

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?   YES[5]

3.1.8.4 Other methods. Please specify:

[1] (though must have a PhD themselves); [2] YES, but usually as a co-supervisor; [3] YES, but usually as the principal supervisor; [4] YES, but as 3.1.8.2. above; [5] YES, but see 3.1.8.2.1 above.

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?   YES

3.1.9.2 Other methods. Please specify:

3.2- COURSE WORK

3.2.1	Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.			NO	

3.2.2   **Extension and assessment.**

		Year 1	**Year 2**	**Year 3**	**Year 4**
3.2.2.1	What is the number of contact hours spent in coursework in each year?				
		hrs	**hrs**	**hrs**	**hrs**

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3   Is the coursework assessed by examinations?
If not, please give details:

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?

3.2.3.2   Is it the ECTS system?

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?   credits

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

YES

3.3.2   At national conferences.

YES[6]

3.3.3   At international conferences.

YES[7]

[6] YES – actively encouraged. [7] YES – if feasible, but usually dictated but availability of funding.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

YES[8]

3.4.2   Teaching undergraduate courses.

NO[9]

[8] YES, typically 4/6 hours per week. [9] NO, in general, but may in exceptional circumstances.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1   Which language is normally used for the thesis?

English

4.1.2   Are alternative languages used for the thesis?
Please Specify:

YES

IRISH or another language, subject to availability of faculty with competence in the language concerned.

4.1.3   Which language is normally used for the oral presentation and/or examination?

English

4.1.4   Are alternative languages used in the oral presentation and examination?
Please Specify:

NO

NO in general, but see 4.1.2. above.

4.1.5   Are credits allocated to the doctoral thesis?

NO

4.1.6   **The doctoral thesis is:**

4.1.6.1   A previously unpublished substantial written report.

YES

4.1.6.2   A collection of individual or co-authored scientific papers with an introduction and/or commentary.

NO[10]

4.1.6.3   Other. Please specify:

[10] NO, at present, but being considered.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1   Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?   NO

NO – closed audience.

4.2.2   Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1   Internal examiners.

1

4.2.2.2   External examiners.

1^{11}

4.2.2.3   TOTAL.

4 or 5

[11] Internal examiners: one; external examiners: one plus Chair, supervisor and possible, Assistant Dean, Research for the Faculty.

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   NO

4.2.3.2   By the scientific committee of the institution.   NO

4.2.3.3   By the rector or equivalent.   NO

4.2.3.4   By the national ministry.   NO

4.2.3.5   Other. Please specify:

In consultation with the Head of Department, Assistant Dean, Dean.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   YES[12]

4.2.4.2   The oral presentation of the thesis work.   YES[12]

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   3 hours[13]

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   NO

[12]YES, both. [13] Variable, typically 3 hours.

4.2.5   Is the oral part of the examination taken behind closed doors?   YES

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1	May not resubmit for doctorate.	See **below**
4.2.6.2	May resubmit revised thesis.	See **below**
4.2.6.3	May do further work as specified by examination board.	See **below**
4.2.6.4	If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:	See **below**

The Following are the possible outcomes of the PhD Examination:
(i) Award degree with no corrections needed.
(ii) Award degree subject to minor corrections being carried out
(Usually verified by internal examiner).
(iii) Refer back to student for major corrections (usually a major rewrite of thesis).
(Examined by internal and external examiners, oral at their discretion).
(iv) Reject, but allow student do additional work and resubmit thesis (within 12 months). Full thesis and oral examination.
(v) Reject.

4.2.7	Is there a grading system for the doctoral degree based on the quality of the work?	NO

12. IS: Lýðveldið Ísland (Republic of Iceland)

Author: Karl Gudmundsson (University of Iceland, karlsg@hi.is)

12.1. General information

A fundamental principle of the Icelandic education system is that everyone shall have equal opportunities to acquire education irrespective of sex, economic status, geographic location, religion, cultural or social background. Education is compulsory (primary and lower secondary education) from age 6 through age 16, i.e. for 10 years. Emphasis is placed on providing the opportunity for upper secondary education and everyone has the legal right to enter school at that school level irrespective of results at the end of compulsory schooling.

The educational system is divided into four levels: *Leikskóli* (pre-school) up till 6 years of age, *grunnskóli* (compulsory - primary and lower secondary in a single structure) 6 – 16 years of age, *framhaldsskóli* (upper-secondary) 16 – 20 years of age and *háskóli* (higher education level) from 20 years of age.

Compulsory school is divided into ten grades. Officially there is no selection or streaming by ability and children automatically go up from one grade to the next according to age. Three types of schools are the most common: schools that have all ten grades, schools that have grades one to seven and schools that have grades eight to ten. Schools that have grades eight to ten are often merger schools, i.e. they take in pupils from more than one school in the catchment area that has grades one to seven.

Nationally co-ordinated examinations at the end of compulsory education are optional, i.e. the pupils can choose if and how many nationally co-ordinated examinations they take. Pupils are able to choose between examinations in six subjects, i.e. Icelandic (*íslenska*), Danish (*danska*), English (*enska*), mathematics (*stærðfræði*), natural sciences (*náttúrufræði*) and social sciences (*samfélagsgreinar*). These examinations are composed, marked and organised by the Educational Testing Institute.

The purpose of these examinations is primarily to indicate the pupil's standing at the completion of his compulsory education and to assist her/him in choosing a course of upper-secondary study. The student also receives separate grades in these subjects from his school.

Admission requirements to different branches of study at the upper secondary level may be different, according to what academic demands are made by the branch of study in question.

The general admission requirements for the academic programmes are: students must have taken a nationally co-ordinated examination in Icelandic and Mathematics and in additional two subjects, depending on the programme they choose.

There are four types of branches of study at upper secondary school level: academic branches of study leading to stúdentspróf (matriculation examination), vocational branches of study, fine arts branches of study, and a short general branch of study. The branches of study are of differing lengths, from one to eight semesters. Each branch of study is organised into core subjects, elected fields and free selection. Pupils in art and vocational programmes have the possibility of doing additional studies to complete the *stúdentspróf* (matriculation examination).

The main types of upper secondary schools are as follows:

- *Menntaskólar* (grammar schools) which offer a four-year academic course of study concluding with a stúdentspróf (matriculation examination), i.e. a university entrance examination.
- *Fjölbrautaskólar* (comprehensive schools) which offer an academic course comparable to that of the grammar schools concluding with a matriculation examination. These schools offer also theoretical and practical training as in the industrial-vocational schools (see below) and, in addition, some other programmes providing vocational and artistic education.
- *Iðnskólar* (industrial-vocational schools), which offer theoretical and practical programmes of study in the certified and some non-certified trades.
- *Sérskólar* (specialised vocational schools) which offer specialised programmes of study as preparation for specialised employment.

Most of the upper secondary institutions are public, run by the state, but some are private, the private schools are also funded by the state. Some of the secondary schools offer adult/evening education and one of them offers the International Baccalaurate. One of the private secondary schools offers the academic course curriculum in two calendar years instead of four academic years.

The Icelandic term "*háskoli*" is used to refer both to traditional universities and institutions which do not have research responsibilities. Consequently there is not a formal distinction between non-universities and universities among higher education institutions.

At present there are seven higher education institutions in Iceland. Most of them are run by the state. Three of them are semi-private, receive government grants, but have private boards and charge tuition. One is multifaculty university, three have three to five faculties and the remaining three are specialized higher education institutions.

Students commencing university study in Iceland must have completed a stúdentspróf (matriculation examination) or comparable course of studies, or have an equivalent level of maturity and knowledge in the estimation of the administration of the university in question.

It must be ensured that university entrance requirements and study standards correspond to what is currently demanded in recognised universities in similar fields abroad.

Universities may set specific additional entrance requirements if necessary, including requiring students who fulfil the above-mentioned requirements to sit for entrance examinations or assessment examinations.

Different methods may be used for selecting students at universities: In some cases everyone who fulfils the entrance requirements may register. In other cases everyone who fulfils the entrance requirements may register, but competitive examinations are held after the first semester (*numerus clausus*). Some institutions choose the best students based on the applications, while entrance examinations are used in others.

12.1.1 *Electrical and Information Engineering in Iceland, boundaries of the field of study*

Electrical and Computer Engineering has traditionally included all disciplines at Departments of Electrical Engineering. It means Power Engineering, Electronics, Automation and Systems Control, and Communications Engineering. In 1988 a new department of Computer Science was launched which later offered a programme in Software Engineering, besides Computer Science. Computer Science programmes are now offered by three universities in Iceland but the University of Iceland is still the only one that offers degrees in Electrical and Computer Engineering.

12.1.2 *Content, degrees and accreditations*

A workload based credit system was introduced in the 70's. In the system 30 credits denoted full time studies for one year. ECTS was used for transfer, one Icelandic credit equivalent to two ECTS credits. A new credit system was implemented in 2006, based on workload as before, but now 60 credits are allocated for one year full time studies. Teaching in universities shall be organised in courses, which are evaluated in standardised course credits. Universities decide which programmes of study they offer within their certified fields of study

The Minister of Education, Science and Culture issues a National Qualification Framework for Iceland. Universities are required to issue a learning-outcome description, for every study programme they offer, and this description must fulfil the requirements set for that specific level in the NQF.

12.1.3 _Implementation of the Bologna-BMD system in Iceland_

A three cycle system was already in existence in Iceland before the Bologna process. A 1.5 to 2 years masters degree was implemented in 1923 and a 3 to 4 year bachelor degree was implemented in 1942. Most disciplines used the bachelor-masters system although some used the older 4 to 6 years, one tier _candidatus_ degree. Today the one tier _candidatus_ degree is only used in Medicine and Dentistry. The Faculty of Engineering, established in the early forties, offered a four year _candidatus_ degree until 1997 when it implemented the bachelor-masters system.

12.2. Figures on the weight of EIE in Iceland

In 2007 9.786 students in all disciplines were enrolled in the University of Iceland. Of these 245 were enrolled in Electrical and Computer Engineering, Software Engineering or Computer Science.

12.3. Degrees in EIE in Iceland

	BS (3 years)	MS (2 years)	Ph.D. (3 years)	Polytechnic BS (3.5 years)
Computer Science	3	2	1	
Software Engineering	2	2	1	
Electrical and Computer Engineering	1	2	1	1

Number of schools awarding degrees in EIE.

12.4 References

http://www.hi.is
http://www.unak.is
http://www.ru.is

Doctoral
Studies

12.5. Doctoral Studies in Iceland

12.5.1. Supervision

Scientific Board

The Scientific board has at least three members elected by the Faculty/Department. The student has the same personal supervisor during his thesis work on an active research area of the department. Supervisor is professor leading research in some area. Doctor students are coming to do research on area of his supervising professor. Of course there are no strict limitations.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, or after a specified period of coursework. Sometimes after 1 or 2 years of research dealing with thesis it might be necessary to trim the subject of thesis. The thesis subject is assigned by agreement between the student and the supervisor.

Who can be a Supervisor

The official supervisor, who is responsible for the guidance of the doctoral student, must have an official position at the university. The supervisor is normally a professor or docent. There could be other tutors to help the official supervisor in guiding the doctoral student.

Tasks of Scientific Board/Supervisor

1.   General management   YES

2.   Deciding/advising layout of course   YES

3.   Assigning a thesis subject   YES

Duration

Three years.

12.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation offered as specialist graduate course units. The course work in some cases can be assessed by examinations and/or by projects. If the student fails in the course work, he/she can retake the exam, or take a different course unit.

2. Extension: not available.

3. Credit system: ECTS. 60 credits are allocated to the course work:

4. Monitoring of the doctoral student taking coursework.

Contribution to Teaching

1. Supervision of undergraduate laboratory work.

2. Tutoring of undergraduate groups.

3. Marking of undergraduate assessments/homework.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

Other: by publishing papers in international scientific magazines, in national papers and research reports at our university.

12.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language normally used: English. All doctoral theses so far have been written and published in English and oral presentation delivered in English. Rules for the Ph.D. programmes in engineering require one of the two opponents at the doctoral defence to come from an international university or research institute and so English is a de facto language for the Ph.D. programmes.

2. Credits are allocated to the doctoral thesis.

3. The doctoral thesis can be a previously unpublished substantial written report (monograph), or a collection of individual or co-authored scientific papers with an introduction and/or commentary.

Oral Presentation of Thesis Work

1. Language normally used: English.

2. Oral presentation with oral examination for an open/public audience.

3. Duration: typical duration of 2 hours.

12.5.4. Examination

Thesis Examination Board

1. Composition: At least two external examiners, one of them from an international research institute.

2. Selection the faculty committee chooses the examination board, upon recommendation of the faculty science committee and the supervisor**.**

Evaluation

1. Result based on the reading of the thesis and the oral presentation of the thesis work, with a mark of "Fail" or "Pass".

2. If the student fails, he/she may resubmit a revised thesis. The student may not resubmit for doctorate. Reviewers give their statement if the thesis has scientifically good quality to be published or not. In this phase the thesis is revised so that the scientific committee of the institution can give the permit to publish the thesis. That is why it is unheard of the candidate failing in public defence.

12.6. Questionnaires

Iceland

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	At least 3
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	YES
3.1.3.2	Chosen by the student?	NO
3.1.3.3	Chosen in another way? Please specify:	NO
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	YES
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	YES[1]
3.1.5.1	Does the same person supervise her/his thesis work?	YES
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	YES[2]

[1] Supervisor is a professor in department where doctoral student is aiming to do his thesis.
[2] Supervisor is professor leading research in some area. Doctor students are coming to do research on area of his supervising professor. Of course there are no strict limitations.

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

YES

3.1.7.2   After a specified period of coursework?

YES[3]

3.1.7.3   Other. Please specify:

[3] Sometimes after 1 or 2 years of research dealing with thesis it might be necessary to trim the subject of thesis.

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

NO[4]

3.1.8.2   Any researcher in the department?

NO

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

NO

3.1.8.3   Any researcher in another institution?

NO

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

NO

3.1.8.4   Other methods. Please specify:

[4] The official supervisor, who is responsible for the guidance of the doctoral student, must have an official position at the university. The supervisor is normally a professor or docent. There could be other tutors to help the official supervisor in guiding the doctoral student.

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

YES[5]

3.1.9.2   Other methods. Please specify:

[5] The scientific board of the faculty gives the permit to publish the thesis. At this phase the final name of the thesis is given if it is not clear already. The scientific board also nominates two reviewers for the thesis from other organisations. Reviewers give their statement about the scientific quality of thesis and propose the permit for publication or not. After the permit for publication there is a public defence of the thesis. The doctor candidate defends his thesis against the opponent. The opponent is also nominated by the scientific board and he has to be from other organisation. After the public defence of the thesis the opponent gives his statement about the defence. If it is passed then the scientific board will accept the thesis and give the grade to the candidate about his thesis.

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

YES

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	Year 2	Year 3	Year 4
hrs	hrs	hrs	hrs

The Ph.D. student has to take 60 ECTS credits of coursework, in consultation with his supervisor and scientific board. Assessments are done by exams and/or by projects.

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.

YES

- As course units taken from the undergraduate programme.

NO

- Other. Please specify.

3.2.2.3   Is the coursework assessed by examinations? If not, please give details:

YES and NO

3.2- COURSE WORK

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?

YES

3.2.3.2   Is it the ECTS system?

YES

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?

Total of 60 credits

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?

YES

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

YES[6]

- Take a different course unit.

YES[6]

[6] Normally this isn't a problem.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

YES[7]

3.3.2   At national conferences.

YES[8]

3.3.3   At international conferences.

YES

[7] YES, methods vary; [8] YES, if any. Other: by publishing papers in international scientific magazines, in national papers and research reports at our university.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

YES

3.4.2   Teaching undergraduate courses.

YES

Tutoring undergraduate groups, marking of undergraduate assessments/homework, and all normal teaching activities.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

| 4.1.1 | Which language is normally used for the thesis? | English |

| 4.1.2 | Are alternative languages used for the thesis?
Please Specify: | NO |

All doctoral theses so far have been written and published in English and oral presentation delivered in English. Rules for the Ph.D. programmes in engineering require one of the two opponents at the doctoral defense to come from an international university or research institute and so English is a de facto language for the Ph.D. programmes.

| 4.1.3 | Which language is normally used for the oral presentation and/or examination? | English |

| 4.1.4 | Are alternative languages used in the oral presentation and examination?
Please Specify: | NO |

| 4.1.5 | Are credits allocated to the doctoral thesis? | YES |

4.1.6 **The doctoral thesis is:**

| 4.1.6.1 | A previously unpublished substantial written report. | YES |

| 4.1.6.2 | A collection of individual or co-authored scientific papers with an introduction and/or commentary. | YES |

| 4.1.6.3 | Other. Please specify: | |

4.2- THESIS EXAMINATION AND DEGREE AWARDING

| 4.2.1 | Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure? | YES |

Yes, it is a public defence.

| 4.2.2 | Composition of the thesis examination board. Please, give the typical number of: | |

| 4.2.2.1 | Internal examiners. | * |

| 4.2.2.2 | External examiners. | 2 |

| 4.2.2.3 | TOTAL. | |

The scientific board along with the faculty committee review the thesis before it is accepted to a defence. For the doctoral defence two opponents are required. They act too as reviewers.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3	How is the examination board chosen?	
4.2.3.1	By the supervisor.	YES
4.2.3.2	By the scientific committee of the institution.	YES
4.2.3.3	By the rector or equivalent.	
4.2.3.4	By the national ministry.	
4.2.3.5	Other. Please specify:	YES
	The faculty committee chooses the examination board, upon recommendation of the faculty science committee and the supervisor.	
4.2.4	Do the examiners base their evaluation mark on:	
4.2.4.1	Reading the thesis.	YES
4.2.4.2	The oral presentation of the thesis work.	YES
4.2.4.3	Both.	
4.2.4.4	What is the typical duration of the oral part of the thesis examination, if applicable?	2 hours
4.2.4.5	Is there an upper limit to the duration of the thesis examination?	NO
4.2.5	Is the oral part of the examination taken behind closed doors?	No, it is public.
4.2.6	What happens if the student fails?	
4.2.6.1	May not resubmit for doctorate.	YES[9]
4.2.6.2	May resubmit revised thesis.	MAYBE
4.2.6.3	May do further work as specified by examination board.	NO
4.2.6.4	If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:	YES/NO

[9] Reviewers give their statement if the thesis has scientifically good quality to be published or not. In this phase the thesis is revised so that the scientific committee of the institution can give the permit to publish the thesis. That is why it is unheard of the candidate failing in public defence.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.7	Is there a grading system for the doctoral degree based on the quality of the work? **Only "Pass" or "Fail".**	YES

13. IT: Italia (Italy)

Authors: D. GIUSTO (Università degli Studi di Cagliari, ddgiusto@unica.it)
and Cristian PERRA (Università degli Studi di Cagliari, cperra@diee.unica.it)

13.1. General information

Italian students have access to EIE University courses if they have completed a five year secondary school. Each University has its own courses and subjects. "*Laurea di primo livello*", "*Laurea specialistica*" and "*Dottorato di Ricercerca*" are, respectively, the Italian terms for "Bachelor", "MSc" and "Doctorate".

Figure 13.1: Italian Higher Education System in EIE disciplines.

13.1.1 Electrical and Information Engineering in Italy, boundaries of the field of study

The subjects present in Italian universities are:
- Electrical engineering
- Electronic engineering
- Computer sciences engineering
- Telecommunication engineering
- Bio-Medical engineering
- Automation engineering
- Information engineering
- Computer science and automation engineering
- Management engineering
- Computer science and bio-medical engineering

- Computer science and telecommunication engineering
- Physics engineering
- Mathematical engineering
- E-business engineering

13.1.2 *Content, degrees and accreditations*

In Italy, each University manages each degree course (Bachelor, Master, Doctorate) through the relevant council of professors (one for each course of studies), who define a curriculum, following some basic rules issued by the Italian Minister of University. The curriculum has then to be approved by the relevant Faculty.

13.1.3 *Implementation of the Bologna-BMD system in Italy*

In Italy, the Bologna-BMD organization has been active since 1999, overlapping the old organization (5-8) till 2003 or later (depending on when each University adopted this reform). Of course, students that did prefer not to change the organization of their studies, will be able to graduate also in the future, in the sense that no teaching activities will be provided for them after five years from adoption of the reforms, but they will be allowed to do exams.

13.2. Figures on the weight of EIE in Italy

Detailed statistics on Italian universities are on line available at the Ministry of Education, University and Research web site (http://www.miutr.it/ustats).
The following table shows the number of MSc degrees in Italy for the year 2001.

	Absolute value	
Electronic Engineering	1.349	51,45%
Information Engineering	545	20,79%
Telecommunication Engineering	385	14,68%
Electric Engineering	343	13,08%
Total	**2.622**	**100,00%**
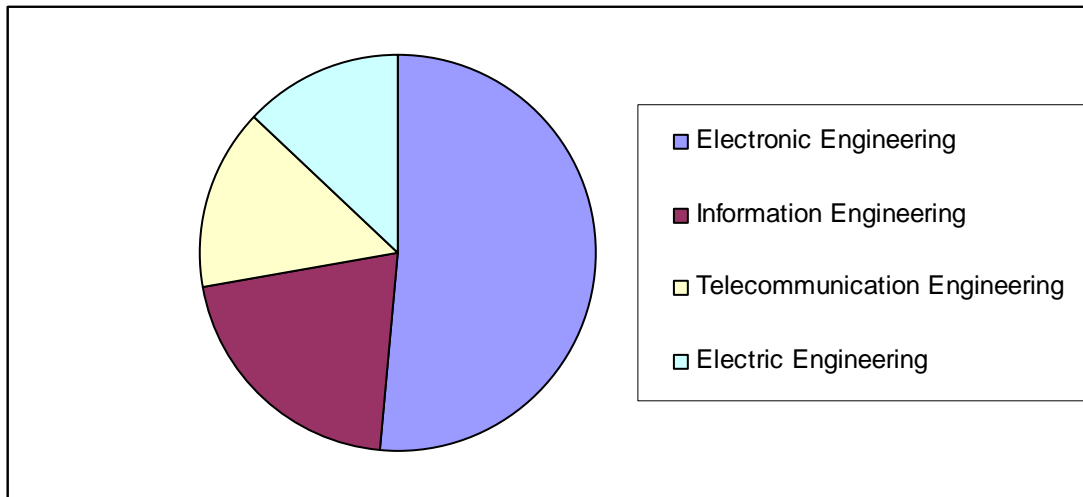
13.3. Degrees in EIE in Italy

Since 1999 the degrees in EIE are based on the new Bologna-BMD scheme. Bachelor is a title given by Italian universities after the completion of 6 semesters of courses. In order to obtain such a title, students must accumulate a total of 180 credits from courses, thesis and other related activities approved by the University. MSc is a title given by Italian universities, after the completion of another 4 semesters where the students must reach a total of 300 credits (180 from the first three years and 120 in the last two years).

The reference for the following courses and institution can be found in: http://www.miur.it/.

A Automation engineering

B Bio-Medical engineering

C Computer science and automation engineering

D Computer science and bio-medical engineering

E Computer science and telecommunication engineering

F Computer sciences engineering

G E-business engineering

H Electrical engineering

I Electronic engineering

J Information engineering

K Management engineering

L Mathematical engineering

M Physics engineering

N Telecommunication engineering

O Computer science and electronic

P Management and information engineering

13.3.1 *Bachelor level*

Bachelor in Automation engineering

Bachelor in Bio-Medical engineering

Bachelor in Computer science and automation engineering

Bachelor in Computer science and bio-medical engineering

Bachelor in Computer science and telecommunication engineering

Bachelor in Computer sciences engineering

Bachelor in E-business engineering

Bachelor in Electrical engineering

Bachelor in Electronic engineering

Bachelor in Information engineering

Bachelor in Management engineering

Bachelor in Mathematical engineering

Bachelor in Physics engineering

Bachelor in Telecommunication engineering

Bachelor in Computer science and electronic

Bachelor in Management and information engineering

13.3.2 *Master level*

Master in Automation engineering

Master in Bio-Medical engineering

Master in Computer science and automation engineering

Master in Computer science and bio-medical engineering

Master in Computer science and telecommunication engineering

Master in Computer sciences engineering

Master in E-business engineering

Master in Electrical engineering

Master in Electronic engineering

Master in Information engineering

Master in Management engineering

Master in Mathematical engineering

Master in Physics engineering

Master in Telecommunication engineering

Master in Computer science and electronic

Master in Management and information engineering

13.4. References

The information given in this monograph is based on the following documents and web links:

http://www.miur.it/, Ministry of Education, University and Research

http://www.miur.it/ustat/, Ministry of Education, University and Research

http://almalaurea.cineca.it/universita/profilo/profilo2001/dati/laureatiper_cdl.html

Doctoral
Studies

13.5. Doctoral Studies in Italy

13.5.1. Supervision

Scientific Board or Supervisor

The Scientific board is composed by 16 members elected by the Faculty/Department. The student has the same personal supervisor during its thesis work on an active research area in the department.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

1. Any professor/lecturer in the department.

2. No internal or external researchers can supervise doctoral studies.

Tasks of Scientific Board/Supervisor

1. General management   YES

2. Deciding/advising layout of course   YES

3. Assigning a thesis subject   YES

Duration

Three years.

13.5.2. Development

- 263 -

Courseware?

No.

Course Work

1. The students don't have to take course work during their doctoral degree preparation. The course work can be assessed by examinations.

2. Extension: no information available.

3. Credit system: no information available.

4. There could be some monitoring of the performance of the doctoral student.

Contribution to Teaching

Supervision of undergraduate laboratory work.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

13.5.3. Thesis

Submission of Doctoral Written Thesis

1. <u>Language</u>: Italian. Alternative language: English.

2. <u>No credits</u> allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1. <u>Language</u> normally used: Italian. Alternative language: English.

2. Oral presentation for an open audience with oral examination at open doors.

3. <u>Duration</u>: typical duration of 1.5 hours with no upper time limit

13.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: two internal examiners and one external examiner (three members).

2. <u>Selection</u> by the scientific committee of the institution or by the rector or equivalent.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with a grading system.

2. <u>If the student fails</u>, he/she may resubmit a revised thesis within a time limit. The time limit is not explicitly defined.

13.6. Questionnaires

Italy

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	16
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	YES
3.1.3.2	Chosen by the student?	NO
3.1.3.3	Chosen in another way? Please specify:	NO
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	YES
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	YES
3.1.5.1	Does the same person supervise her/his thesis work?	YES
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	YES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

YES

3.1.7.2   After a specified period of coursework?

NO

3.1.7.3   Other. Please specify:

NO

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

YES

3.1.8.2   Any researcher in the department?

NO

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

NO

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

NO

3.1.8.4   Other methods. Please specify:

NO

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

YES

3.1.9.2   Other methods. Please specify:

NO

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

NO

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
hrs	**hrs**	**hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

        - As specialist graduate course units.

        - As course units taken from the undergraduate programme.

        - Other. Please specify.

3.2.2.3	Is the coursework assessed by examinations? If not, please give details:	Y/N

3.2.3   **Credit system**

3.2.3.1	Is the coursework in your institution described by a credit system?	Y/N
3.2.3.2	Is it the ECTS system?	Y/N
	If not, what is the relationship with ECTS?	
3.2.3.3	How many credits are allocated to coursework?	**credits**

3.2.4   **Monitoring**

3.2.4.1	Do you monitor the performance of the doctoral student taking coursework?	Y/N

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

        - Retake the exam.

        - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1	In the department.	YES
3.3.2	At national conferences.	YES
3.3.3	At international conferences.	YES

3.4- CONTRIBUTION TO TEACHING:

3.4.1	Supervision of undergraduate laboratory.	YES
3.4.2	Teaching undergraduate courses.	NO

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1   Which language is normally used for the thesis?

ITALIAN

4.1.2   Are alternative languages used for the thesis?
Please Specify:

YES

English.

4.1.3   Which language is normally used for the oral presentation and/or examination?

ITALIAN

4.1.4   Are alternative languages used in the oral presentation and examination?
Please Specify:

YES

English.

4.1.5   Are credits allocated to the doctoral thesis?

NO

4.1.6   **The doctoral thesis is:**

4.1.6.1   A previously unpublished substantial written report.

YES

4.1.6.2   A collection of individual or co-authored scientific papers with an introduction and/or commentary.

NO

4.1.6.3   Other. Please specify:

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1   Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?

YES

4.2.2   Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1   Internal examiners.

2

4.2.2.2   External examiners.

1

4.2.2.3   TOTAL.

3

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

NO

4.2.3.2   By the scientific committee of the institution.

YES

4.2.3.3   By the rector or equivalent.

YES

4.2.3.4   By the national ministry.

NO

4.2.3.5   Other. Please specify:

NO

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.

YES

4.2.4.2   The oral presentation of the thesis work.

YES

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?

1.50 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

NO

4.2.5   Is the oral part of the examination taken behind closed doors?

NO

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

NO

4.2.6.2   May resubmit revised thesis.

YES

4.2.6.3   May do further work as specified by examination board.

NO

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:
[1] Not explicitly defined.

YES[1]

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?

YES

14. LT: Lietuva (Lithuania)

Author: Romanas KRIVICKAS (EAEEIE, Kauno technologijos universitetas,

rkr@soften.ktu.lt)

14.1. General information

Higher education is divided into undergraduate, graduate, and doctoral studies. Universities award Bachelor's, Master's and Doctor's degrees.

Undergraduate studies (160 credits = 240 ECTS credits) lead to a Bachelor's (*Bakalauras*) degree.

Master's (*Magistras*) degree is awarded for an individual who has received a Bachelor's degree and conducted the 60 to 80 (90 to 120 ETCS) credits study programme in one and a half or two years, acquiring a special training and skill for research.
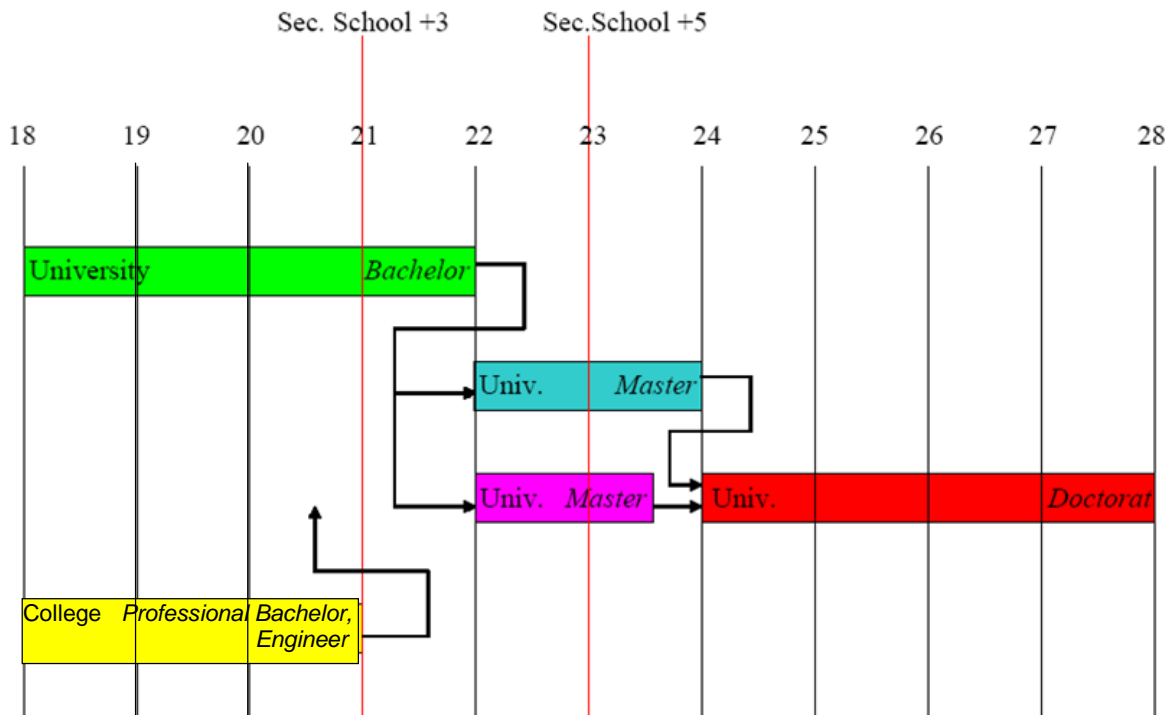
Figure 14.1: Lithuanian Higher Education System in EIE disciplines.

The Doctor of Science (*Mokslu daktaras*) degree (D.Sc), which equates with a Ph.D., takes a further three or four years to acquire and is only awarded to those whose research provides a significant and original contribution in the selected field.

Higher non-university technical education is offered in colleges. Technical colleges award Professional Bachelor, Engineer's degree (*Profesinis bakalauras, Inžinierius*) (120 credits = 180 ECTS credits).

The academic year consists of an autumn and spring semester.

The autumn semester starts on September 1 for 16 weeks followed by Christmas vacation and four weeks winter exam session.

The spring semester starts at the beginning of February for 16 weeks with four weeks spring exam session.

The basic unit of a study programme is a course module. It may involve various forms of study: lectures, laboratory work, practice, tutorials, seminars, independent study, research, projects, other work or a combination of some of these. The duration of a course module is one semester.

The measure of a course module and all course plans is a credit. One credit corresponds to 40 hours of a student's work.

Two credits are equivalent to 3 ECTS credits.

14.1.1 *Electrical and Information Engineering in Lithuania, boundaries of the field of study*

- Electrical Engineering,
- Electronics Engineering,
- Information Engineering.

14.1.2 *Content, degrees and accreditations*

The guidelines for higher engineering education study programmes are defined by legislation.

The study programmes are developed by universities and registered at the Department of Science and Higher Education of Lithuanian Republic.

The Lithuanian Centre for Quality Assessment in Higher Education is in charge for the quality of study programmes.

The study programmes should be available on the web sites of the universities.

14.1.3 *Implementation of the Bologna-BMD system in Lithuania*

As implementation of Bologna system is still in progress, the following changes have taken place:
- The three level system of higher education was introduced.
- An advanced system of credits for measuring the amount of study and promoting student exchange was introduced.

- A ten-point grading scale assessment system was introduced.
- An external assessment system for the quality of studies was introduced.
- The content of education has been updated - the system has become more flexible, students are offered more choice, more time is provided for the students' individual work.
- Universities and colleges are using ECTS credits in student exchange.

14.2. Figures on the weight of EIE in Lithuania

* see the list of universities given in appendix A

Official number of students, October 1, 2007

Professional Bachelor, Engineer

Engineering	KK	KVTK	ŠK	PK	VK	KTK	UK	AK	ŽK	Total	%
Electrical	61	146	91	127		169	-	-	-	594	25.58
Electronics					278	73	-	-	-	351	15.12
Information	93		181	178	569		156	160	40	1377	59.30
Total	154	146	272	305	847	242	156	160	40	2322	100

Bachelor

Engineering	KUT	VGTU	KU	SU	VU	Total	%
Electrical	482	291	176	104	-	1053	28.54
Electronics	406	890	-	193	153	1642	44.51
Information	436	243	92	223	-	994	26.95
Total	1324	1424	268	520	153	3689	100

Master

Engineering	KUT	VGTU	KU	SU	VU	Total	%
Electrical	227	76	11	-	-	314	26.34
Electronics	165	140	-	21	31	357	29.95
Information	343	178	-	-	-	521	43.71
Total	735	394	11	21	31	1192	100

.

	Engineering	EIE
Professional Bachelor, Engineer	6054	2322
Bachelor	10541	3689
Master	2314	1192

14.3. Degrees in EIE in Lithuania

14.3.1 Professional Bachelor, Engineer (technician) level

Professional Bachelor, Engineer (non-university higher education, three years after secondary school)

- *Electrical Engineering*

    Automatic control (KK)

    Electrical and automation equipment (PK, KVTK, SK)

- *Electronics Engineering*

Electronics Engineering (KTK, VK)

Telecommunications (VK)

• *Information engineering*

Computer Engineering (VK, ZK, PK)

Information systems (PK, VK)

Informational Systems Technology (UK, SU, AK)

Administration of computer network (AK, KK)

14.3.2 Bachelor level

Bachelor *(four years after secondary school) in:*

• *Electrical Engineering*

Electrical Engineering (KTU, KU, SU)

Automation and Control (KTU, VGTU)

Electric Power Technology (KTU)

• *Electronics Engineering*

Electronics Engineering (KTU, VGTU, SU)

Electronics Engineering and Management (KTU)

Telecommunications (KTU)

Telecommunication Engineering (VGTU)

Telecommunication Physics and Electronics (VU)

Computer Engineering (VGTU)

• *Information Engineering*

Information Engineering (KTU, KU, SU) :

Information Technologies (SU)

Information System Engineering (VGTU).

14.3.3 Master level

Master (two or one and a half years after bachelor level) in:

• *Electrical Engineering*

Electric Power Engineering (KTU)

Electric Power System Engineering (VGTU)

Control Engineering (KTU)

Control Technologies (KTU)

Industrial Power Equipment and Automation (KU)

Marine Power Equipment and Automation (KU)

Automation (VGTU)

• *Electronics Engineering*

Applied Electronics (KTU)

Electronics (VGTU)

Electronics Engineering (KTU

Engineering Electronics (KTU

Signal Technology (KTU)

Radioengineering (SU)

Telecommunications (KTU)

Telecommunication Systems (KTU)

Telecommunication Engineering (VGTU)

Telecommunication Physics and Electronics (VU)

Computer Engineering (VGTU)

• *Information Engineering*

Information Technologies (KTU, VGTU)

Information System Engineering (KTU)

Software Engineering (KTU)

Distance Learning Information Technologies (KTU, VGTU)

Business Process Management Technologies (VGTU)

Single-Chip Systems (KTU)

14.3.4 Doctor level (three or four years after master level)

• *Electrical and electronics engineering*

• *Information Engineering*

Abbreviations

- *AK - Alytaus kolegija / Alytus College*
- *KK - Kauno kolegija / Kaunas College*
- *KTK - Kauno technikos kolegija / Kaunas Technical College*
- *KVTK - Klaipėdos verslo ir technologijų kolegija / Klaipeda Business and Technology College*
- *PK - Panevėžio kolegija / Panevezys College*
- *SK - Šiaulių kolegija / Siauliai College*
- *VK - Vilniaus kolegija / Vilnius College*
- *UK - Utenos kolegija / Utena College*
- *ZK - Žemaitijos kolegija / Zemaitija College*
- *KTU / Kauno technologijos universitetas / Kaunas University of Technology*
- *KU - Klaipėdos universitetas / Klaipeda University*
- *SU - Šiaulių universitetas / Siauliai University*
- *VGTU - Vilniaus Gedimino technikos universitetas / Vilnius Gediminas Technical University*
- *VU - Vilniaus universitetas / Vilnius University*

14.4. References

The information given in this monograph is based on the following documents and web links:

- http://www.aikos.smm.lt/aikos/webdriver.exe?MIval=/DizPirmas.html
- http://www.ktu.lt
- http://www.vgtu.lt
- http://www.vu.lt
- http://www.su.lt
- http://www.ku.lt
- http://www.akolegija.lt
- http://www.kauko.lt
- http://www.ktk.lt
- http://www.viko.lt
- http://www.klvtk.lt
- http://www.siauliukolegija.lt
- http://www.panko.lt
- http://www.utenos-kolegija.lt
- http://www.zemko.lt

Doctoral
Studies

14.5. Doctoral Studies in Lithuania

14.5.1. Supervision

Scientific Board or Supervisor

Scientific board chosen by the Senate of the University. The student, in most cases, has the same personal supervisor during its thesis work on an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Professor or researcher in the department with PhD and with the appropriate experience.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	NA
3.	Assigning a thesis subject	YES

Duration

Four years.

14.5.2. Development

- 278 -

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units.

2. Extension: 200 hours for the first year. There are four course units: three for the first year and the fourth for the second or third or fourth year.

3. Credit system: KTU. Three ECTS correspond to two KTU. There are twenty KTU credits allocated to course work.

4. Monitoring of the doctoral student. In case of failure the student must retake the exam.

Contribution to Teaching

Supervision of undergraduate laboratory work.

Presentation of Work

At international conferences.

14.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   <u>Language</u>: Lithuanian. Alternative language: English.

2.   <u>No credits</u> allocated to the doctoral thesis.

3.   The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1.   <u>Language</u> normally used: Lithuanian. Alternative language: English.

2.   Oral presentation with oral examination for an open/public audience.

3.   <u>Duration</u>: typical duration of 1,5 to 3 hours including examination with no upper time limit.

14.5.4. Examination

Thesis Examination Board

1.   <u>Composition</u>: minimum of three internal examiners (60%) and minimum of two external examiners (40%) with a total minimum of five members.

2.   <u>Selection</u> by the rector or equivalent.

Evaluation

1.   <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with no grading system.

2.   <u>If the student fails</u>, he/she may resubmit a revised thesis within one year.

14.6. Questionnaires

Lithuania

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y/N
3.1.3.2	Chosen by the student?	Y/N
3.1.3.3	Chosen in another way? Please specify:	Y
	By the Senate of the University.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y/N
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

Y

3.1.7.2 After a specified period of coursework?

Y/N

3.1.7.3 Other. Please specify:

Y/N

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

Y/N

3.1.8.2 Any researcher in the department?

Y/N

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3 Any researcher in another institution?

Y/N

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4 Other methods. Please specify:

Y

Professor or researcher in the department, with Ph.D. and with an appropriate experience.

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

Y

3.1.9.2 Other methods. Please specify:

Y/N

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?	Year 1	**Year 2**	**Year 3**	**Year 4**
	200 hrs	**15 hrs**	**hrs**	**hrs**

Remark: Four course units: three for the first year and the fourth for the second or third or fourth year.

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

         - As specialist graduate course units.   Y

         - As course units taken from the undergraduate programme.

         - Other. Please specify.

3.2.2.3   Is the coursework assessed by examinations?   Y
If not, please give details:

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?   Y

3.2.3.2   Is it the ECTS system?   N

         If not, what is the relationship with ECTS?   3 ECTS correspond to 2 KTU credits

3.2.3.3   How many credits are allocated to coursework?   20 KTU **credits**

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   Y

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

         - Retake the exam.   Y

         - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

3.3.2   At national conferences.

3.3.3   At international conferences.   Y

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   Y

3.4.2   Teaching undergraduate courses.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Lithuanian
4.1.2	Are alternative languages used for the thesis? Please Specify: **English.**	Y
4.1.3	Which language is normally used for the oral presentation and/or examination?	Lithuanian
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English.**	YES
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Y
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	Min. 3 (60%)
4.2.2.2	External examiners.	Min. 2 (40%)
4.2.2.3	TOTAL.	Min 5

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.   Yes

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   Y

4.2.4.2   The oral presentation of the thesis work.   Y

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if   (1,5 – 3)
applicable?   hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   N

4.2.5   Is the oral part of the examination taken behind closed doors?   N

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   Y/N

4.2.6.2   May resubmit revised thesis.   Y

4.2.6.3   May do further work as specified by examination board.   Y/N

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   Y
Please specify:
After one year.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the   N
work?

15.LU: Luxembourg

Author: Hélène FREMONT (Université Bordeaux 1, helene.fremont@ims-bordeaux.fr)

Information summarized from http://wwwen.uni.lu

15.1. General information

Since August 12th 2003, the university of Luxembourg offers Bachelor and Master Degrees, and Doctorates in line with the Bologna agreement, as well as other specific courses. Research focuses on certain priorities and is grouped in research units (fig.15.1)
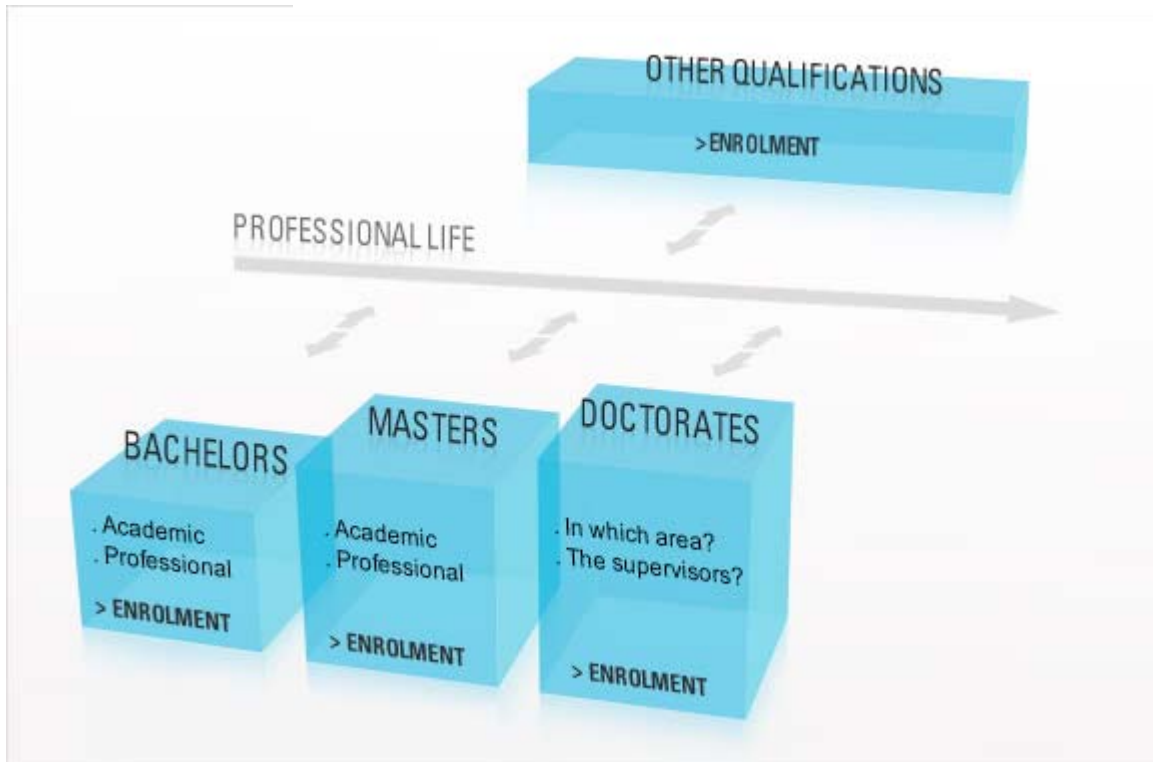
Figure 15.1: Higher Education System in Luxembourg since 2003 (source

http://wwwen.uni.lu/formations)

Candidates wishing to enrol for a Masters degree or doctorate must ask for the recognition of their

university degree by sending a certified copy of their university diploma to:

Department of Culture, Secondary Education and Research
Grants for study or research abroad
20, Montée de la Pétrusse
L-2273 LUXEMBOURG

15.2. Languages

The University's languages are: French, English, and German.

Multilingualism is a key element in the strategic development of the UL as this can provide the University with a unique asset of being able to offer a bilingual diploma, which is a justifiable and undeniable niche opportunity based on the multilingual context enjoyed by the UL: Luxembourg is bordered by three other countries, right in the heart of Europe and accommodates many European institutions. Multilingualism appears to be an essential element that is indeed central to the international reputation of the UL.

It is becoming essential to place the students at the core of the process and to equip them with an additional asset with which to enter the labour market; something which adds value and can be directly transferred to their qualification. Competence in essential languages on the international market will give them knowledge, flexibility and an open-minded attitude which will distinguish them from candidates with monolingual qualifications.

1. All degree courses must be bilingual and the secondary language should represent at least 25% of the course, except in cases where the language determines the content of the discipline.
2. Masters: the majority of masters courses must be bilingual (the secondary language should represent at least 25% of the course) and a minimum of 20% will be in English, except in cases where the language determines the content of the course.
3. Each of the three languages must at least be evident in 20% of the courses.
4. To have students, academic staff engaged in teaching and research and administrative staff who are trilingual, if possible.
   o For students, competence in the languages required for the course is sufficient.
   o For academic staff engaged in teaching and research and administrative staff, most must be competent in at least two and ideally three of the languages used within the University (French, English, and German).
   o Administrative staff in direct contact with students must be competent in at least three and ideally four of the following languages: French, English, German, and Luxembourgish.

15.3. Degrees

In Luxembourg, the Bachelor programme consists of 6 semesters, at least one of them **must** be made in another country. Two types exist: "academics bachelors" are preparing towards a master degree, while "professional bachelors" directly prepare to professional life. A master degree can be obtained after 4 further semesters. Two types also exist: "academics masters" are preparing towards doctoral studies, while "professional masters" directly prepare to professional life

The EIE topics are included in the Faculty of Science, Technology and Communication (FSTC). In our fields, the Faculty offers three bachelor and two master teaching programmes:

- Bachelor in Science and Engineering (Academic Bachelor),
- Bachelor in Computer Science (Professional Bachelor)
- Bachelor in Engineering (Professional Bachelor)

- Master in Engineering Science (Academic Master
- Master in Information and Computer Sciences (Academic Master)

The University of Luxembourg offers students the opportunity to pursue doctoral studies; the academic staff authorized to manage research supervise PhD students. These can be managed either autonomously by the University of Luxembourg or in under a joint supervision with a co-supervisor who is also authorized to manage research in its institution. Among the areas of research were the university can confer the title of "doctor" , we find for our fields:

- engineering,
- informatics,
- physics

15.4 References

The information given in this monograph is based on the following documents and web links:

- liste formations officielles pour année académique 2008_9.pdf

- Procédure de soutenance de doctorat à l'Université du Luxembourg

- http://wwwen.uni.lu

Doctoral
Studies

15.5. Doctoral Studies in Luxembourg

15.5.1. Supervision

In an initial phase, the University of Luxembourg implemented a strict policy for granting authorization for the management of research to its academic staff, thus enabling them to establish who, at the University of Luxembourg, has the capacity to supervise a research project or a doctoral thesis.

In a second phase, the faculties proceeded to set up and organise research units (RU). A RU is made up of one or more laboratories, and its objective is to use and share a common team with a high level of expertise, research and scientific activity so as to foster and encourage administration and investment synergies. Doctorate students are supervised by the academic staff of the RU having the authorization for the management of research. The RUs develop work around the research projects.

PhD student- Registration procedure

Eligibility for Admission:

You can enrol for the Ph.D. degree, without nationality requirement, if you hold a second-level university diploma or foreign diplomas and degrees entered in the register of titles at the Ministry of Culture, Higher Education and Research (valid only for European candidates or any candidate residing in the Grand Duchy of Luxembourg).

How to be a doctoral candidate at the University of Luxembourg

Two possibilities:

Case 1 : **Assistant**

1. Reply to a recruitment advertisement (mentioning the advert reference)

2. Once the candidate has been selected, the dissertation director sends the following documents to SEVE: "request to accept a doctoral candidate/ demande d'acceptation d'un étudiant doctorant" and "task description for an assistant in the non-professorial teaching staff/ configuration de tâche pour assistant du corps intermédiaire."

3. The candidate completes the registration documents and sends them to SEVE

4. The Rector confirms the recruitment of the candidate in writing.

5. Before signing the contract, the future assistant proceeds to the definitive registration with SEVE

6. The assistant's contract is signed at the Human Resources Department

7. The dissertation supervision committee must be communicated to SEVE within 2 months after registration

Case 2: Scholarship holder (BFR*) or doctoral candidate working on a project

1. Choose a dissertation director

2. The dissertation director consents by sending the "request to accept a doctoral candidate/ demande d'acceptation d'un étudiant doctorant" to SEVE.

3. The candidate completes the registration documents and sends them to SEVE

4. The Rector confirms the recruitment of the candidate in writing.

5. The dissertation supervision committee must be communicated to SEVE within 2 months after registration.

Jointly supervised dissertations are possible in both cases. Nevertheless, the candidate may and indeed must register without necessarily knowing the partner university.

The <u>registration</u> is available online at all times. You can complete it and file it with SEVE accompanied by the <u>required documents</u> .

If you wish to reside in Luxembourg, you must obtain a " <u>residency permit</u> "

*BFR: for details on how to apply, please go to <u>www.recherche.lu</u> . All applications for Research Training Scholarships must **necessarily** by filed with the Research Administration. **Contact** : Nathalie.klopfenstein@uni.lu

15.6. **Questionnaire**

LUXEMBOURG

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	Y
3.1.2	**How many members are in the Scientific Board?**	3
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	N
	.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	N
3.1.4.4	Assigning the thesis subject.	N
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

Y

3.1.7.2   After a specified period of coursework?

N

3.1.7.3   Other. Please specify:

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

Y

3.1.8.2   Any researcher in the department?

N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

Y/N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4   Other methods. Please specify:

Y

One of the supervisors should be a Full Professor or Associate Professor with Habilitation

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

Y

3.1.9.2   Other methods. Please specify:

Y/N

Imposed subject.

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

N

3.2.2   **Extension and assessment.**

3.2.2.1	What is the number of contact hours spent in coursework in each year?	Year 1	**Year 2**	**Year 3**	**Year 4**
		hrs	**hrs**	**hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

Two specialist graduate courses and a professional course (English for Science, Meetings with industrials).

3.2.2.3 Is the coursework assessed by examinations?
If not, please give details:

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?

3.2.3.2 Is it the ECTS system?

If not, what is the relationship with ECTS?

3.2.3.3 How many credits are allocated to coursework?   __ **credits**

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1 In the department.   Y

3.3.2 At national conferences.   Y

3.3.3 At international conferences.   Y[1]

[1]This point should be achieved before the PhD can be passed.

3.4- CONTRIBUTION TO TEACHING:

3.4.1 Supervision of undergraduate laboratory.   Y[2]

3.4.2 Teaching undergraduate courses.   Y[2]

[2]It depends but generally Y.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Français, English or Deutch
4.1.2	Are alternative languages used for the thesis? Please Specify:	N
	It could be in some specific cases (international juries, bi-national theses).	
4.1.3	Which language is normally used for the oral presentation and/or examination?	Français, English or Deutch
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	N
	It could be in some specific cases (international juries, bi-national theses).	
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Y
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	Y
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work or an open audience as part of the evaluation procedure?	Y
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	2 or 3
4.2.2.2	External examiners.	3 or 2
4.2.2.3	TOTAL.	5

.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

N

4.2.3.2   By the scientific committee of the institution.

N

4.2.3.3   By the rector or equivalent.

Y

4.2.3.4   By the national ministry.

N

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.

Y

4.2.4.2   The oral presentation of the thesis work.

Y

4.2.4.3   Both.

Y

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

N

.

4.2.5   Is the oral part of the examination taken behind closed doors?

N

Normally not, sometimes YES due to the confidentiality of some works (need specific authorization).

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

4.2.6.2   May resubmit revised thesis.

Y

4.2.6.3   May do further work as specified by examination board.

Y

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:

Y

5 If he is allowed to proceed his oral session He never fails.
6 Only for the manuscript.
7 If the authorization of presentation of the thesis has been given by the " pre-evaluation, on the written document.
[8] This is very, very rare.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?

Y

16. LV: Latvia

Author: Ilmars SLAIDINS (EAEEIE, Riga Technical University, slaidins@rsf.rtu.lv)

16.1 General information

LV: Latvia	General information [REF 1], [REF 17]
	''In **Latvia**, Bologna process did not initiate reforms in higher education but rather shaped and directed them into the direction of higher education reforms in Europe on the way towards European Higher Education Area graduate Master degrees (of 60 to 120 credits) were made as a purely academic degree. The amendments to the Latvian Higher Education Law of 2000 introduce professional Master degrees. Both universities and academies on the one hand, and professional higher education institutions on the other may offer Master degrees.
	The law foresees that, programmes leading to a bachelor or master degree are, where possible, at the same time oriented towards a profession and meet its standard. Where it is not possible, programmes should ensure a sufficient level of transferable pedagogical modules so that even at bachelor level holders can successfully find their needs for professional orientation. The total duration of studies should not be less than 5 years (300 ECTS or 200 Latvian credits). ''
	Specific view provided by Theiere partner
	…In the Riga Technical University, largest HE institution providing engineering education in Latvia, 3 year (180 ECTS) Bachelor studies were introduced in the early 90s. It was treated as an intermediate qualification before choosing between professional programmes (1-2 years, 60-120 ECTS) and Master studies (3 years, 180 ECTS). This was a 3-6-9 system. There were also introduced 4 year study programmes leading to Engineer qualifications (without a Bachelor degree), but not allowing continuation in Master studies as a Bachelor is required.
	In December 2000 the Law on Higher educational establishments was amended in the spirit of the Bologna declaration. According to these amendments the Law provides for the award of a professional bachelor degree (if the total duration of the programme is no less than 4 years, 160 Latvian credits, 240 ECTS) and a professional master degree (if the total duration of the programme is no less than 5 years (= 200 Latvian credit points or 300 ECTS credits). Thus, in the long run the reforms will lead to a symmetric degree and qualification system shown in the Diagram of Latvia Higher Education System (see second part of the monograph, the part dedicated to Latvia).
	From September 1, 2002 Master degree programmes could not be longer than 2 years; it means mainly 3-5-8, but allowing other schemas too, as 4-6-9, 4-5-8…

28
27
26
25
24

Postgraduate education (Doctor's degree)

24
23
22

Professional higher edu 1-2 years

Academic higher education (Master's degree) 2 years

Professional higher education (Master's degree) 1-2 years

24
23
22
21
20
19
18

Academic higher education (Bachelor's degree) 3-4 years

Professional higher education (Bachelor's degree) 4 years

College education 2-3 years

Professional higher education 4-6 years

Figure 16.1: Latvian Higher Education System in EIE disciplines.

The Law on Education Establishments (1995) sets a difference between academic and professional higher education. In some cases these are merged in one programme issuing academic degrees and professional qualifications at the graduation. The duration of Bachelor programmes may be 3 or 4 years at different institutions. The 4-year *Bakalaurs*[10] (bachelor) degree is seen as a complete academic qualification, while a 3-year *Bakalaurs* degree is rather an intermediate qualification before choosing between professional programmes or Master studies.

Magistrs degree is awarded after the second stage of academic education and requires a total duration of university studies of 5-6 years.

According to recent changes in regulations, the Master of Science studies may not be longer than 2 years (previously 3 year programmes were possible) and there must also be 3 year college programmes (previously just 2 years). Besides academic Bachelor and Master degrees since the end of 2001 Professional Bachelor and Master degrees have been introduced. A gradual transformation process to a new system is now on the way.

Curricula of academic study and professional study programmes must contain some stated minimum of studies in Science, General Engineering, Humanities etc. There are also standards for Bachelor programmes in EIE regulating minimum amount of studies in the field of speciality subject areas, e.g. Analogue Electronics, Digital Electronics etc.

---

[10] *"Bakalaurs"* in Latvian means Bachelor and *"Maģistrs"* in Latvian means Master.

16.1.1 Electrical and Information Engineering in Latvia, boundaries of the field of study

Computer Science and Engineering

Electrical Engineering

16.1.2 Content, degrees and accreditations

In Latvia new regulation is demanding that study programmes leading to professional qualifications must comply with the standards of profession. These standards in appropriate EIE branch must be developed in co-operation with industry partners and approved by professional organisations, accreditation and licensing.

16.1.3 Implementation of the Bologna-BMD system in Latvia

In the Riga Technical University, largest HE institution providing engineering education in Latvia, 3 year (180 ECTS) Bachelor studies were introduced in the early 90s. It was treated as an intermediate qualification before choosing between professional programmes (1-2 years, 60-120 ECTS) and Master studies (3 years, 180 ECTS). This was a 3-6-9 system.

There were also introduced 4 year study programmes leading to Engineer qualifications (without a Bachelor degree), but not allowing continuation in Master studies as a Bachelor is required. In December 2000 the Law on Higher educational establishments was amended in the spirit of the Bologna declaration. According to these amendments the Law provides for the award of a professional bachelor degree (if the total duration of the programme is no less than 4 years, 160 Latvian credits, 240 ECTS) and a professional master degree (if the total duration of the programme is no less than 5 years (= 200 Latvian credit points or 300 ECTS credits).

Thus, in the long run the reforms will lead to a symmetric degree and qualification system shown in the Diagram of Latvia Higher Education System.

From September 1, 2002 Master degree programmes could not be longer than 2 years. It means mainly 3-5-8, but allowing other schemas too, as 4-6-9, 4-5-8.

16.2. Figures on the weight of EIE in Latvia

Institution	Faculty	Degree, qualification	Number of diplomas 2006
Universities			
Riga Technical university	Faculty of Computer Science and Information Technology	Bachelor of Engineering in Computer Systems and Control	123

		Bachelor of Engineering in Computer Systems, Engineer Qualification in programming	5
		Engineer Qualification in Automation and Computer Engineering	3
		Master of Engineering in Computer Systems and Control	63
		Master of Engineering in Computer Systems and Control, Engineer Qualification in programming	4
		Master of Engineering in Information Technologies	53
		Qualification in Information Technologies	33
		Qualification in programming	9
	Faculty of Electronics and Telecommunications	Bachelor of Engineering in Electrical Engineering	130
		Bachelor of Engineering in Electrical Engineering, Engineer Qualification in electronics	6
		Master of Science in Electrical Engineering	72
		Engineer Qualification in electronics	1
		Qualification in management of electronics and services technician	13
		Qualification in Transport Electronics and Telematics	6
	Faculty of Electrical and Power Engineering	Bachelor of Engineering in Electrical Engineering	25
		Master of Science in Electrical Engineering	29
University of Latvia	Faculty of Physics and Mathematics	Bachelor of Engineering in Computer Systems and Control	106
		Master of Engineering in Computer Systems and Control	53

		Qualification in programming	22
	Faculty of Education and Psychology	Qualification in Administration of computer systems and computer networks	10
Daugavpils University	Faculty of Natural Sciences and Mathematics	Bachelor of Engineering in Computer Systems and Control	19
		Bachelor of Engineering in Information Technologies, Engineer Qualification in programming	0
		Master of Engineering in Computer Systems and Control	7
Latvia University of Agriculture	Faculty of Information Technology	Bachelor of Engineering in Computer Systems and Control	31
		Bachelor of Engineering in Information Technologies	27
		Master of Engineering in Information Technologies	13
State higher education institutions			
Liepaja Pedagogical Higher School	Faculty of natural and social sciences	Bachelor of Engineering in Computer Systems and Control	14
		Master of Engineering in Information Technologies, Engineer Qualification in programming or project leader of information technologies	0
		Qualification in programming or Administration of computer networks	7
Transport and Telecommunication Institute	Faculty of Computer Science and Electronics	Bachelor of Engineering in Electronics	28
		Bachelor of Natural Sciences in Computer Science	105
		Engineer Qualification in Electronics and Electrical Engineering.	1

		Master of Engineering Sciences in Electronics	1
		Master of Natural Sciences in Computer Science	28
Ventspils University College	The Faculty of Information Technologies	Bachelor of Natural Sciences in Computer Science	43
		Master of Natural Sciences in Computer Science	0
		Qualification in Administration of computer systems and computer networks	9
Vidzeme University College	Department of Information technologies	Bachelor of Engineering in Computer Science, Engineer Qualification in programming	33
		Qualification in Administration of computer systems and computer networks	12
Rēzekne Higher Education Institution	Faculty of Engineering	Bachelor of Engineering in Computer Science, Engineer Qualification in programming	19
		Master of Engineering in Computer Science	0
State colleges			
Jekabpils Agro business college		Qualification in Administration of computer systems and computer networks	28
Riga Technical Collage	Department of information and telecommunication technologies	Qualification in Administration of computer systems and computer networks	
Riga Technical Collage		Qualification in Electronics	15
Riga Technical Collage		Qualification in Telecommunications	22
College RRC		Qualification in Administration of computer systems and computer networks	5
College RRC		Qualification in programming	3
Higher education institutions founded by legal entity			

Information Systems Management Institute		Master of Engineering in Computer Science	0
Information Systems Management Institute		Qualification in system analyzing	35

16.3. Degrees in EIE in Latvia

16.3.1 College level

The first level tertiary professional higher education or college education (2-3 years) leading to professional qualification Level 4. These study programmes are for applicants with general or professional secondary education.

16.3.2 Bachelor level

Bachelor of Engineering in Computer Systems and Control;
Bachelor of Engineering in Electrical Engineering;
Bachelor of Engineering in Information Technologies.

16.3.3 Engineer level

This is a professional qualification (4-4.5 years after secondary school, or 1.5, 2, 2.5 years after bachelor), which exists in the following fields:

- Electronics

- Computer hardware and control

- Information technology

- Telecommunications

- Programming

- System analysis

16.3.4 Master level

Master of Science in Computer Science,

Master of Science in Electrical Engineering,

Master of Engineering in Computer Systems and Control,

Master of Engineering in Information Technologies;

Master of Engineering in Transport Telematics,

Master of Engineering in Electronics.

16.3.5 Doctor level

Doctor of Science,
Doctor of Engineering

16.4. List of degrees

Bachelor level

City	Institution	Faculty or department	Computer Systems and Control	Electrical Engineering	Computer Science	Information Technologies	Electronics	Programming	Computerised Control of Electrical Technologies	Telecommunications	Computerized Control, Information and Electronics Systems of Transport
Universities											
Daugavpils	Daugavpils Universitāte	Faculty of Natural Sciences and Mathematics			X		X				
Jelgava	Latvijas Lauksaimniecības universitāte	Faculty of Information Technology			X						
Riga	Latvijas Universitāte	Faculty of Physics and Mathematics			X	X					
Riga	Rīgas Tehniskā universitāte	Faculty of Computer Science and Information Technology	X			X					
		Faculty of Electronics and Telecommunications		X			X			X	X
		Faculty of Electrical and Power Engineering		X					X		
State higher education institutions											
Liepaja	Liepājas Pedagoģijas akadēmija	Department of mathematics and Computer Science			X						
Riga	Transporta un sakaru institūts	Faculty of Computer Science and Electronics			X		X				
Ventspils	Ventspils augstskola	The Faculty of Information Technologies			X						

Engineer level

City	Institution	Faculty or department	Automation and Computer Engineering	Information Technologies	Electronics	Transport Electronics and Telematics	Computer systems	Transport Electronics and Telematics	Computerized Control of Electrical Technologies	Programming	Information technologies	Information systems	Computer systems	Computerized Control of Electrical Technologies	Information technologies	Information systems
Universities																
Daugavpils	Daugavpils universitāte	Faculty of Natural Sciences and Mathematics		X												
Riga	Rīgas Tehniskā universitāte	Faculty of Computer Science and Information Technology	X	X			X						X			
		Faculty of Electronics and Telecommunications			X	X		X								
		Faculty of Electrical and Power Engineering							X					X		
Jelgava	Latvijas Lauksaimniecības universitāte	Faculty of Information Technology								X						
State higher education institutions																
Riga	Transporta un sakaru institūts	Faculty of Computer Science and Electronics			X											
Liepāja	Liepājas Pedagoģijas akadēmija	Faculty of natural and social sciences													X	
Valmiera	Vidzemes augstskola	Department of Information technologies										X				
Rēzekne	Rezekne Augstskola	Faculty of Engineering								X			X			
Higher education institutions founded by legal entity																
Jūrmala	Information Systems												X			X

	Manageme nt Institute												

Professional higher education
Professional higher education Bachelor's degree
Professional higher education Master's degree

Master level

City	Institution	Faculty or department	Computer Systems and Control	Electrical Engineering	Computer Science	Information Technologies	Electronics	Programming	Computerised Control of Electrical Technologies	Telecommunications	Computerized Control, Information and Electronics Systems of Transport	Automation and Computer Engineering
Universities												
Daugavpils	Daugavpils Universitāte	Faculty of Natural Sciences and Mathematics			X		X					
Jelgava	Latvijas Lauksaimniecības universitāte	Faculty of Information Technology			X							
Riga	Latvijas Universitāte	Faculty of Physics and Mathematics			X							
	Rīgas Tehniskā universitāte	Faculty of Computer Science and Information Technology	X			X						X
		Faculty of Electronics and Telecommunications		X			X			X	X	
		Faculty of Electrical and Power Engineering		X					X			
State higher education institutions												
Riga	Transporta un sakaru institūts	Faculty of Computer Science and Electronics			X		X					
Ventspils	Ventspils augstskola	The Faculty of Information Technologies			X							

It exist also some professional qualifications, some years after the bachelor:

Riga, University of Latvia, Faculty of Physics and Mathematics

Engineer Qualification in Programming (college) - 2,5 years

Database Engineer Qualification (college) - 3 years

College level

City	Institution	Faculty or department	Computer Systems	Electrical Engineering	Programming and Computer Science	Information Technologies	Electronics	Programming	Telecommunications	Computerized Control, Information and Electronics Systems of Transport	Programming and Administration of computer networks	Administration of computer systems and computer networks
Universities												
Riga	Latvijas Universitāte	Faculty of Physics and Mathematics						X			X	
		Faculty of Education and Psychology										X
	Rīgas Tehniskā universitāte	Faculty of Computer Science and Information Technology	X									
		Faculty of Electronics and Telecommunications		X			X		X	X		
State higher education institutions												
Liepāja	Liepājas Pedagoģijas akadēmija	Faculty of natural and social sciences				X						
Ventspils	Ventspils augstskola	The Faculty of Information Technologies				X						
Valmiera	Vidzemes augstskola	Department of Information technologies				X						
State colleges												
Jēkabpils	Jekabpils Agro business college											X
Riga	Riga Technical Collage	Department of information and telecommunication technologies					X	X	X			
Jūrmala	College RRK					X	X					

16.5. References

The information given in this monograph is based on the following documents and web links:

Ministry of Education and Science http://www.izm.lv/en/default.htm

University and Higher Education Institution Web pages

Doctoral

Studies

16.5. Doctoral Studies in Latvia

16.5.1. Supervision

Scientific Board or Supervisor

Scientific board. The student has the same personal supervisor during its thesis work not necessarily on an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Any professor or any person approved by the Senate of the University.

Tasks of Scientific Board/Supervisor

1.	General management	NO
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

Duration

Three or four years.

16.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as special doctorate courses.

2. Extension: depends on the course CP.

3. Credit system: not ECTS. One CP is equivalent to 1.5 ECTS. The course work has 42 CP allocated, equivalent to 63 ECTS.

4. Monitoring of the doctoral student.

Contribution to Teaching

1. Supervision of undergraduate laboratory work.

2. Teaching of undergraduate students, typically practice classes, not lecturing.

Presentation of Work

At international conferences. Demand of five internationally recognized papers/conference proceedings.

16.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   Language: Latvian. No alternative languages. The thesis has a 30 page summary in Latvian and English.

2.   There are credits allocated to the doctoral thesis.

3.   The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1.   Language normally used: Latvian. No alternative languages.

2.   Oral presentation with oral examination for an open/public audience.

3.   Duration: typical duration of 3 hours including examination with no upper time limit.

4. Examination

Thesis Examination Board

1.   Composition: special approved Promotion Committee + one expert-reviser from the Science Council of Latvia + two experts-revisers from Latvia or abroad.

2.   Selection by the Science Council of Latvia.

Evaluation

1.   Result based on the reading of the thesis and the oral presentation of the thesis work, with no grading system.

2.   If the student fails, he/she may resubmit a revised thesis or do further work as specified by the examination board.

16.6. Questionnaires

Latvia

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y/N
3.1.3.2	Chosen by the student?	Y/N
3.1.3.3	Chosen in another way? Please specify:	Y/N
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	N
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	N

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

Y

3.1.7.2   After a specified period of coursework?

Y/N

3.1.7.3   Other. Please specify:

Y/N

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

Y/N

3.1.8.2   Any researcher in the department?

Y/N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

Y/N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4   Other methods. Please specify:

Y

Right to be a supervisor must be approved by the University Senat if person is not in a position of professor.

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

Y

3.1.9.2   Other methods. Please specify:

Y/N

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
hrs	**hrs**	**hrs**	**hrs**

According to course CP, the duration of doctoral studies is 3 years or 4 years for part-time (working) students.

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

Special doctoral courses.

3.2.2.3   Is the coursework assessed by examinations?
If not, please give details: Y

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?   Y

3.2.3.2   Is it the ECTS system?   N

If not, what is the relationship with ECTS?   1 CP= 1.5 ECTS

3.2.3.3   How many credits are allocated to coursework?   42 CP = 63 ECTS

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   Y

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

3.3.2   At national conferences.

3.3.3   At international conferences.

Demand 5 internationally recognized papers/conference proceedings.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

Y

3.4.2   Teaching undergraduate courses.

Y[1]

[1]Y (typical – practice not lecturing).

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1   Which language is normally used for the thesis?

Latvian[2]

4.1.2   Are alternative languages used for the thesis?
Please Specify:

N

[2] Latvian with about 30 page summary in Latvian and English.

4.1.3   Which language is normally used for the oral presentation and/or examination?

Latvian

4.1.4   Are alternative languages used in the oral presentation and examination?
Please Specify:

NO

4.1.5   Are credits allocated to the doctoral thesis?

Y

4.1.6   **The doctoral thesis is:**

4.1.6.1   **A previously unpublished substantial written report**.

4.1.6.2   A collection of individual or co-authored scientific papers with an introduction and/or commentary.

4.1.6.3   Other. Please specify:

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1   Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?

YES

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.2   Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1   Internal examiners.

*

4.2.2.2   External examiners.

2*

4.2.2.3   TOTAL.

* Special approved promotion Committee + 1 expert-reviser from Science Council of Latvia 2 experts-revisers from Latvia or abroad.

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

Science Council of Latvia.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.

Y/N

4.2.4.2   The oral presentation of the thesis work.

Y/N

4.2.4.3   **Both**.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?

~2 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

N

4.2.5   Is the oral part of the examination taken behind closed doors?

N Open

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

Y/N

4.2.6.2   May resubmit revised thesis.

Y

4.2.6.3   May do further work as specified by examination board.

Y

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:

Y/N

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?

N

EIE-Surveyor

17. MT: Malta

Author: Albert Leone Ganado (EAEEIE, University of Malta),

Review: Jan LIGUŠ (EAEEIE, Technical University of Košice, Slovakia)

17.1. General information

This description commences with a summary of the conventional Higher Education system in Malta. This is then followed by an overview of some of the variations on the theme that can occur.

School System

Based on 5 years primary and 5 years secondary education leading to the SEC (secondary education certificate as managed by the matriculation board (MATSEC).

Post Secondary

Sixth form for two years leading to the Matsec certificate which comprises two advanced level subjects and three intermediate level subjects or higher secondary for students who do not attain the grades required for sixth form.

University or Polytechnic

After obtaining their Matsec certificate plus attaining the required grades as demanded by the Faculty of Engineering or the Faculty of ICT students are admitted to the first cycle of studies leading to the B.Eng (honours) degree or the BSc (ICT) degree normally at the age of 17 or 18.

FCDs are typically graded using pass, ordinary, third class, lower second class, upper second class and first class classifications.

Until the year 2006 most degrees were based on a four year first cycle followed by a 12 month cycle to obtain an MSC or a Master of Engineering degree but in line with the Bologna guidelines degrees are being standardised as well as harmonised to a 3 + 2 system.

The second cycle leading to a MSc or an M(Eng) is normally of two years duration and is considered as being the second cycle of tertiary education . Second cycle courses are of three types. Master by research through a thesis, masters through taught courses and a dissertation and a conversion Masters.

Second cycle courses are classified as with distinction, merit Pass or Fail.

After the second cycle students can register for a three year doctoral program. However upon completion of an undergraduate programme and subject to the student achieving a first class honours, a student can register directly to a four Doctoral programme. Normally students are accepted for a

M.Phil degree which is then transferred to a Phd. Doctorate programmes after satisfactory progress in the research after one year.

A wide range of variations is possible. Students can defer entry to higher education after school/college in favour of employment, returning to the academic system at any stage. In a similar way, a break can be taken between the FCD and the SCD. Both the FCD and SCD can be taken part time normally then requiring twice the duration for completion.

17.1.1 _Electrical and Information Engineering in Malta, boundaries of the field of study_

One of the definitions possible for EIE lies in the way in which a student would select a course within an academic institution. The source for this information is the Admissions office of the University of Malta

Course offered
  • Digital electronics
  • Electronic / electrical engineering
  • Electronic and information communications
  • Computer engineering systems
  • Electronic control
  • Mechanical electronic systems engineering (1 course)
  • Power engineering
  • Computer Science
  • Business systems engineering
  • Computing
  • European computer science
  • Information systems
  • Information technology (ICT)
  • Informatics
  • Information systems engineering
  • Nanotechnology engineering
   Telecommunications

Notes:

The above list is a reduced list to include only those subjects considered to be directly of interest to the EAEEIE.

17.1.2 *Content, degrees and accreditation*

The Maltese higher education system consists of three main cycles, undergraduate, graduate Masters and graduate doctorate.. FCDs are typically of 3-year and classified as Bachelor of Science(ICT) or Bachelor of Engineering usually, but not always, indicative of a scientific or engineering basis. SCDs are typically of 1-year or 3-year duration classified as Master of Science (MSc) or Master of Philosophy (MPhil) for the 1-year duration degrees and Doctor of Philosophy (PhD) for the 3-year degrees.

The 'value' of the FCDs is defined by the Quality Assurance Agency (APQRU) in terms of ECTS credits. A FCD consists of 3 years of studies where each year must comprise 60 credits. A 3-year BSc or BEng therefore comprises 180 ECTS credits. One ECTS credit normally comprises five to seven lecturer contact plus an additional student workload of about 20 student hours. This time comprises lectures, laboratories, assessments, lecture preparation, assessment preparation, assignments, etc.

Masters level degrees are now standardising on a two year cycle of 120 ECTS credits although student who followed a four year honours degree can so far obtain a Masters in 12 months equivalent to 90 ECTS credits.

Basic studies in engineering include mathematics, basic sciences and computer technology. After two years the studies become more subject-related. Students can choose specific study options within the degree programme. A Master's thesis is usually written during the final year of the studies.

17.2 Degrees in EIE in Malta

The general requirements for entry to a first cycle degree in a higher education institution are the acquisition of the required Matsec certificate at a higher secondary school or sixth form college. The value of this tariff will depend on the programme selected. Normally each Faculty imposes its own specific additional requirements based on subjects included and grades achieved in the MATSEC examination.

Doctoral
Studies

17.3. Doctoral Studies in Malta

17.3.1. Supervision

Scientific Board or Supervisor

Principal Supervisor - personal supervisor for the student's thesis work on an active/new research area of the department.

Co-Supervisor   Appointed where nature of work requires the role of a consultant on a regular basis

Advisers   Appointed where occasional consultation with experts is required.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor. Head of department must recommend that the topic is acceptable. The Faculty Doctoral Committee must recommend approval to the PhD sub-committee of Senate.

Who can be a Supervisor

Any professor/lecturer in the department.

Tasks of Scientific Board/Supervisor

1.   General management   YES

2.   Deciding/advising layout of course   YES

3.   Assigning a thesis subject   YES

Duration

Three years for students who have a Master and four years for First cycle students with a first class honours.

17.3.2. Development

- 323 -

Courseware?

No.

Course Work

The students don't have to take course work during their doctoral degree preparation.

Contribution to Teaching

1. Supervision of undergraduate laboratory work (typically 4/6 hours per week).

2. Tutoring of undergraduate groups.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

17.3.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language normally used: English. Alternative languages: provided the University has necessary language expertise and an Abstract in English is provided.

2. No credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1. Language normally used: English. Alternative languages: provided the University has necessary language expertise and an Abstract in English is provided.

2. Oral presentation to an open audience. Examination is a 2 stage process: first thesis is examined by the Board of examiners individually and if approved an oral examination will take place at another set date.

3. Duration: typical duration of 3 hours with no upper time limit.

17.3.4. Examination

Thesis Examination Board

1. Composition: two internal examiners and one external examiner (3 members). When the student is a member of the University an additional external examiner is required.

2. Selection: by the Senate on the recommendation of the PhD Committee.

Evaluation

1. Result based on the reading of the thesis and the oral examination of the candidate, with no grading system for the doctoral degree.

2. If the student fails, he/she may resubmit a revised thesis or may also do further work as specified by the examination board within six months. He or she may not resubmit for doctorate.

17.4. Questionnaires

MALTA

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	3 to 5
3.1.3	How are the members of the Scientific Board chosen? By Faculty	
3.1.3.1	Elected by the Faculty, Department?	YES
3.1.3.2	Chosen by the student?	NO
3.1.3.3	Chosen in another way? Please specify:	N/A
	Elected by Faculty on recommendation of the Head of Department.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	YES
3.1.4.4	Assigning the thesis subject.	NO
3.1.4.5	Other. Please specify:	YES
	Faculty Doctoral Committee which acts as the scientific Board monitors progress of students in their research work.	
3.1.5	Does the student need a personal supervisor during her/his studies?	YES
3.1.5.1	Does the same person supervise her/his thesis work?	YES
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	YES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

YES

3.1.7.2   After a specified period of coursework?

No

3.1.7.3   Other. Please specify:

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

YES

3.1.8.2   Any researcher in the department?

NO

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

N/A

3.1.8.3   Any researcher in another institution?

NO

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

N/A

3.1.8.4   Other methods. Please specify:

An external academic can be appointed as a co-supervisor.

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

YES

3.1.9.2   Other methods. Please specify:

NO

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

NO

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
hrs	**hrs**	**hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?
If not, please give details:

N/A

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?

N/A

3.2.3.2 Is it the ECTS system?

N/A

If not, what is the relationship with ECTS?

3.2.3.3 How many credits are allocated to coursework?

credits

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?

N/A

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1 In the department.

YES

3.3.2 At national conferences.

YES

3.3.3 At international conferences.

YES

3.4- CONTRIBUTION TO TEACHING:

3.4.1 Supervision of undergraduate laboratory.

YES

3.4.2 Teaching undergraduate courses.

YES

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	English
4.1.2	Are alternative languages used for the thesis? Please Specify:	Yes

Provided the University has necessary language expertise and an Abstract in English is provided.

4.1.3	Which language is normally used for the oral presentation and/or examination?	English
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	YES

As in 4.1.2

4.1.5	Are credits allocated to the doctoral thesis?	NO
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	YES
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	N/A
4.1.6.3	Other. Please specify:	N/A

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	TWO
4.2.2.2	External examiners.	ONE
4.2.2.3	TOTAL.	THREE

When the student is a member of the University an additional external examiner is required.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   NO

4.2.3.2   By the scientific committee of the institution.   YES

4.2.3.3   By the rector or equivalent.   NO

4.2.3.4   By the national ministry.   NO

4.2.3.5   Other. Please specify:

[1](4.2.3.1) By Senate on the recommendation of the PhD Committee.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   YES

4.2.4.2   The oral presentation of the thesis work.   YES

4.2.4.3   Both.   YES

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if   3 hours
                 applicable?

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   NO

4.2.5   Is the oral part of the examination taken behind closed doors?   YES

             Examination is a 2 stage process: first thesis is examined by the Board of examiners
             individually and if approved and oral examination will take place at another set date.

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   YES

4.2.6.2   May resubmit revised thesis.   YES

4.2.6.3   May do further work as specified by examination board.   YES

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   YES
                 Please specify:
                 Usually SIX months.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the   NO
             work?

18. NO: Norge/Noreg (Norway)

Coordinating author: Saba MYLVAGANAM (EAEEIE, Høgskolen i Telemark,

saba.mylvaganam@.hit.no)

Other contributors: Professor Einar Aas (Norwegian University of Science and Technology (NTNU), einar.aas@iet.ntnu.no), Professor Kjell MALVIG (Norwegian University of Science and Technology, (NTNU), Kjell.Malvig@itk.ntnu.no)

Lecturer Mr. Gerhard NYGÅRD, Research Advisor, International Research Institute of Stavanger, Gerhard.Nygaard@iris.no

Review: Cyril BURKLEY (EAEEIE, University of Limerick, Ireland)

18.1. General Information

The institutional types for higher education in Norway are as follows: Universities, (Universiteter) University Colleges (Vitenskapelige høyskoler), State Colleges (Statlige høyskoler), Art Colleges (Kunsthøyskoler) and Private institutions of higher education (Privathøyskoler). For our survey, the focus will be mostly on the first three types of institutions. The Norwegian Higher Educational System is very closely aligned to the 3-5-8 model with some variations particularly at the PhD level. The entry requirements are based on candidates' prior education or completed vocational training with certificate of completed apprenticeship (called "Y-vei" in Norway).

From secondary school to university education in Norway.

Some figures:

- 2 years diploma of technician in Norway
- 3 years Bachelor of science
- 30000 students in "External Distance learning programmes"

NO: Norge/ Noreg (Norway)	General information [REF 1], [REF 5], [REF 19] ''In **Norway**, many university professors argued strongly against the change from a four-year degree to a three-year bachelor-degree. The parliament adopted a new degree system in June 2001 which will be introduced between autumn 2002 and the end of 2003. The new system follows the 3+2+3 pattern. In addition to the 120 ECTS Master, there is an international Master (60–90 credits) and an experience-based Master (60–90 credits). All public higher education institutions – universities and state colleges – will offer the new degrees. Bachelor and Master's degrees will be introduced, not by law, but by Government decision. The revised law gives universities full freedom to start any course at any level; state colleges will have such rights for lower level degrees. The Law on Private Higher Education has also been changed and a new Law on Higher Education (state and private) is envisaged as the next step

in the process of giving the institution greater autonomy, but at the same time also greater responsibility. The reform also includes implementation of the Diploma Supplement. They will be issued automatically.'' According to NOKUT,

"In response to the Bologna Process which started in 1998, a Quality Reform was launched in 2001. It introduced bachelor's, master's and PhD degrees generally following a 3 year + 2 year + 3 year model. The new degrees superseded the old ones (mainly 4 year + 2 year + 3 year, as e.g. cand.-mag., cand.-philol., cand.- scient., dr.-polit., dr.philos. etc.) from the end of 2003. The old degrees will be completely phased out by the end of 2007. The Quality Reform also introduced a concept to establish stricter quality assurance mechanisms in higher education which resulted in the founding of an independent agency for quality assurance in education – NOKUT (Norwegian Agency for Quality Assurance in Education)."

Specific view provided by EIE-Surveyor partner
As per today Bologna process has been successfully implemented in all the major higher educational institutions in Norway. Many state colleges in Norway are successful in recruiting students to Bachelors programmes based on their completed apprenticeships (so called Y-Vei in Norwegian) thus helping aspiring technical personnel to continue their studies to Bachelors level, thus paving the way for them to even higher levels, irrespective their ages. We see a trend in many institutions of offering the courses in English thus catering to an increasing number of international students. Government Commission for Higher Education of 2006 called "Stjernø-Utvalget" has looked into the possibilities of integrating existing universities and state colleges of forming clusters thus paving the way to larger and fewer official higher educational institutions in Norway. The discussion is a current phenomenon in Norway and reflects the very dynamic environment of education in general. As such, readers should always refer to the dedicated web-pages of the institutions and government organisations given below.
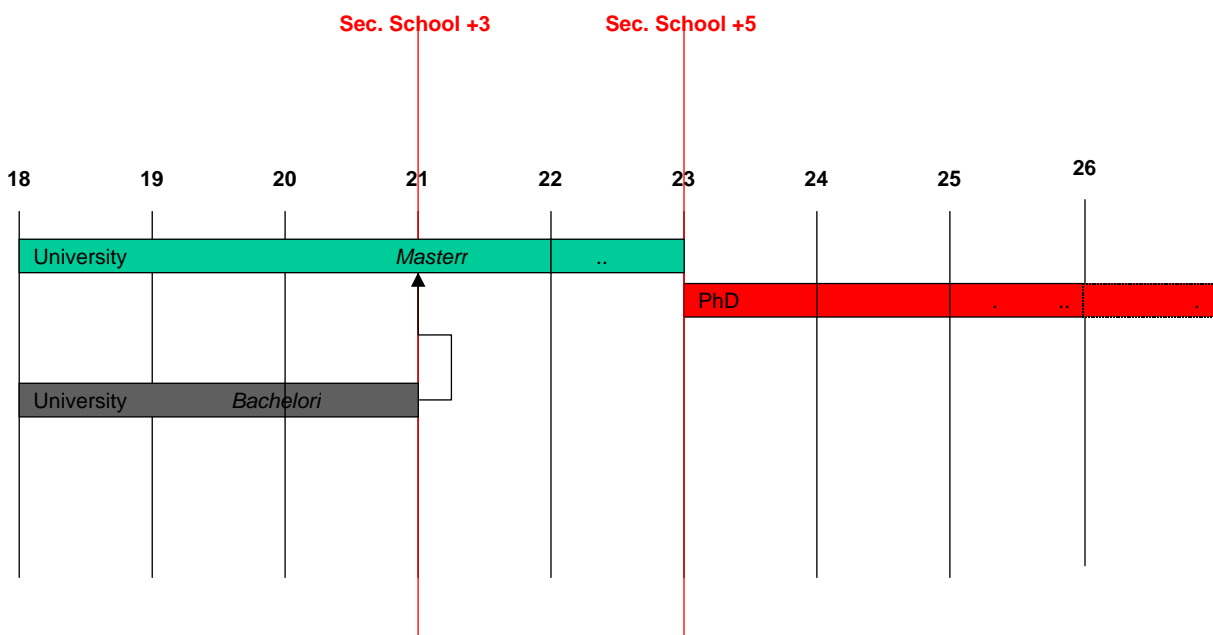
Figure 18.1: Norwegian Higher Education System in EIE disciplines - general trend in the carrier of students. For more details see Figure 18.3. In case of completed apprenticeship, the age of entry may vary considerably.

As of 1994, every child in Norway is offered 12 years of primary and secondary education. The 9 first years are compulsory, while the last 3 years in upper secondary school are voluntary, and end with an examination, which determines entry to higher education, including engineering. Figure 18.1 gives an overview of technical education in Norway, starting from Secondary School.

In Norway, both university and non-university education is offered in engineering. Appendix A contains a list of institutions. The university degree is now accepted to be Bachelors (normally of 3 –years duration) Masters. Nominal time to obtain the Masters degree is 5 years.

Electrical and Information Engineering in Norway, boundaries of the field of study

This is a difficult question. Elements of EIE are found in many disciplines now. The trend is some stand-alone degrees in Informatics, Electronics, Cybernetics, Mechatronics, Computer Science etc. In recent times, there is also a focus on Bioinformatics. With more and more courses becoming interdisciplinary, the demarcation is getting increasingly blurred.

18.1.1 *Content, degrees and accreditations*

Due to a new rule (as the results of "Mjøsutvalget", committee headed by Prof. Mjøs (medicine)) the colleges and universities have a certain amount of freedom, although the framework is defined by the ministry.

Usually this information is available on the webpage of the colleges / universities.

At NTNU and Telemark University College, particularly in engineering disciplines, course evaluation is used extensively, with student based evaluation of all 1-3 year courses. A system for this evaluation has been developed since 1988. These evaluations are mostly done using intranet questionnaires. Teacher evaluation has been limited now due to legal problems concerning use of personnel data base information. Programme evaluation, however, is less frequent. Such evaluation is initiated in various fields of higher education from the Institute for Studies in Research and Higher Education, a body of the Norwegian Council of Science. In 1995, an in-depth evaluation of the university and non-university electronic engineering education at 21 universities and technical colleges was completed. The objective of this evaluation was defined thus: Provide qualified assessments of each institution's educational profile, and strong and weak facets in a national and international context. The committee shall not rank the institutions. The assessment shall conclude with a list of actions that may be implemented to improve the education and the learning environment. An important instrument was the self-evaluation phase, resulting in a report read by the experts who conducted the peer review. After assessing the self-evaluation report, the experts visited each institution for two days, and later wrote an evaluation report. These reports are open to the public. Similarly, NOKUT assessed the Engineering Education in Norway recently. The report is available in the references given below, including an English summary of the findings.

Implementation of the Bologna-BMD system in Norway[11]

According to the "The Norwegian Agency for Quality Assurance in Education" (called Nasjonalt organ for kvalitet i utdanningen (NOKUT)), we have the following information on the implementation of Bolgna process in Norway:

"In response to the Bologna Process which started in 1998, a Quality Reform was launched in 2001. It introduced bachelor's, master's and PhD degrees generally following a 3 year + 2 year + 3 year model. The new degrees superseded the old ones (mainly 4 year + 2 year + 3 year, as e.g. cand.-mag., cand.-philol., cand.- scient., dr.-polit., dr.philos. etc.) from the end of 2003. The old degrees will be completely phased out by the end of 2007. The Quality Reform also introduced a concept to establish stricter quality assurance mechanisms in higher education which resulted in the founding of an independent agency for quality assurance in education – NOKUT (Norwegian Agency for Quality Assurance in Education)."

Norway has probably implemented the Bologna process successfully in all higher educational institutions coming under NOKUT.

Qualification framework

The authoritative organisation on qualification and accreditation matters in Norway NOKUT has the following comment:
"In accordance with the Bologna Process recommendations Norway is currently taking part in the work on the planned European Qualification Framework. The objective of this is to create a European framework to enable qualification systems at the national and sectoral levels relate to each other."

All the universities and colleges offer Bachelors and Masters and as a result also a PhD within the Bologna-BMD concept. Here follows a short introduction to the Bologna system. Presenting the Engineering education in the Nordic countries for own purposes and for the insight of others is essential. Keep in mind that this is dynamic information, because all the processes in the different countries are not finished yet, and the decisions are not yet final.

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[11] Based on information provided by Professor Kjell Malvig, Norwegian University of Science and Technology, (NTNU)
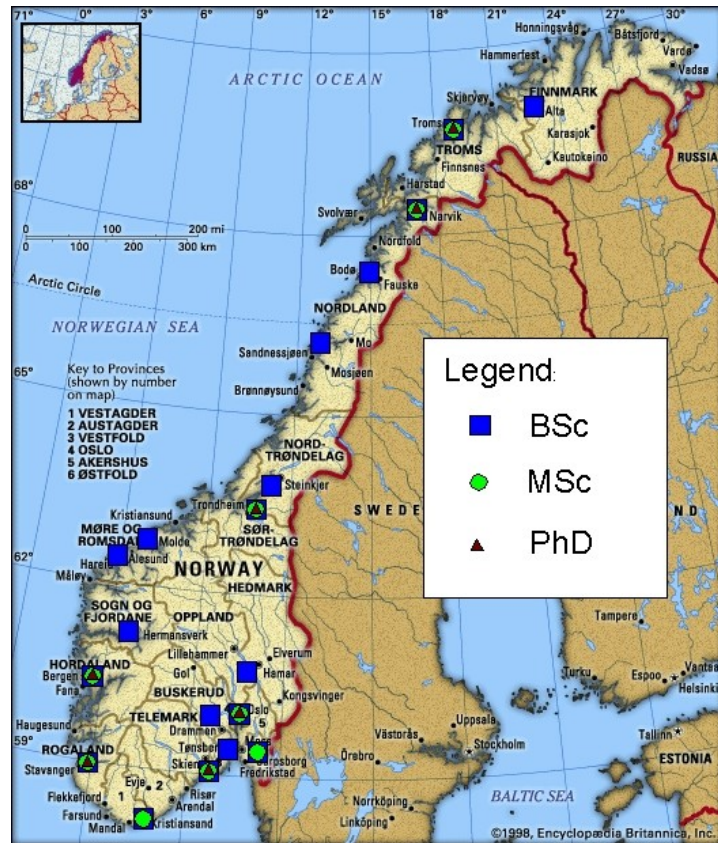
Figure 18.2: The locations of the educating organisations within the field of IT/Computer Science and Electronic/Cybernetics in Norway.
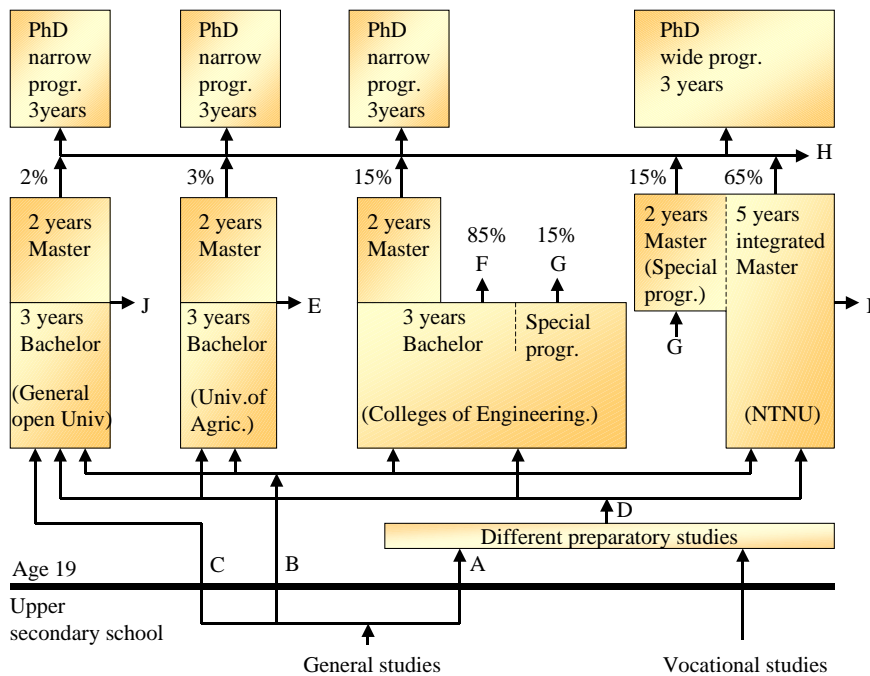
Figure 18.3 Transition from upper secondary school, general studies and vocational studies to universities, university colleges offering BMD. This figure is important to understand what follows below on BMD process in Norway. Please refer to the letters A to J in the figure when reading what follows. Provided by Prof. Kjell Malvig of NTNU

1. Entrance from upper secondary school, General studies or Vocational studies

The letters A-J in the following refer to the different stages of transition to higher education as depicted in Figure 18.3.

- B: First level (upper) Mathematics and second level Physics mandatory
- C: Second level Mathematics and first level Physics recommended but not mandatory
- A: For students without required courses

2. Main Structure:

- 3 years Bachelor (E, F, G, J)
- 3 years study pivot (I) (Virtual)
- 2 years Master (H)
- 5 years integrated Master (H)
- 3 years PhD

3. Participating institutions:

One can say NTNU has the highest percentage of students graduating with Masters.

- NTNU, broad number of programs available on all levels:
    - 5 years integrated Master (65% of total Masters in the nation)
    - 2 years Master based on a Bachelor in the same profession. (Special program for students from other institutions, 15% of Bachelors) (15% of total Masters)
    - 3 years PhD, often with an extra year as Assist. Prof. (98% of total)

- University Colleges of Engineering:
    - 3 years Bachelor, professional, broad number of programs.
    - 3 years Bachelor, professional, special programmes for continuation as Masters on NTNU, broad number of programmes.
    - 2 years Master based on a Bachelor in the same profession. Narrow number of programs.
    - 3 years PhD, often with an extra year as Assist. Prof. (2% of total). Narrow special number of programs

- Colleges of Engineering:
    - 3 years Bachelor, professional, broad number of programs.
    - 3 years Bachelor, professional, special programmes for continuation as Masters on NTNU, broad number of programmes.

- General Universities and Norwegian University of Life Sciences:
    - 3 years Bachelor, probably nonprofessional as engineers, very narrow number of programs. Very few candidates. Questionable in the future.

-2 years Master based on a Bachelor in the same topic. Very narrow number of programs. Very few candidates. Questionable in the future.

-3 years PhD, often with an extra year as Assist. Prof. Almost no candidates. Very narrow number of programs

4. <u>Academic titles:</u>

– E,F,G,J:

-Norwegian: *Bachelor* name of curriculum

-English: Bachelor of Engineering, name of curriculum

– H:

-Norwegian: *Master i Teknologi*, name of curriculum

English: Master of Science, name of curriculum

5. <u>Professional titles:</u>

– E, F, G, J:

-Norwegian: *bachelor*, name of curriculum

-English: Bachelor of Engineering, name of curriculum

– H:

-Norwegian: *Master*, name of curriculum

English: Master of Science, name of curriculum

Doctoral degree programmes in Norway take three years of full-time studies. The structure of the different doctoral programmes varies. Some of the programmes consist of one year of taught courses and a two years research period, where the candidates have to write and defend a dissertation in public. Very often the research period gets an extension.

18.2 Figures on the weight of EIE in Norway

Organisation, (Norwegian Name) (Homepage)	IT/Computer Science	Electronics/Cybernetics
Finnmark UniversityCollege (*Høgskolen i Finnmark*)	BSc	
University of Tromsø (*Universitetet i Tromsø*)	BSc/ MSc, PhD	MSc, PhD
Tromsø University College (*Høgskolen i Tromsø*)	BSc	BSc(10)
Narvik University College (*Høgskolen i Narvik*)	BSc ,MSc, PhD	BSc,MSc, PhD
Bodø University College (*Høgskolen i Bodø*)	BSc	
Nesna University College (*Høgskolen i Nesna*)	BSc	
North-Trøndelag University College (*Høgskolen i Nord-Trondelag*)	BSc	BSc

Norwegian University of Science and Technology (*Norges Teknisk og Naturvitenskapelige Universitet*)	BSc/MSc, PhD	MSc, PhD
South-Trøndelag University College (*Høgskolen i Sør-Trondelag*)	BSc	BSc
Ålesund University College (*Høgskolen i Ålesund*)	BSc	BSc
Molde University College (*Høgskolen i Molde*)	BSc	
Sogn og Fjordane University College (*Høgskolen i Sogn og Fjordane*)	BSc	BSc
Bergen University College (*Høgskolen i Bergen*)	BSc	BSc
University of Bergen (*Universitetet i Bergen*)	MSc, PhD	MSc, PhD
Naval Engineering College		BSc
University of Stavanger(*Universitetet i Stavanger*)	BSc, MSc	BSc, MSc, PhD
Norwegian School of Information Technology	BSc	
University of Agder (*Universitetet i Agder*)	BSc , MSc	BSc
Telemark University College (*Høgskolen i Telemark*)		BSc ,MSc,PhD
Vestfold University College (*Høgskolen i Vestfold*)	BSc	BSc , MSc, PhD
Østfold University College (*Høgskolen i Østfold*)	BSc, MSc	BSc , MSc
Oslo University College (*Høgskolen i Oslo*)	BSc	BSc
University of Oslo (*Universitetet i Oslo*)	MSc, PhD	MSc, PhD
Gjøvik University College (*Høgskolen i Gjøvik*)	BSc	BSc
Buskerud University College (*Høgskolen i Buskerud*)	BSc , MSc	BSc, MSc, PhD

Figure 18.4: Figures on the weight of EIE in Norway (compiled by Dr. Gerhard Nygård)

18.3 Degrees in EIE in Norway

The information on various courses can be found in the web - pages of the universities and university colleges given in the table below.

Bachelor level

Currently, there are around 9000 students in the Bachelor of science/engineering programmes. 3600 admissions have been offered each year, but all have not been taken. Thus there are a lot of entries that are not filled, especially at the smaller colleges in Norway. The teaching staff amounts to 900 in total.

- Conditions for admission

  Basically the same conditions for admission apply as for a university, namely completed upper level secondary school, with sufficient course load in mathematics and physics and/or chemistry. Some schools have limited admission, while others allow everyone with a suitable examination grade to enter, because they still do not fill up the predefined capacity.

- Conditions for admission

  The nominal duration is set to 3 years. There is a large variation in real duration from college to college. Some colleges have close to 40% dropout, while others have only 10%.

- Structure of the Bachelor programmes

  The basic structure for the three-year "*bachelor*" study program is shown below. The different study programmes are listed in Appendix B.

Master level

The M. Sc. degree is recognised by the professional environment, and provides access to all kinds of engineering professions in Norway. It is also recognised as the entry-point for a doctoral degree.

- Conditions for admission

  The basic condition for admission is successful examination results from upper level secondary school, with sufficient course load in mathematics and physics and/or chemistry. But as all M.Sc. programmes have limited numbers of places, the examination marks are used to select those admitted. The marks in mathematics and physics are given highest weight. In addition, some points are granted for work experience and completion of military service. Also, female students are given a small additional advantage. The admission to most engineering subjects at the Norwegian Institute of Technology is very competitive.

  In addition to direct entry from upper secondary school, the Norwegian Institute of Technology allows a certain percentage (approx. 20-25%) into the third year with a completed B. Sc. degree from one of the colleges of engineering.

- Nominal and real duration of the studies

  The nominal duration of M. Sc. studies is 4.5 years. The real duration at the Norwegian Institute of Technology is 4.7 years, and the completion rate has been stable at about 91% (defined as the percentage of students, once entered, who finish with a diploma).

Doctorate level

In principle we have now only one type of doctorate degrees in engineering in Norway, the PhD.

- Condition for admission

A completed "*Master*" degree or similar education is required, in addition to a course and research plan endorsed by a supervisor.

- Prerequired or simultaneous doctoral programme

The programme includes a certain workload based on courses and a thesis. Normally, the candidate works on both these at the same time. The course load corresponds to one full year of study, while two years are allocated for the research and thesis work. At least one third of the courses are to be at doctorate level, the others may be selected from the normal graduate courses.

- Nominal and real duration

Nominal duration is 3 years. Recently, there has been a change to three years of study plus one year of service work for the host department (teaching, grading, supervision etc.), thus allowing for 4 years of calendar time. The average real duration is 3.8 years.

- Number of students

More than 100 dr. ing. degrees are awarded every year. There has been an increase from 90 to 129 in 1994.

- Main types of financing

Most scholarships are granted directly from the university. Other sources are: the Norwegian Research Council, the Norwegian Telecom, several large companies, and EU programmes.

- Professional recognition

The PhD. degree from Norway is considered to be on an international Ph.D. level, and external opponents, always at least one from abroad, assure that this is the case. Several large Norwegian companies have made it their policy to hire a certain percentage of doctorates.

18.4. References

Einar Aas, "ENGINEERING EDUCATION IN NORWAY", A report prepared for the European Commission to the Conference of European Schools for Advanced Engineering Education and Research - CESAER, 1995. (A classic paper on the evolving new educational system in Norway)

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Doctoral
Studies

18.5. Doctoral Studies in Norway

18.5.1. Supervision

Scientific Board or Supervisor

The <u>Scientific board</u> is composed by nine members elected by Faculty or Department. The student, <u>in most cases,</u> has the same personal supervisor during its thesis work on an <u>active</u> research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, normally by agreement between the student and the supervisor. Adjustments can be made during the work.

Who can be a Supervisor

1. Only professors.

2. Often there are 1-2 supervisors for cross-disciplinary work.

Tasks of Scientific Board/Supervisor

1. General management   YES

2. Deciding/advising layout of course   NO

3. Assigning a thesis subject   YES

4. The PhD-programmes and PhD courses are the responsibility of the Board.

Duration: nominal duration is 3 years. Recently, there has been a change to three years of study plus one year of service work for the host department (teaching, grading, supervision etc.), thus allowing for 4 years of calendar time. The average real duration is 3.8 years.

18.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units. However a maximum of ¼ of the course work course units can be taken from undergraduate programmes.

2. Extension: ½ year, mostly the first two years.

3. Credit system: no ECTS system. ½ year allocated to course work.

4. Monitoring of the doctoral student. In case of failure the student must retake the exam.

Contribution to Teaching

1. Supervision of undergraduate laboratory work.

2. Teaching of undergraduate students.

Presentation of Work

1. In the department.

2. At international conferences.

18.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language: English. No alternative languages.

2. No credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report, or a collection of individual or co-authored scientific papers with an introduction and/or commentary.

Oral Presentation of Thesis Work

1. Language normally used: English. Alternative language: Norwegian.

2. Oral presentation with oral examination for an open/public audience.

3. Duration: typical duration of 3 hours including examination with an upper time limit.

18.5.4. Examination

Thesis Examination Board

1. Composition: one internal examiner and two external examiners (three members). One of the external members is a full professor from another country.

2. Selection by the scientific committee of the institution.

Evaluation

1. Result based on the reading of the thesis and the oral presentation of the thesis work, with no grading system. However, the committee gives written statements on the level compared to the levels in the home country (One of the external members of the committee is a full professor from another country).

2. If the student fails, he/she may resubmit a revised thesis within six months.

*18.5.*5. Questionnaires

Norway

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	9
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	Y
3.1.3.2	Chosen by the student?	Y/N
3.1.3.3	Chosen in another way? Please specify:	Y/N
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	N
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
	The PhD-programmes and PhD courses are the responsibility of the Board. We have around 300 PhD student.	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

Y

3.1.7.2   After a specified period of coursework?

N

3.1.7.3   Other. Please specify:

Adjustments can be made during the work.

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

N^1

3.1.8.2   Any researcher in the department?

N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y/N

3.1.8.4   Other methods. Please specify:

Y/N

We often have 1-2 co-supervisors, in particular in cross-disciplinary work.

[1] **Only professor.**

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

Y^2

3.1.9.2   Other methods. Please specify:

Y/N

[2] Normally.

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	Year 2	Year 3	Year 4
hrs	hrs	hrs	hrs

In total ½ year, mostly the first two years.

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.   Yes

- As course units taken from the undergraduate programme.   3

- Other. Please specify.

[3] Maximum ¼ of the course work at this level.

3.2.2.3   Is the coursework assessed by examinations?   Y
If not, please give details:

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?   Y

3.2.3.2   Is it the ECTS system?   Y

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?   **½ year**

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking
coursework?   Y

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.   Yes

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.   Yes

3.3.2   At national conferences.

3.3.3   At international conferences.   Yes

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   Yes

3.4.2   Teaching undergraduate courses.   Yes

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	English
4.1.2	Are alternative languages used for the thesis? Please Specify:	Y/N
4.1.3	Which language is normally used for the oral presentation and/or examination?	English[4]
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	YES/NO

[4] English, but Norwegian in some cases.

4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Yes
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	Yes[5]

[5] Yes, it is two options.

4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	1
4.2.2.2	External examiners.	2
4.2.2.3	TOTAL.	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3 How is the examination board chosen?

4.2.3.1 By the supervisor.

4.2.3.2 By the scientific committee of the institution.

Yes

4.2.3.3 By the rector or equivalent.

4.2.3.4 By the national ministry.

4.2.3.5 Other. Please specify:

4.2.4 Do the examiners base their evaluation mark on:

4.2.4.1 Reading the thesis.

Y

4.2.4.2 The oral presentation of the thesis work.

Y

4.2.4.3 Both.

4.2.4.4 What is the typical duration of the oral part of the thesis examination, if applicable?

3 hours

4.2.4.5 Is there an upper limit to the duration of the thesis examination?

Y

4.2.5 Is the oral part of the examination taken behind closed doors?

N

4.2.6 What happens if the student fails?

4.2.6.1 May not resubmit for doctorate.

N

4.2.6.2 May resubmit revised thesis.

Y

4.2.6.3 May do further work as specified by examination board.

N

4.2.6.4 If the thesis is to be re-submitted is there a time limit for this to occur?
Please specify:
½ year.

Y

4.2.7 Is there a grading system for the doctoral degree based on the quality of the work?

N[6]

[6] N, but the committee gives written statements on the level compared to level in home country. We always have a full professor from another country on the committee.

Bachelor level

Table 18.1. Educational organisations in Norway for Computer Science and
Electronics/Cybernetics with associated levels of educations (BSc).

Educating level (BSc)						
Location	Organisation	Owner	Electronics	Cybernetics	IT/Computer Science	Electronics/Cybernetics
Alta	Finnmark University College	Public			BSc	
Tromsø	University of Tromsø	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc ,PhD	MSc, PhD
Tromsø	Tromsø University College	Public		BSc	BSc	BSc(10)
Narvik	Narvik University College	Public	BSc, MSc	BSc,MSc,PhD	BSc, MSc, PhD	BSc, MSc,PhD
Bodø	Bodø University College	Public			BSc	
Mo i Rana	Nesna University College	Public			BSc	
Levanger	North-Trøndelag University College	Public	BSc		BSc	BSc
Trondheim	Norwegian University of Science and Technology	Public	BSc,MSc,PhD	BSc,MSc,PhD	BSc/MSc, PhD	BSc/ MSc ,PhD
Trondheim	South-Trøndelag University College	Public	BSc	BSc	BSc	BSc
Ålesund	Ålesund University College	Public	BSc	BSc	BSc	BSc
Molde	Molde niversity College	Public			BSc	
Førde	Sogn og Fjordane University College	Public		BSc	BSc	BSc
Bergen	Bergen University College	Public	BSc(	BSc	BSc	BSc
Bergen	University of Bergen	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc, PhD	MSc, PhD
Bergen	Naval Engineering College	Public	BSc			BSc
Bergen	Norwegian School of Information Technology	Private			BSc	
Stavanger	University of Stavanger	Public	BSc	BSc,MSc	BSc, MSc	BSc, MSc
Stavanger	Norwegian School of Information Technology	Private			BSc	
Grimstad	Agder University College	Public	BSc		BSc, MSc	BSc
Porsgrunn	Telemark University College	Public	BSc,MSc,PhD	BSc,MSc,PhD		BSc ,MSc, PhD
Borre	Vestfold University College	Public	BSc	BSc	BSc	BSc
Sarpsborg	Østfold University College	Public	BSc	BSc		BSc
Halden	Østfold University College	Public			BSc, MSc	
Oslo	Norwegian School of Information Technology	Private			BSc	
Oslo	Oslo University College	Public	BSc	BSc	BSc	BSc
Oslo	University of Oslo	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc,PhD	MSc ,PhD
Gjøvik	Gjøvik University College	Public	BSc	BSc	BSc	BSc
Kongsberg	Buskerud University College	Public	BSc	BSc	BSc	BSc
Table prepared by Dr. Gerhard Nygård, Research Adviser, IRIS						

Master level
Table 18.2. Educational organisations in Norway for Computer Science and
Electronics/Cybernetics with associated levels of educations (MSc).

Educating level (MSc)						
Location	Organisation	Owner	Electronics	Cybernetics	IT/Computer Science	Electronics/Cybernetics
Tromsø	University of Tromsø	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc ,PhD	MSc, PhD
Narvik	Narvik University College	Public	BSc,MSc	BSc,MSc,PhD	BSc, MSc,PhD	BSc,MSc,PhD
Trondheim	Norwegian University of Science and Technology	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc,PhD	MSc,PhD
Bergen	University of Bergen	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc,PhD	MSc, PhD
Stavanger	Stavanger University College	Public	BSc	BSc,MSc	BSc,MSc	BSc,MSc
Grimstad	Agder University College	Public	BSc		BSc,MSc	BSc
Porsgrunn	Telemark University College	Public	BSc,MSc,PhD	BSc,MSc,PhD		BSc,MSc,PhD
Halden	Østfold University College	Public			BSc,MSc	
Oslo	University of Oslo	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc,PhD	MSc,PhD
Table prepared by Dr. Gerhard Nygård, IRIS.						

Doctorate level
Table 18.3 Educational organisations in Norway for Computer Science and
Electronics/Cybernetics with associated levels of educations (PhD).

Educating level (PhD)						
Location	Organisation	Owner	Electronics	Cybernetics	IT/Computer Science	Electronics/Cybernetics
Tromsø	University of Tromsø	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc, PhD	MSc , PhD)
Narvik	Narvik University College	Public	BSc,MSc	BSc,MSc,PhD	BSc, MSc,PhD	BSc, MSc, PhD
Trondheim	Norwegian University of Science and Technology	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc, PhD	MSc, PhD
Stavanger	University of Stavanger	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc, PhD	MSc, PhD
Bergen	University of Bergen	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc , PhD	MSc, PhD
Porsgrunn	Telemark University College	Public	BSc,MSc,PhD	BSc,MSc,PhD		BSc, MSc ,PhD
Oslo	University of Oslo	Public	BSc,MSc,PhD	BSc,MSc,PhD	MSc,PhD	MSc, PhD
Table prepared by Dr. Gerhard Nygård, IRIS.						

19. PL: Polska (Poland)

Coordinating author: Wojciech GREGA (AGH University of Science and Technology, Akademia Górniczo-Hutnicza im. Stanislawa Staszica, wgr@ia.agh.edu.pl)
Other contributors: Andrzej Tutaj, Wojciech Kreft, (AGH University of Science and Technology, Akademia Górniczo-Hutnicza im. Stanislawa Staszica)

Review: Daniel Pasquet (EAEEIE, ENSEA, Cergy, France)

19.1. General information
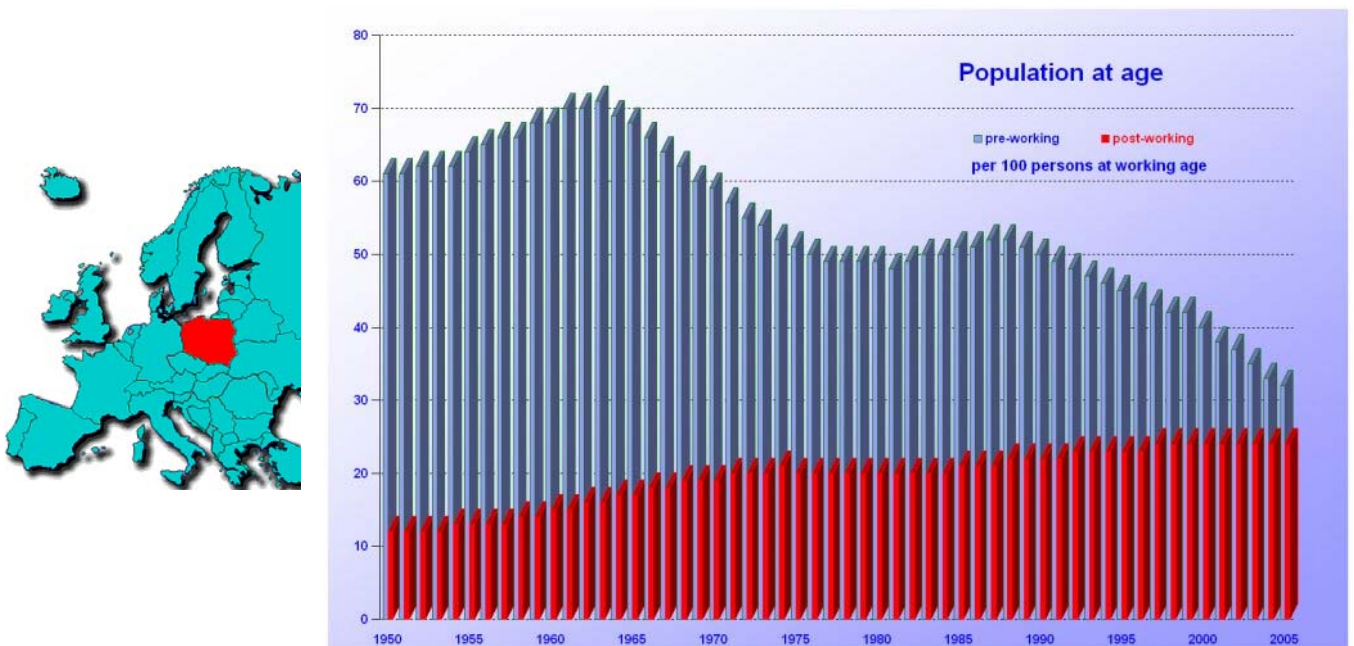
Fig 19.1 Polish population according to age (source: http://www.stat.gov.pl/gus/)

In recent years, the number of students in Poland has been constantly growing (2001/02: 1718 700; 2002/03: 1 800 548; 2003/04: 1 858 700, 2004/05**:** 1926 100, 2005/06: 1953 800) and this tendency can still be observed. This is mostly related to an increase in the number of evening and extramural students enrolled in the public higher education institutions as well as to the development of diversified study systems in non-public higher education institutions. In 2005/06 there were 445 higher education institutions in Poland (including 130 public institutions). In 2005/06, 950 000 students were registered for full-time studies. 100 92 foreigners were registered as regular students in Polish higher education institutions.

In 2003/04 the number of doctoral students was 32 054 in total.

Both **public** and **private** institutions of higher professional technical education exist in Poland. Private institutions acquire a legal status when they get permission and are registered by the Minister of Education and Science.

The basic form of higher education in Poland is full-time studies. Full time studies at public institutions of higher education are free of charge. Polish institutions of higher education also implement part-time, (extramural) which are equivalent to full-time courses, have similar requirements, and lead to the same degrees and diplomas. During the last few years, these forms of study have become more popular as they provide an opportunity to upgrade the qualifications of people who are employed.

The Polish higher technical education system consists of two kinds of institutions:

Universities and Technical Universities, offering scientific oriented education at BSc., M. Sc. and Ph.D. levels,

Professional High Schools, offering job-oriented education at B.Sc. level.

Before 2004 universities and high schools entry was based on results of "*Matura*" examination or competitive examination. Competitive entry examinations were organized by universities.

Since 2005 the rules of admission have been standarized and are based on the final grades of maturity certificate. The ranking of applicants' scores is announced on each faculty. Certain faculties are allowed to organize additional oral exams or competency tests (e.g. predisposition tests in the field of arts or sports).
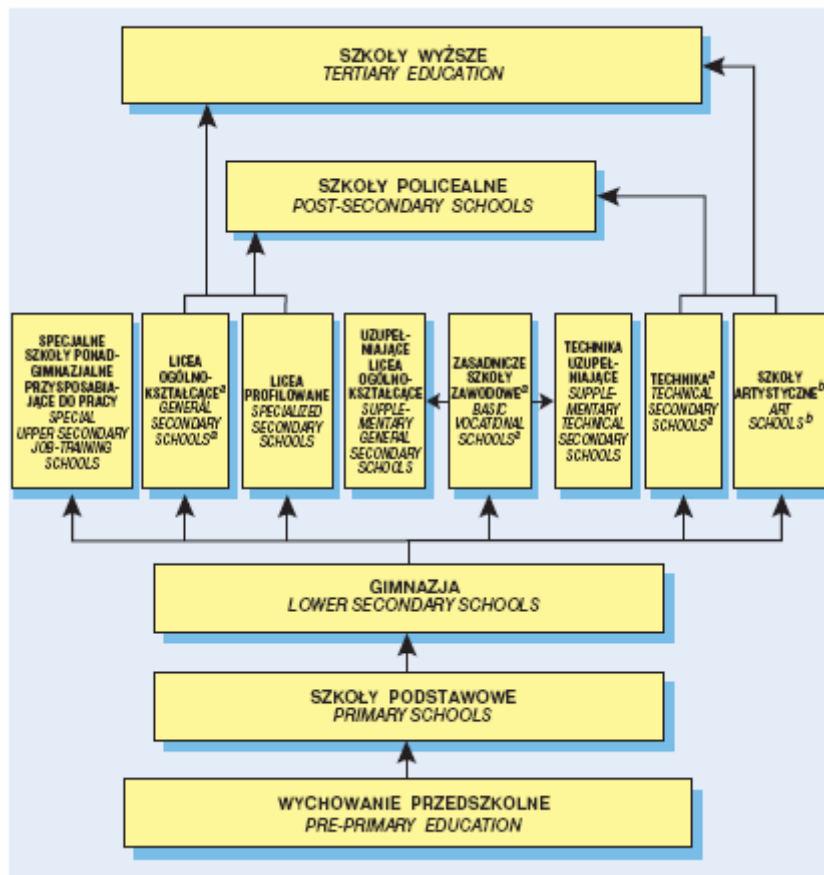
Fig. 19.2 The schema of Polish education system (*source: Small Statistical Yearbook 2006*)

POLISH HIGHER EDUCATION SYSTEM

The University faculties organize and oversee the educational process within the various study programmes. The institutes and departments are responsible for carrying out study programmes. Students study according to a plan of study and curriculum determined by the authorities of the given educational institution, or they may follow an individual curriculum. They may also follow courses other than their basic fields of study. The language of instruction is Polish; however, at several universities students may often attend lectures given in English, German, or French.

The General Council for Higher Education (*Rada Główna Szkolnictwa Wyższego*) is an elective body of the higher education system. The General Council for Higher Education issues opinions on the proposals of statutes for higher education institutions. It is responsible for the definition of fields of study and the development of standards in education. These standards are implemented in accordance with a separate regulation by the Minister of Science and Higher Education.

The following professional degrees are awarded to graduates of Polish higher education institutions:

At the Bachelor level:

- the professional Bachelor's degree (*licencjat*) is awarded following the completion of 3 or 3.5-year higher professional education courses;

- the professional Bachelor's degree and professional title of engineer (*inżynier*) is awarded following the completion of 3.5 or 4-year higher professional education courses in technical areas but also in agriculture, and economics and related areas.

At the Master level:

- the degree of Master of Science (*magister*) is awarded following the completion of uniform 5 or 6-year magister-level courses in some fields of studies (e.g. law, pharmacy, psychology, veterinary medicine, medicine and medicine and dentistry);

- equivalent degree is Master of Science and professional title of engineer (*magister inżynier*), in the field of Engineering; Since 2007 the degree of *magister inżynier*, may be only obtained following the completion of 1,5 or 2-year complementary magister-level *c*ourses, for which holders of the professional degree of *licencjat* or *inżynier* are eligible.

The academic degree of doctor (*doktor)* is awarded to a person who has passed doctoral examinations and submitted and defended a doctoral dissertation. Holding the degree of *magister* or its equivalent is a necessary condition for the doktor's degree.

More detailed arrangements for doctoral programmes at both higher education and other research institutions are included in the 2005 Regulation of the Minister of Science and Higher Education on the requirements and procedures for the organisation of doctoral

programmes and for the award of doctoral scholarships. They must be also are subject to provisions of the 2003 Act on Academic Degrees and Title and Arts Degrees and Title.

Doctoral programmes last between three and four years, but, the predominant model is a four-year programme. Curricula for doctoral programmes, which comprise courses attended by students in parallel to individual research, are adopted by the boards of the educational institutions and are approved by the authorities of the institution.

All Polish educational institutions are required to have a two-tier structure in compliance with the 2006 Regulation of the Minister of Science and Higher Education. In accordance with the regulation, all study programmes in 101 of 118 existing fields of study will be provided only as two-tier study programmes, thus replacing any long-cycle Master's degree programmes still in place.

Programmes in four of the remaining 17 fields (e.g. i.e. Cosmetology, Dentistry Techniques) will be provided only as first-thier programmes. Programmes in 11 fields, including Acting, Art Conservation and Restoration, Canon Law, Dentistry, Law, Medical Analysis, Medicine, Moving Image Production and Photography, Pharmacy, Psychology and Veterinary Medicine, will be provided only as long-cycle Master's programmes. These rules are applicable to programmes commencing in the academic year 2007/08.

At present, two-tier programmes coexist with long-cycle programmes.

Foreigners may study in Poland provided (article 43 of the Higher Education Act of 27th July 2005) they:

- have a permit to settle in Poland; or

- are EU, EEA or EFTA citizens and they are mobile workers who have been employed in Poland (and also the members of their families) if they still resident on the territory of Poland;

- or have an EC long-term residence permit; or

- are EU, EEA or EFTA citizens with sufficient financial support for the duration of their studies in Poland (since they are not entitled to any kind of social scholarship). Special treatment is designed for foreigners who undertake studies on the basis of the bilateral international agreements.

The full list of the institutions is available at: http://www.eng.nauka.gov.pl/meinen. The list given in the appendix A includes only government-owned (public) institutions in the field of EIE.

Electrical and Information Engineering in Poland, boundaries of the field of study
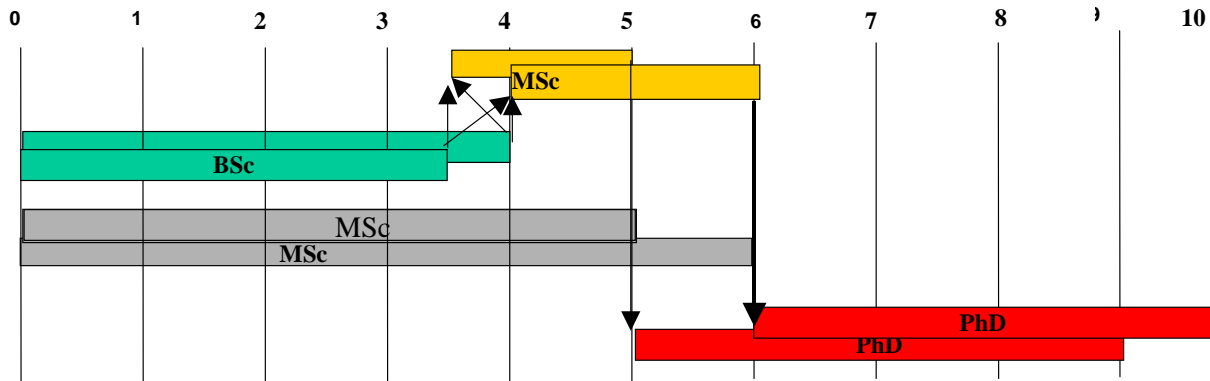
Figure 19.3: Polish Higher Education System in EIE disciplines

EIE in Poland means a curricula leading to the following degrees:

- electrical engineering,
- automatics and robotics,
- computer science,
- applied computer science,
- electronics and telecommunication,
- computer science and econometrics.

The degrees in electrical engineering, automatics and robotics, computer science, electronics and telecommunication and applied computer science, generally are offered at Technical Universities. The degree in computer science is offered at several Polish Universities. The degree in computer science and econometrics is offered at Universities of Economics.

There are several degrees partly related to the EIE, based on the applications of information technologies in engineering (see appendices A and B).

These curricula cover a large spectrum of topics in electrical engineering and information technologies. Details of the curricula are defined by the specialisations (Fig.19.4, 19.5).
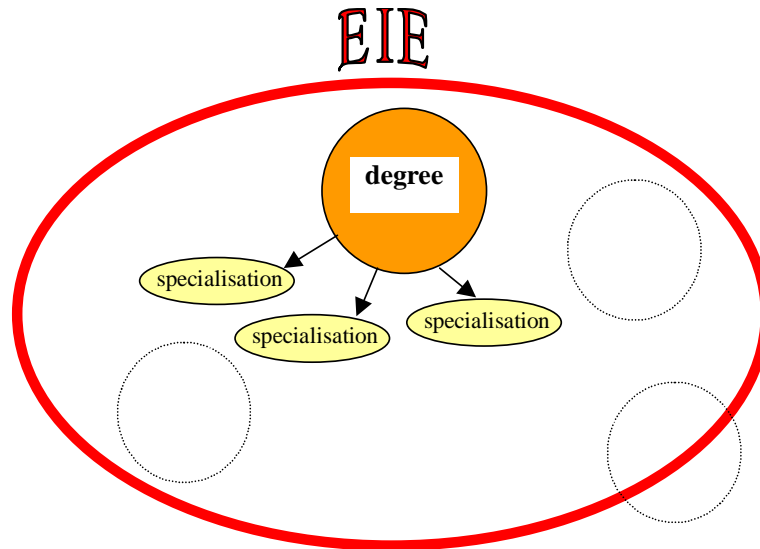
Fig. 19.4 Degrees and specialisations

General comments:

- **EIE** curricula concentrates at the faculties of electrical and computer engineering of **Technical Universities**. Some selected specializations, mainly related to the applied computer science, are implemented at other faculties and in **Professional High Schools**. For example, the degree in *chemical and process engineering* could be received by studying the EiE specialization *computer application in chemical engineering and technology* at Faculty of Chemical Engineering and Technology of the Cracow University of Technology.
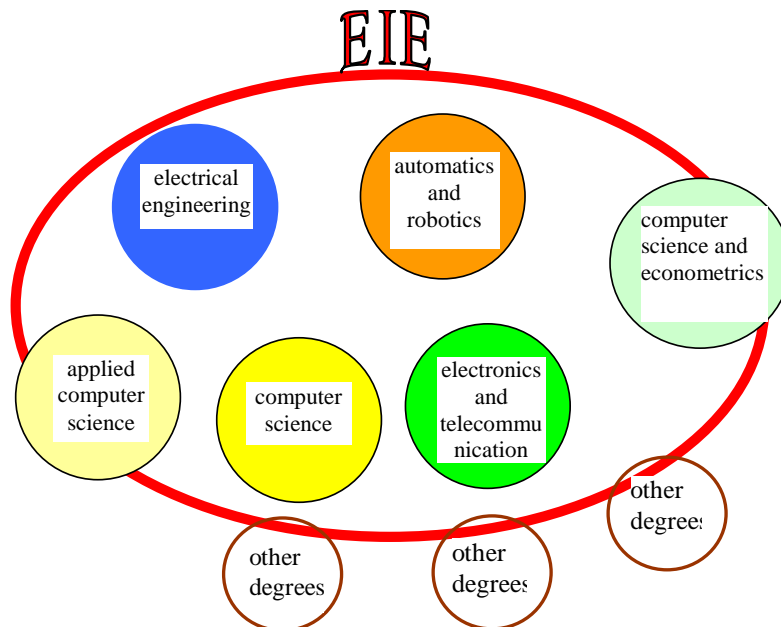
Fig.19.5 Degrees in EIE at technical universities in Poland

General comments:

- The pedagogical content of the diploma strongly depends on selection of the specialisation. The content of the specialization is proposed by the faculty and decided by the university board. Since 1 January 2002, there have been trials to create a unified national system. General (national level) Council for Higher Education is responsible for the definition of fields of study and the development of

standards in education. These standards are implemented in accordance with a separate regulation by the Polish Ministry of Science and Higher Education.

Implementation of the Bologna-BMD system in Poland

- According to the new Law on Higher Education of 2005 Polish institutions of higher education are developing an uniform three-tier system of Bachelor, Master and Doctoral studies. Since academic year 2007/08 programs in all EIE fields will be provided on a three - tier basis: (3 - 4) + (1.5 - 2) +(3 - 4).

- Implementation of the three - tier systems is illustrated in Fig.19.2.

- At present, two-tier programmes in EIE coexist with long-cycle programmes.

19.2. Figures on the weight of EIE in Poland

In the 2005/2006 academic year 1953 800 students were enrolled in 445 higher-education institutions in Poland (130 between them were public higher education institutions).

EIE programs are offered by the following number of public   higher education institutions:

- 20 Technical Universities,

- 16 Universities,

- 4 Pedagogical Universities,

- 4 Economic Universities,

- 1 Maritime High School,

- 15 Higher Vocational Schools

Degrees in EIE in Poland

At the Bachelor level:

- the professional Bachelor's degree in EIE   (*licencjat*) is awarded following the completion of 3 or 3.5-year higher professional education courses;

- the professional Bachelor's (BSc) degree and professional title of engineer (*inżynier*) is awarded following the completion of 3.5 or 4-year higher professional education courses in technical areas but also in agriculture, and economics and related areas;

At the Master level:

- degree include Master of Science (MSc) and professional title of engineer (*magister inżynier*), obtained following the completion of 1,5 or 2-year complementary *magister*-level *c*ourses, for which holders of the professional degree of *licencjat* or *inżynier* are eligible.

The curricula at BSc and MSc. levels are based on the "teaching standards" published by the Polish Ministry of National Education, based on the opinion issued by The General Council for Higher Education. The teaching standards give the recommended and minimum number of teaching hours required for each degree as well as the pedagogical content of the diplomas. Teaching standards in EIE consist of:

- general courses , like Foreign Languages, Economy and Management,

- basic courses, like Mathematics, Physics, Computer Science,

- degree courses, creating the final professional profile of the graduate,

- practical and industrial training.

19.3. References

[1] http://www.howtostudyinpoland.pl

[2] http://www.eng.nauka.gov.pl/meinen/index.jsp

[3] Focus on the Structure of Higher Education in Europe 2006/07,

National Trends in the Bologna Process, Edited by European Commission, Directorate-General for Education and Culture

[4] Polish Small Statistic Yearbook, edited by GUS

[5] Polish Ministry of Science and Higher Education http://www.eng.nauka.gov.pl/meinen

PL: Polska (Poland)

Bachelor level

Town Name	Institution	Faculty or department	Electrical Engineering	Electronics and Telecommunications	Automatics and Robotics	Computer Science	Applied Computer Science	Computer Science and Econometrics
Białystok	Białystok Technical University	Faculty of Computer Science				BSc/MSc		
		Faculty of Electrical Engineering	BSc/MSc /PhD	BSc/MSc				
		Faculty of Mechanical Engineering			BSc			
	University of Bialystok	Faculty of Mathematics and Physics				BSc/Msc		BSc
Bielsko-Biala	University of Bielsko- -BiałaBielsko University	Faculty of Mechanical Engineering and Computer Science	BSc		BSc	BSc		
Bydgoszcz	Kazimierz Wielki University in Bydgoszcz	Faculty of Mathematics Physics and Technology				BSc		
	Univerisity of Technology and Agriculture in Bydgoszcz	Faculty of Telecommunication and Electrical Engineering	BSc/MSc	BSc/MSc				
Częstochowa	Jan Długosz Pedagogical University in Częstochowa	Faculty of Mathematics and Natural Sciences				BSc/MSc		
	Technical University of Częstochowa	Faculty of Electrical Engineering	BSc/MSc	BSc		BSc		
		Faculty of Mechanical Engineering and Computer Science				BSc/MSc		
		Faculty of Management						BSc
Gdanńsk	Gdansk University of Technology	Faculty of Electronics, Telecommunication and Computer Science		BSc/MSc	BSc/MSc	BSc/MSc		
		Faculty of Electrical Engineering and Control Engineering	BSc/MSc /PhD		BSc			
	University of Gdańsk	Faculty of Mathematics Physics and Computer Science				BSc/MSc /PhD		
		Faculty of Management						BSc/MSc
Gdynia	Gdynia Maritime University	Faculty of Electrical Engineering	BSc/MSc	BSc/MSc				
Gliwice	The Silesian University of Technology in Gliwice	Faculty of Automatics, and Robotics, Electronics, Telecommunication and, Computer Science		BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD		
		Faculty of Electrical Engineering	BSc/MSc /PhD	BSc/MSc /PhD				

EIE-Surveyor

City	University	Faculty						
		Faculty of Mechanics and Technology			MSc			
Katowice	The Karol Adamiecki University of Economics in Katowice	Faculty of Management						BSc/MSc
	University of Silesia in Katowice	Faculty of Computer and Materials Science				BSc/MSc		
		Faculty of Mathematics, Physics and Chemistry				BSc		
Kielce	Kielce University of Technology	Faculty of Electrical Engineering, Automatics and Computer Science	BSc/MSc			BSc		
		Faculty of Mechatronics and Machine Building			BSc			
	Swietokrzyska Academy in Kielce	Faculty of Mathematics and Natural Science				BSc		
Koszalin	Technical University of Koszalin	Faculty of Electronics and Computer Science		BSc/MSc		BSc/MSc		
Krakow (Cracow)	Cracow University of Technology in Cracow	Faculty of Applied Physics, Mathematics and Applied Computer ModellingScience				BSc/MSc		
		Faculty of Mechanics			BSc/MSc	BSc		
		Faculty of Electrical and Computer Engineering	BSc/MSc			BSc		
	AGH University of Science and Technology	Faculty of Mechanical Engineering and Robotics			BSc/MSc /PhD			
		Faculty of Electrical Engineering, Automatics, Computer Science and Electronics	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc	
		Faculty of Physics and Nuclear TechnicsApplied Computer Science					BSc/MSc	
		Faculty of Metals Engineering and Industrial Computer ScienceFaculty of Metallurgy and Materials Science					BSc/MSc	
		Faculty of Geology, Geophysics and Environmental Protection					BSc/MSc	
		Faculty of Management						BSc

City	University	Faculty						
	Cracow University of Economics	Faculty of Management						BSc/MSc
	Pedagogical University in Cracow	Faculty of Mathematics, Physics, and Technical Science				BSc		
	Jagiellonian University in Cracow	Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
		Faculty of Physics, Astronomy and Applied Computer Science				BSc/MSc		
Łódź	Łódź Technical University of Lodz	Faculty of Electrical, Electronic, Computer and Control Engineering / Faculty of Electrical Engineering, and Electronics	BSc/MSc/PhD	BSc/MSc/PhD	BSc/MSc/PhD	BSc/MSc/PhD		
		Faculty of Mechanical Engineering			BSc/MSc			
		Faculty of Technical Physics, Computer Science and Applied Mathematics				BSc/MSc		
		International Faculty of Engineering		BSc		BSc		
	University of Łódź	Faculty of Economics and Sociology						BSc/MSc
		Faculty of Physics and Chemistry				BSc/MSc		
		Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
Lublin	Lublin University of Technology	Faculty of Electrical Engineering and Computer Science	BSc/MSc/PhD			BSc/MSc		
	Maria Curie-Sklodowska University in Lublin	The Faculty of Mathematics, Physics and Computer Science				BSc/MSc		
	The Catholic University of Lublin	Faculty of Mathematics and Natural Sciences				BSc		
Olsztyn	University of Warmia and Mazury in Olsztyn	Faculty of Mathematics and Computer Science				BSc/MSc		
Opole	Opole University of TechnologyTechnical University of Opole	Faculty of Electrical Engineering, , and Automatics and Computer Science	BSc/MSc/PhD	BSc	BSc/MSc/PhD	BSc/MSc		
	University of Opole	Faculty of Mathematics, Physics and Chemistry				BSc		
Poznań	Adam Mickiewicz University in Poznań	Faculty of Physics				BSc		
		Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
	Poznań University of Technology	Faculty of Computer Science and Management			BSc/MSc	BSc/MSc		
		Faculty of Electrical Engineering	BSc/MSc/PhD	BSc/MSc	BSc/MSc/PhD	BSc		
	The Poznań University of Economics	Faculty of Computer Science and Electronic Economy						BSc/MSc
Radom	University of Technology in Radom	Faculty of Teaching				BSc		

City	University	Faculty						
Rzeszów	Rzeszów University of Technology	Faculty of Electrical and Computer Engineering	BSc/MSc	BSc/MSc		BSc/MSc		
		Faculty of Machine Building and Aviation			BSc			
Siedlce	University of Podlasie in Siedlce	Faculty of Sciences				BSc/MSc		
Szczecin	Szczecin University of Technology	Faculty of Computer Science				MSc/BSc/Msc/PhD		
		Faculty of Electrical Engineering	BSc/MSc/PhD	BSc/MSc	BSc/MSc/PhD			
Toruń	Nicolaus Copernicus University in Torun	Faculty of Physics, Astronomy and Applied Computer Science			BSc			
		Faculty of Mathematics and Computer Science				Bsc/Msc/PhD		
Warszawa (Warsaw)	Cardinal Stefan Wyszyński University in Warsaw	Faculty of Mathematics and Natural Science						BSc
	Military Academy of Technology in Warsaw	Faculty of Electronics		BSc/MSc/PhD				
		Faculty of cCybernetics				BSc/MSc/PhD		
	Warsaw University	Faculty of MatematicsMathematics, Computer Science and Mechanics				BSc/MSc/PhD		
	Warsaw University of Technology	Faculty of Mechatronics			BSc/MSc/PhD			
		Faculty of Electronics and Information Technology		BSc/MSc/PhD	BSc/MSc/PhD	BSc/MSc/PhD		
		Faculty of Production Engineering			BSc/MSc			
		Faculty of Mathematics and Information Sciences				BSc/MSc		
		Faculty of Electrical Engineering	BSc/MSc/PhD		BSc/MSc/PhD	BSc/MSc		
		Faculty of Power and Aeronautical Engineering			BSc/MSc/PhD			
Wrocław	Wrocław University of Economics	Faculty of Computer Science and Finances						BSc/MSc
	Wrocław University	Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
	Wrocław University of Technology	Faculty of Electronics		BSc/MSc/PhD	BSc/MSc/PhD	BSc/MSc/PhD		
		Faculty of Microsystems Electronics and Photonics		BSc/MSc/PhD				
		Faculty of Electrical Engineering	BSc/MSc/PhD		BSc/MSc/PhD			
		Faculty of Computer Science and Management				BSc/MSc/PhD		
		Faculty of Mechanical Engineering			BSc/MSc/PhD			

		Faculty of Basic Fundamental Problems of Technology				BSc/MSc /PhD		
Zielona Góra	University of Zielona Góra, School of Technical Science	Faculty of Electrical Engineering, Computer Science and Telecommunication	BSc/MSc /PhD	BSc/MSc	BSc	BSc/MSc /PhD		

Higher Vocational Schools level

Town Name	Institution	Computer Science	Applied Computer Science	Electronics engineering and Telecommunication	Electrical Engineering
Biała Podlaska	Państwowa Wyższa Szkoła Zawodowa w Białej Podlaskiej State Higher Vocational School in Biała Podlaska	X	X		
Chełm	Państwowa Wyższa Szkoła Zawodowa w Chełmie State Higher Vocational School in Chełm				X
Elbląg	Państwowa Wyższa Szkoła Zawodowa w Elblągu The State Higher School of Vocational Education in Elbląg	X			X
Gniezno	Państwowa Wyższa Szkoła Zawodowa w Gnieźnie State Higher Vocational School in Gniezno	X			
Jarosław	Państwowa Wyższa Szkoła Zawodowa w Jarosławiu State Higher Vocational School in Jarosław	X	X		
Jelenia Góra	Kolegium Karkonoskie w Jeleniej Górze Karkonosze Collegium in Jelenia Góra			X	
Kalisz	Państwowa Wyższa Szkoła Zawodowa w Kaliszu Higher Vocational State School of President Stanisław Wojciechowski in Kalisz				X
Krosno	Państwowa Wyższa Szkoła Zawodowa w Krośnie State Higher Vocational School in Krosno	X			
Legnica	Państwowa Wyższa Szkoła Zawodowa w Legnicy State Higher Vocational School in Legnica	X			
Leszno	Państwowa Wyższa Szkoła Zawodowa w Lesznie				X

Town Name	Institution				
	Jan Amos Komeński State School of Higher Vocational Education in Leszno				
Łomża	Państwowa Wyższa Szkoła Informatyki i Przedsiębiorczości w Łomży College of Computer Science and Business Administration in Łomża	X			
Nowy Sącz	Państwowa Wyższa Szkoła Zawodowa w Nowym Sączu State Higher Vocational School in Nowy Sacz		X		
Nysa	Państwowa Wyższa Szkoła Zawodowa w Nysie The State Higher Vocational School in Nysa		X		
Piłła	Państwowa Wyższa Szkoła Zawodowa w Pile State Higher Vocational School in Piła				X
Tarnoów	Państwowa Wyższa Szkoła Zawodowa w Tarnowie Higher Vocational School in Tarnow	X	X		X

Master & Doctorate level

Town Name	Institution	Faculty or department	Electrical Engineering	Electronics and Telecommunications	Automatics and Robotics	Computer Science	Applied Computer Science	Computer Science and Econometrics
Białystok	Białystok Technical University	Faculty of Computer Science				BSc/MSc		
	Białystok Technical University	Faculty of Electrical Engineering	BSc/MSc/PhD	BSc/MSc				
	University of Bialystok	Faculty of Mathematics and Physics				BSc/Msc		BSc
Bydgoszcz	UniveristyUniversity of Technology and Agriculture in Bydgoszcz	Faculty of Telecommunication and Electrical Engineering	BSc/MSc	BSc/MSc				
Częstochowa	Jan Długosz Pedagogical University in Częstochowa	Faculty of Mathematics and Natural Sciences				BSc/MSc		
	Technical University of Częstochowa	Faculty of Electrical Engineering	BSc/MSc	BSc		BSc		
	Technical University of Częstochowa	Faculty of Mechanical Engineering and Computer Science				BSc/MSc		
GdanskGdańsk	Gdansk University of Technology	Faculty of Electronics, Telecommunication and Computer Science		BSc	BSc	BSc/MSc		
	Gdansk University of Technology	Faculty of Electrical Engineering and Control Engineering	BSc/MSc		BSc			
	University of Gdańsk	Faculty of Mathematics Physics and Computer Science				BSc/MSc/PhD		

EIE-Surveyor

City	University	Faculty						
		Faculty of Management						BSc/MSc
Gdynia	Gdynia Maritime University	Faculty of Electrical Engineering	BSc/MSc	BSc/MSc				
Gliwice	Silesian University of Technology in Gliwice	Faculty of Automatics, ElectronicsandElectronics and Computer Science		BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD		
		Faculty of Electrical Engineering	BSc/MSc /PhD	BSc/MSc				
		Faculty of Mechanics and Technology			MSc			
Katowice	The Karol Adamiecki University of Economics in Katowice	Faculty of Management						BSc/MSc
	University of Silesia in Katowice	Faculty of Computer and Materials Science				BSc/MSc		
Kielce	Kielce University of Technology	Faculty of Electrical Engineering, Automatics and Computer Science	BSc/MSc			BSc		
Koszalin	Technical University of Koszalin	Faculty of Electronics and Computer Science		BSc/MSc		BSc/MSc		
Krakow	University of Technology in Cracow	Faculty of Physics, Mathematics and Applied Computer Science				BSc/MSc		
		Faculty of Mechanics			BSc/MSc	BSc		
		Faculty of Electrical and Computer Engineering	BSc/MSc			BSc		
	AGH University of Science and Technology	Faculty of Mechanical Engineering and Robotics			BSc/MSc /PhD			
		Faculty of Electrical Engineering, Automatics, Computer Science and Electronics	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc	
	Cracow University of Economics	Faculty of Management						BSc/MSc
	Jagiellonian University in Cracow	Faculty of Mathematics and Computer Science				BSc/MSc /PhD		
		Faculty of Physics, Astronomy and Applied Computer Science				BSc/MSc		
Łódź	Technical University of Lodz	Faculty of Electrical, Electronic, Computer and Control Engineering	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD	BSc/MSc /PhD		
		Faculty of Mechanical Engineering			BSc/MSc			
		Faculty of Technical Physics, Computer Science and Applied Mathematics				BSc/MSc		
	University of Łódź	Faculty of Economics and Sociology						BSc/MSc

EIE-Surveyor

City	University	Faculty						
		Faculty of Physics and Chemistry				BSc/MSc		
		Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
Lublin	Lublin University of Technology	Faculty of Electrical Engineering and Computer Science	BSc/MSc/PhD			BSc/MSc		
	Maria Curie-Sklodowska University in Lublin	The Faculty of Mathematics, Physics and Computer Science				BSc/MSc		
Olsztyn	University of Warmia and Mazury in Olsztyn	Faculty of Mathematics and Computer Science				BSc/MSc		
Opole	Opole University of Technology	Faculty of Electrical Engineering, Automatics and Computer Science	BSc/MSc/PhD	BSc	BSc/MSc/PhD	BSc/MSc		
Poznań	Adam Mickiewicz University in Poznań	Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
	Poznań University of Technology	Faculty of Computer Science and Management				BSc/MSc		
		Faculty of Electrical Engineering	BSc/MSc/PhD	BSc/MSc	BSc/MSc/PhD	BSc		
	The Poznań University of Economics	Faculty of Computer Science and Electronic Economy						BSc/MSc
Rzeszów	Rzeszów University of Technology	Faculty of Electrical and Computer Engineering	BSc/MSc	BSc/MSc		BSc/MSc		
Siedlce	University of Podlasie in Siedlce	Faculty of Sciences				BSc/MSc		
Szczecin	Szczecin University of Technology	Faculty of Computer Science				BSc/Msc/PhD		
		Faculty of Electrical Engineering	BSc/MSc/PhD	BSc/MSc	BSc/MSc/PhD			
Toruń	Nicolaus Copernicus University in Torun	Faculty of Mathematics and Computer Science				Bsc/Msc/PhD		
Warszawa	Military Academy of Technology in Warsaw	Faculty of Electronics		BSc/MSc/PhD				
		Faculty of Cybernetics				BSc/MSc/PhD		
	Warsaw University	Faculty of MatematicsMathematics, Computer Science and Mechanics				BSc/MSc/PhD		
	Warsaw University of Technology	Faculty of Mechatronics			BSc/MSc/PhD			
		Faculty of Electronics and Information Technology		BSc/MSc/PhD	BSc/MSc/PhD	BSc/MSc/PhD		
		Faculty of Production Engineering			BSc/MSc			
		Faculty of Mathematics and Information Sciences				BSc/MSc		
		Faculty of Electrical Engineering	BSc/MSc/PhD		BSc/MSc/PhD	BSc/MSc		
		Faculty of Power and Aeronautical Engineering			BSc/MSc/PhD			
Wrocław	Wrocław University of Economics	Faculty of Computer Science and Finances						BSc/MSc

Region	University	Faculty						
	Wrocław University	Faculty of Mathematics and Computer Science				BSc/MSc/PhD		
	Wrocław University of Technology	Faculty of Electronics		BSc/MSc/PhD	BSc/MSc/PhD	BSc/MSc/PhD		
		Faculty of Microsystems Electronics and Photonics		BSc/MSc/PhD				
		Faculty of Electrical Engineering	BSc/MSc/PhD		BSc/MSc			
		Faculty of Computer Science and Management				BSc/MSc/PhD		
		Faculty of Mechanical Engineering			MSc			
		Faculty of Fundamental Problems of Technology				BSc/MSc		
Zielona Góra	University of Zielona Góra, School of Technical Science	Faculty of Electrical Engineering, Computer Science and Telecommunication	BSc/MSc/PhD	BSc	BSc	BSc/MSc/PhD		

Doctorate level

Region	Name of the University in national language	Name of the University in English	Name of the Doctoral School	Name of the Doctorate (in national language)	Name of the Doctorate (in English)
Poland, Białystok	Politechnika Białostocka	Białystok Technical University	Wydział Elektryczny Faculty of Electrical Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinie elektrotechnika	Doctorate in Technical Sciences, discipline Electrical Engineering
Poland, Gdańsk	Uniwersytet Gdański	University of Gdańsk	Środowiskowe Studium Doktoranckie z Matematyki i Informatyki – Wydział Matematyki, Fizyki i Informatyki Faculty of Mathematics, Physics and Computer Science	Doktorat w dyscyplinie informatyka	Doctorate in discipline Computer Science
Poland, Gliwice	Politechnika Śląska	Silesian University of Technology in Gliwice	Wydział Elektryczny Faculty of Electrical Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinie elektrotechnika	Doctorate in Technical Sciences, discipline Electrical Engineering
			Wydział Automatyki, Elektroniki i Informatyki Faculty of Automatics, Electronics and Computer Science	Doktorat w dziedzinie nauk technicznych w dyscyplinach: automatyka i robotyka, elektronika, informatyka	Doctorate in Technical Sciences, disciplines: Automatics and Robotics, Electronics, Computer Science

EIE-Surveyor

Poland, Krakow	Akademia Górniczo-Hutnicza w Krakowie	AGH University of Science and Technology	Wydział Elektrotechniki, Automatyki Informatyki i Elektroniki Faculty of Electrical Engineering, Automatics, Computer Science and Electronics	Doktorat w dziedzinie nauk technicznych w dyscyplinach: informatyka, elektronika, elektrotechnika, automatyka i robotyka, telekomunikacja	Doctorate in Technical Sciences, disciplines: Computer Science, Electronics, Electrical Engineering, Automatics and Robotics, Telecommunications
			Wydział Inżynierii Mechanicznej i Robotyki Faculty of Mechanical Engineering and Robotics	Doktorat w dziedzinie nauk technicznych w dyscyplinie automatyka i robotyka	Doctorate in Technical Sciences, discipline Automatics and Robotics
	Uniwersytet Jagielloński w Krakowie	Jagiellonian University in Cracow	Wydział Matematyki i Informatyki Faculty of Mathematics and Computer Science	Doktorat w dziedzinie nauk matematycznych w dyscyplinie informatyka	Doctorate in Mathematics, discipline Computer Science
Poland, Łódź	Politechnika Łódzka	Technical University of Lodz	Wydział Elektrotechniki, Elektroniki, Informatyki i Automatyki Faculty of Electrical Engineering, Electronic, Computer Science and Control Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinach: elektrotechnika, elektronika, automatyka i robotyka, informatyka	Doctorate in Technical Sciences, disciplines: Electrical Engineering, Electronics, Automatics and Robotics, Computer Science
	Uniwersytet Łódzki	University of Łódź	Wydział Matematyki i Informatyki Faculty of Mathematics and Computer Science	Doktorat w dyscyplinie informatyka	Doctorate in discipline Computer Science
Poland, Lublin	Politechnika Lubelska	Lublin University of Technology	Wydział Elektrotechniki i Informatyki Faculty of Electrical Engineering and Computer Science	Doktorat w dziedzinie nauk technicznych w dyscyplinie elektrotechnika	Doctorate in Technical Sciences, discipline Electrical Engineering
Poland, Opole	Politechnika Opolska	Opole University of Technology	Wydział Elektrotechniki, Automatyki i Informatyki Faculty of Electrical Engineering Automatics and Computer Science	Doktorat w dziedzinie nauk technicznych w dyscyplinach: elektrotechnika, automatyka i robotyka	Doctorate in Technical Sciences, disciplines: Electrical Engineering, Automatics and Robotics
Poland, Poznań	Uniwersytet im. Adama Mickiewicza w Poznaniu	Adam Mickiewicz University in Poznań	Wydział Matematyki i Informatyki Faculty of Mathematics and Computer Science	Doktorat w dziedzinie nauk matematycznych w dyscyplinie informatyka	Doctorate in Mathematics, discipline Computer Science
	Politechnika Poznańska	Poznań University of Technology	Wydział Elektryczny Faculty of Electrical Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinach: elektrotechnika, automatyka i robotyka	Doctorate in Technical Sciences, disciplines: Electrical Engineering, Automatics and Robotics

Poland, Szczecin	Politechnika Szczecińska	Szczecin University of Technology	Wydział Elektryczny Faculty of Electrical Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinach: automatyka i robotyka, elektrotechnika	Doctorate in Technical Sciences, disciplines: Automatics and Robotics, Electrical Engineering
			Wydział Informatyki Faculty of Computer Science	Doktorat w dziedzinie nauk technicznych w dyscyplinie: Informatyka	Doctorate in Technical Sciences, discipline Computer Science
Poland, Toruń	Uniwersytet Mikołaja Kopernika w Toruniu	Nicolaus Copernicus University in Torun	Wydział Matematyki i Informatyki Faculty of Mathematics and Computer Science	Doktorat w dyscyplinie informatyka	Doctorate in discipline Computer Science
Poland, Warszawa	Wojskowa Akademia Techniczna w Warszawie	Military Academy of Technology in Warsaw	Wydział Elektroniki Faculty of Electronics	Doktorat w dziedzinie nauk technicznych w dyscyplinach: elektronika, telekomunikacja	Doctorate in Technical Sciences, disciplines: Electrical Engineering, Electronics, Telecommunications
			Wydział Cybernetyki Faculty of Cybernetics	Doktorat w dziedzinie nauk technicznych w dyscyplinie informatyka	Doctorate in Technical Sciences, discipline Computer Science
	Uniwersytet Warszawski	Warsaw University	Wydział Matematyki, Informatyki i Mechaniki Faculty of Mathematics, Computer Science and Mechanics	Doktorat w dyscyplinie informatyka	Doctorate in discipline Computer Science
	Politechnika Warszawska	Warsaw University of Technology	Wydział Mechatroniki Faculty of Mechatronics	Doktorat w dziedzinie nauk technicznych w dyscyplinie automatyka i robotyka	Doctorate in Technical Sciences, discipline Automatics and Robotics
			Wydział Elektroniki i Technologii Informacyjnych Faculty of Electronics and Information Technology	Doktorat w dziedzinie nauk technicznych w dyscyplinach: automatyka i robotyka, elektronika, informatyka, telekomunikacja	Doctorate in Technical Sciences, disciplines: Automatics and Robotics, Electronics, Computer Science, Telecommunications
			Wydział Elektryczny Faculty of Electrical Engineering	Doktorat w dyscyplinach: automatyka i robotyka, elektrotechnika	Doctorate in disciplines: Automatics and Robotics, Electrical Engineering
			Wydział Mechaniczny Energetyki i Lotnictwa Faculty of Power and Aeronautical Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinie automatyka i robotyka	Doctorate in Technical Sciences, discipline Automatics and Robotics
Poland, Wrocław	Uniwersytet Wrocławski	Wrocław University	Wydział Matematyki i Informatyki Faculty of Mathematics and Computer Science	Doktorat w dyscyplinie informatyka	Doctorate in discipline Computer Science

				Doktorat w dziedzinie nauk technicznych w dyscyplinach: elektronika, automatyka i robotyka, informatyka, telekomunikacja	Doctorate in Technical Sciences, disciplines: Electronics, Automatics and Robotics, Computer Science, Telecommunications
	Politechnika Wrocławska	Wrocław University of Technology	Wydział Elektroniki Faculty of Electronics		
			Wydział Elektroniki Mikrosystemów i Fotoniki Faculty of Microsystems Electronics and Photonics	Doktorat w dziedzinie nauk technicznych w dyscyplinie elektronika	Doctorate in Technical Sciences, discipline Electronics
			Wydział Elektryczny Faculty of Electrical Engineering	Doktorat w dziedzinie nauk technicznych w dyscyplinie elektrotechnika	Doctorate in Technical Sciences, discipline Electrical Engineering
			Wydział Informatyki i Zarządzania Faculty of Computer Science and Management	Doktorat w dziedzinie nauk technicznych w dyscyplinie informatyka	Doctorate in Technical Sciences, discipline Computer Science
Poland, Zielona Góra	Uniwersytet Zielonogórski	University of Zielona Góra	Wydział Elektrotechniki, Informatyki i Telekomunikacji Faculty of Electrical Engineering, Computer Science and Telecommunication	Doktorat w dziedzinie nauk technicznych w dyscyplinach: elektrotechnika, informatyka	Doctorate in Technical Sciences, disciplines: Electrical Engineering, Computer Science

Pedagogical content of the diplomas in the field of EIE for the Polish Universities.
(Detailed analysis of the selected Public Universities and Vocational High Schools)

	Faculty	Degree courses	Type of study	Specialisations
Wroclaw University of Technology	Faculty of Electronics	automatics and robotics	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• Computer systems in automatics • computer-based control networks • robotics • software engineering of control systems and robotics • computer management systems of production processes
		computer science and engineering	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• computer systems and networks • microprocessor and microcomputer systems • applied computer science in medicine and engineering • Internet engineering • data processing system engineering
		electronics and telecommunication	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• acoustics • electronic equipment • • distributing teleinformation systems • wide bandwidth telecomunication network • systems of mobile telecomunication • signals in digital telecomunication • sound engineering • applied electronics and optocomunication • optoelectronics and fibre technology • telecommunication systems • • applied computer engineering •
		teleinformatics	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D	• teleinformation systems design • teleinformation systems maintenance
	Faculty of Microsystems Electronics and Photonics	electronics and telecommunication	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• microelectronic • microsystems • optronics and optical waveguide technology • electronics devices • photonics
	Faculty of Electrical Engineering	automatics and robotics	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• automation of machines, vehicles and apparatus • control in electrical power systems
		electrical engineering	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• • electrical power engineering • electrical engineering • Control in Electrical Power Engineering (eng)

	Faculty	Degree courses	Type of study	Specialisations
	Faculty of Computer Science and Management	computer science	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• software engineering • information systems and networks • information systems • computer control systems brak nowych danych
	Faculty of Mechanical Engineering	automatics and robotics	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• engineering machine and process automation • manufacturing systems • biomedical engineering
	Faculty of Basic Problems of Technology	computer science	4 B.Sc. / 6 M.Sc / 9 Ph.D. and 5 M.Sc. / 9 Ph.D.	• algorithm and informatics systems • computering security • numerical method and computer graphics • information systems • computational statistics

Radom University of

Faculty	Degree courses	Type of study	Specialisations
Faculty of Teaching	technical education	5 M.Sc.	• computing and information systems
	Computer science		• Computer science
Faculty of Transportation	electrical engineering	5 M.Sc.	• automatics and computer science • electrical power engineering
	transportation	3,5 B.Sc. / 5,5 M.Sc.	• automatics in railway transportation ← B.Sc. • electronics and telecommunication in transportation ← B.Sc. • power electronics traction ← B.Sc. • telecommunication in transportation ← M.Sc.

Kielce University of technology

Faculty	Degree courses	Type of study	Specialisations
Faculty of Electrical Engineering Computer Science and Automation	electrical engineering	3,5 B.Sc. / 5 M.Sc. lub 4 B.Sc. / 2 M.Sc.	• automatics • industrial electronics and power electronics • technical computer science • computer measurement systems • processing and using of power energy • telecommunication
	computer science	3,5 B.Sc. lub 4 B.Sc.	• information systems
Faculty of Mechanics and Machine Building	automatics and robotics	3,5 B.Sc. / 5 M.Sc.	• industrial automatics

Gdansk University of

Faculty	Degree courses	Type of study	Specialisations	
Faculty of Electronics, Telecommunication and Computer Science	automatics and robotics	4 B.Sc.	• computer control systems	
		5 M.Sc.	• computer control systems • intelligent decision systems • mobile control systems	
	electronics and telecommunication	4 B.Sc.	Electronics	• wireless comunication engineering • electronic instrumentation • optoelectronics • microelectronics systems • komputer electronic systems

Faculty	Degree courses	Type of study		Specialisations
		5 M.Sc.	Telecommunication	• teleinformation systems • radiocommunication systems and services • marine electronic systems • sound and image engineering
			Electronics	• electronic instrumentation and computer hardware • computer electronic systems • microelectronic instrument design • medical and ecological electronics
			Telecommunication	• tele-information systems • sound and image engineering • environmental monitoring • telecommunication systems and networks • radiocommunication systems • microwave telecommunication devices
	computer science	3 B.Sc.		• computer Science
		5 M.Sc.		• distributed applications and internet systems • system engineering and databases • computer networks • document engineering • modeling and computer system programming • geoinformation systems
	interdisciplinary	5 M.Sc.		• optoelectronics • digital signal processing
Faculty of Electrical Engineering and Control Engineering	electrical engineering	3,5 B.Sc. / 5 M.Sc./ 9 Ph.D.		• power electronics • electrical machines • electrical drives and power electronics • electrical engineering in transportation • electrical devices • technical computer science
	automatics and robotics	3,5 B.Sc. / 5 M.Sc./ 9 Ph.D.		• automatics • technical computer science • robotics (soon)
Faculty of Mechanical Engineering	mechatronics	3,5 B.Sc. / 5 M.Sc./ 9 Ph.D.		• applied mechatronics

Rzeszów University of Technology

Faculty	Degree courses	Type of study	Specialisations
Faculty of Mechanical Engineering and Aeronautics	automatics and robotics	I stopien	• computer science and robotics • computer science in machine design
Faculty of Electrical and Computer Engineering	electrical engineering	4 B.Sc. and 5 M.Sc.	• control and computer engineering • electronic devices • • conversion and use of electric energy • electrical engineering • computer information and measure systems • telecomunication
	computer science	5 M.Sc.	• computer engineering • computer networks and systems
	electronics and telecommunication	5 M.Sc.	• electronic devices

Poznań University of Technology

Faculty	Degree courses	Type of study	Specialisations
Faculty of Computer Science and Management	computer science	3 B. Sc. / 5 M. Sc.	• computer networks and distributed systems • design and exploatation of data processing systems • integrated systems of manufacturing and management • data processing supporting systems • software engineering • electronic economy • computer science in business processes • intelligent systems for decission supporting • software engineering • design and exploatation information systems • computer networks and distributed systems • information systems in management • software creation technology

		automatics and managment	3,5 B. Sc. / .	• automatics • intelligent systems of production engineering • multimedia • reprogramming control systems • microcomputer control systems • work security engineering
	Faculty of Electrical Engineering	electrical engineering	3,5 B. Sc.	• electroenergetics • microprocessor and actuator control systems • electrical and information systems in industry and vehicles
		Computer science	3,5 B. Sc.	• security of computer networks • mathematical methods of applied computer science • teleinformation systems
		automatics and robotics	3,5 B. Sc.	• automatics • robotics
	Faculty of Electronics and Telecommunication	Electronics and Telecommunication	3,5 B. Sc.	• integration of information technics • computer measure systems • multimedia and electronics of common use • computer networks • networks of information transfer • radiocommunication systems • telecommunication systems

	Faculty	Degree courses	Type of study	Specialisations
Warsaw University of Technology	Faculty of Mechatronics	automatics and robotics	3,5 B.Sc. / 5 M.Sc./ 9 Ph.D	• automatics • robotics
		automatics and robotics	5 M.Sc. / 9 Ph.D. and 4 B.Sc. / 6 M.Sc. / 10 Ph.D.	• automatics • biocybernetics and biomedical engineering • sensors and measure systems • robotics • fotonical engineering • multimedial technics
		mechatronics	3,5 B.Sc. / 5 M.Sc./ 9 Ph.D	• fotonical engineering • quality engineering • engineering of making mechatronical products • micromechanics • sensors and measure systems • multimedial technics • electromedical devices
	Faculty of Electronics and Information Technology	computer science ,automatics adn robotics, electronics and telecommunication	5 M.Sc. / 8 Ph.D. and 4 B.Sc. / 6 M.Sc. / 9 Ph.D.	• biomedical engineering • electronics and computer engineering • radiocomunication and multimedia technics • telecomunication systems and networks • • teleinformation technology and management in telecomunication
		computer science	5 M.Sc. / 8 Ph.D. and 4 B.Sc. / 6 M.Sc. / 9 Ph.D.	• engineering of information systems • information-decision systems •
	Faculty of Electrical Engineering	electrical engineering (eng)	4 B.Sc. / 6 M.Sc./	
		electrical engineering	3,5 B.Sc. / 5 M.Sc./ 9 Ph.D	• data processing and measurement systems • electrical power engineering • mechatronics and electrical equipment of vehicles • applied electrical engineering • automatics and computer engineering • electrical power engineering • applied enectrical engineering • electrical mechatronics
		automatics and robotics		• automatics
		computer science		• computer engineering • computer science in electrical power engineering
	Faculty of Production Engineering	automatics and robotics [12]	3,5 B.Sc. / 5 M.Sc.	• automation of manufacturing processes • flexible manufacturing systems

	Faculty	Degree courses	Type of study	Specialisations
	Faculty of Mathematics and Information Sciences	computer science	3,5 B.Sc. / 5,5 M.Sc.	• applied computer science • CAD/CAM without specialisation

	Faculty	Degree courses	Type of study	Specialisations
University of Zielona Góra, School of Technical Science	Faculty of Electrical Engineering, Computer Science and Telecommunication	electrical engineering	3,5 B.Sc / 5 M.Sc.	• digital measurement systems • power engineering electronics in power engineering • computer control systems processing systems • engineering of microcomputer systems
		computer science	3,5 B.Sc / 5 M.Sc.	• sofware engineering • software engineering • industrial data processing systems
		electronics and telecommunication	3,5 B.Sc / 5 M.Sc.	• electronic hardware • industrial electronics • teleinformation technology
	Faculty of Mathematics, computer science and econometrics	computer science and econometrics	5 M.Sc.	• information systems • statistics and econometrics •

	Faculty	Degree courses	Type of study	Specialisations
Cracow University of Technology	Faculty of Electrical and Computer Engineering	electrical engineering	3,5 B.Sc	• automatics in electrical systems • electrical systems engineering and control in transport • engineering of electrical systems •
			5 M.Sc.	• control and diagnostics of electrical systems • energoelectronics • computer engineering in electrical engineering • metrological computer systems • computer control systems • electromechanical and drive systems • modern systems of electrical traction
		computer science	3,5 B.Sc	
			5 M.Sc.	
	Faculty of Mechanical Engineering	automatics and robotics	5 M.Sc.	• automation of manufacturing • multimedia in industial systems
		computer science	5 M.Sc.	• applied computer science
	Faculty of Physics, Mathematics and Computer Modelling	computer science	3,5 B.Sc. 5 M.Sc.	• applied computer science
	Faculty of Civil Engineering	computer science	3,5 B.Sc. 5 M.Sc. 9 Ph.D	• computer science in civil engineering • computer mechanics of constructions and materials

	Faculty	Degree courses	Type of study	Specialisations
Warsaw Military	Faculty of Electronics	electronics and telecommunication	4 B.Sc. ; 5 M.Sc.	• telecommunication systems • teleinformation systems • teledetection systems • radioelectronic systems • information and measure systems • digital systems • security systems engineering • optoelectronics

Faculty	Degree courses	Type of study	Specialisation
Faculty of Cybernetics	computer science	5 M.Sc. 9 Ph.D	• information systems • management information systems • computer engineering • cryptology • multimedia systems
Faculty of Mechatronics	mechatronics	5 M.Sc. 9 Ph.D	• automatics and control • identification and diagnostics of technical systems • security systems engineering • armament technics and detonation materials • computer technics in mechatronics • clasical armament and battle means • rocket armament

AGH University of Science and Technology

Faculty	Degree courses	Type of study	Specialisation
Faculty of Mechanical Engineering and Robotics	automatics and robotics	4 B.Sc. / 5 M.Sc. / 9 Ph.D.	• robotics and mechatronics • automatics and metrology
	mechanics and machine building	4 B.Sc. / 5 M.Sc. / 9 Ph.D.	• Structural and Biomedical Acoustics • Machines and Vehicles Engineering • Computer Methods in Mechanical Engineering • Minerals Production and Processing Machines • Earth Moving for Materials Handling Machines • Manufacturing Machines and Facilities • Power Systems, Machines and Facilities • Cable Transport • Environmental Protection Facilities • Vibroacoustics and Sound Engineering
Faculty of Metals Engineering and Industrial Computer Science	Applied computer science	5 M.Sc. / 9 Ph.D.	• Computer Science in Industry • (without specjalization)
Faculty of Geology and Mining Engineering	Applied computer science	5 M.Sc. / 9 Ph.D.	• Modelling and computer systems in geophysics • Software and databases in geology
Faculty of Physics and Applied Computer Science	Applied computer science	5 M.Sc. / 9 Ph.D.	• Computer Techniques in Science and Technology
Faculty of Management	management and marketing	4 B.Sc. / 5 M.Sc. / 9 Ph.D.	• information systems of management
Faculty of Electrical Engineering, Automatics, Computer Science and Electronics	automatics and robotics	5 M.Sc. / 9 Ph.D.	• computer control systems • computer science in control and management
	electronics and telecommunication	3,5 B.Sc. / 5 M.Sc. / 9 Ph.D.	• electronic equipment • microelectronics and biomedical equipment • telecommunication networks and services • teleinformation devices and systems
	computer science	5 M.Sc. / 9 Ph.D.	• information system and database engineering • distributed systems and computer networks
	applied computer science	3,5 B.Sc. / 5 M.Sc. /	• computer science in medicine and multimedia • computer science in industrial processes • computer science in control systems • information systems in production and administration
	electrical engineering	3,5 B.Sc. / 5 M.Sc. / 9 Ph.D.	• automatics and measurement and instrumentation • automatics of drive and technological devices • electrical power • power engineering electronics • computer engineering in industry • industry electrical power engineering

	Faculty	Degree courses	Type of study	Specialisations
University of Bielsko-Biała	Faculty of Mechanical Engineering and Computer Science	electrical engineering	3,5 B.Sc. / and 4,5 B.Sc /	Converting and Usage of Electric Energy Industrial Automation and Measurement Systems
		computer science	3,5 B.Sc. / and 3,5 M.Sc.	• **Application of Computer Science for Machine Design** • **Application of Computer Science for Management** • Telecommunication and computer networks • Software Engineering • Database nad networks administration
		automatics and robotics	3,5 B.Sc. / and 4,5 B.Sc /	• Mechatronics • **Automation and Control Systems of Vehicles** • Designing of Work Stand Equipped in Robots • Electrical engineering control and information-measurement systems

19.4. References

The information given in this section are based on the following sources:

Small Statistic Yearbook, edited by GUS

Polish Ministry of Education and Sport:

http://www.men.waw.pl/

http://www.msz.gov.pl/mszpromo/en/1_3.htm

http://elt.britcoun.org.pl/e_poland.jpg

Doctoral
Studies

19.5. Doctoral Studies in Poland

19.5.1. Supervision

Scientific Board or Supervisor

The Scientific board consists of a minimum of 8 professors (with the voting rights) plus other members. The student, in most cases, has the same personal supervisor during its thesis work on an active research area of the supervisor.

Subject Assignment

Subject assigned after a specified period of coursework, by agreement between student and supervisor.

Who can be a Supervisor

1. Any professor or Doctoral of Science title holder in the department.

2. Any external professor or Doctoral of Science title holder, but with an obligatory internal supervisor.

Tasks of Scientific Board/Supervisor

1. General management   NO

2. Deciding/advising layout of course   YES

3. Assigning a thesis subject   YES

Duration

Four years.

*19.5.*2. Development

Courseware?

Yes.

Course Work

1.   The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations. The coursework is offered as specialist graduate course units.

2.   Extension: 240 hours in the first year, 120 hours in the second year, 120 hours in the third year and 60 hours in the fourth year.

3.   Credit system: ECTS (0-15 credits for MSC studies). No credit system for PhD studies at the moment.

4.   Monitoring of the doctoral student. In case of failure the student must retake the exam.

Contribution to Teaching

Supervision of undergraduate laboratory work.

Presentation of Work

1.   In the department.

2.   At national conferences.

3.   At international conferences.

19.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   <u>Language</u>: Polish. Alternative language: English.

2.   <u>No credits</u> allocated to the doctoral thesis at the moment.

3.   The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1.   <u>Language</u> normally used: Polish. Alternative language: English.

2.   Oral presentation for an open audience with oral examination at open doors.

3.   <u>Duration</u>: typical duration of 2 hours including discussion with no upper time limit.

19.5.4. Examination

Thesis Examination Board

1.   <u>Composition</u>: five internal examiners and one external examiner (six members).

2.   <u>Selection</u> by the Scientific Board.

Evaluation

1.   <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with a grading system: passed or outstanding passed.

2.   <u>If the student fails</u>, he/she may resubmit a revised thesis.

19.6. Questionnaires

Poland

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	58
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	N
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	Y
	Professors and DSc title holders are members of SB.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	N
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y/N
	In most cases, but not obligatory.	
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	N
	Must be active research area of the thesis supervisor.	

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

N

3.1.7.2   After a specified period of coursework?

Y

3.1.7.3   Other. Please specify:

N

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

Y[1]

3.1.8.2   Any researcher in the department?

N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

Y[2]

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y

3.1.8.4   Other methods. Please specify:

N

[1] **Any professor or DSc title holder in the department.**
[2] **Any professor or DSc title holder in another institution.**

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

Y

3.1.9.2   Other methods. Please specify:

N

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

y

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
240 hrs	**120 hrs**	**120 hrs**	**60 hrs**

3.2- COURSE WORK

3.2.2.2 **In which form is this coursework offered?**

    - **As specialist graduate course units.**   Y

    - As course units taken from the undergraduate programme.

    - Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?   Y
If not, please give details:

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?   Y[3]

3.2.3.2 Is it the ECTS system?   Y

If not, what is the relationship with ECTS?

3.2.3.3 How many credits are allocated to coursework?   0-15[*] credits

[3] But not applied for PhD studies! [*] (for MSc studies).

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?   Y

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

    - **Retake the exam**.   Y

    - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1 In the department.

3.3.2 At national conferences.

3.3.3 At international conferences.

3.4- CONTRIBUTION TO TEACHING:

3.4.1 **Supervision of undergraduate laboratory.**   Y

3.4.2 Teaching undergraduate courses.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Polish
4.1.2	Are alternative languages used for the thesis? Please Specify: **English.**	Y
4.1.3	Which language is normally used for the oral presentation and/or examination?	Polish
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English.**	YES
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	**A previously unpublished substantial written report.**	Y
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	5
4.2.2.2	**External examiners.**	1
4.2.2.3	TOTAL.	6

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   <u>**By the scientific committee of the institution.**</u>

Y

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.

Y

4.2.4.2   The oral presentation of the thesis work.

Y

4.2.4.3   <u>**Both.**</u>

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?

1.5 h[4]

4.2.4.5   Is there an upper limit to the duration of the thesis examination?

N

[4] 1.5 h including discussion.

4.2.5   Is the oral part of the examination taken behind closed doors?

N

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

N

4.2.6.2   May resubmit revised thesis.

Y

4.2.6.3   May do further work as specified by examination board.

N

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:

N

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?
Two-state grading: passed or outstanding passed.

Y

20. PT: Portugal

Coordinating author: F. MACIEL-BARBOSA (EAEEIE, Universidade do Porto, fmb@fe.up.pt)
Other contributors: Maria João MARTINS (EAEEIE, Instituto Superior Técnico, Lisboa,
mariajoaomartins@ist.utl.pt)

20.1. General information

In Portugal there are Universities and Polytechnic Institutes. The students arrive at the University/Polytechnic after 12 years at the secondary school. As the course/school has "*numerus clausus*", at the end of the secondary school the students have a National Exam to choose the course they want. The students are admitted or not taking into account the the global results which are constituted by the marks obtained in the secondary school, the national exams and the marks obtained in specific subjects.
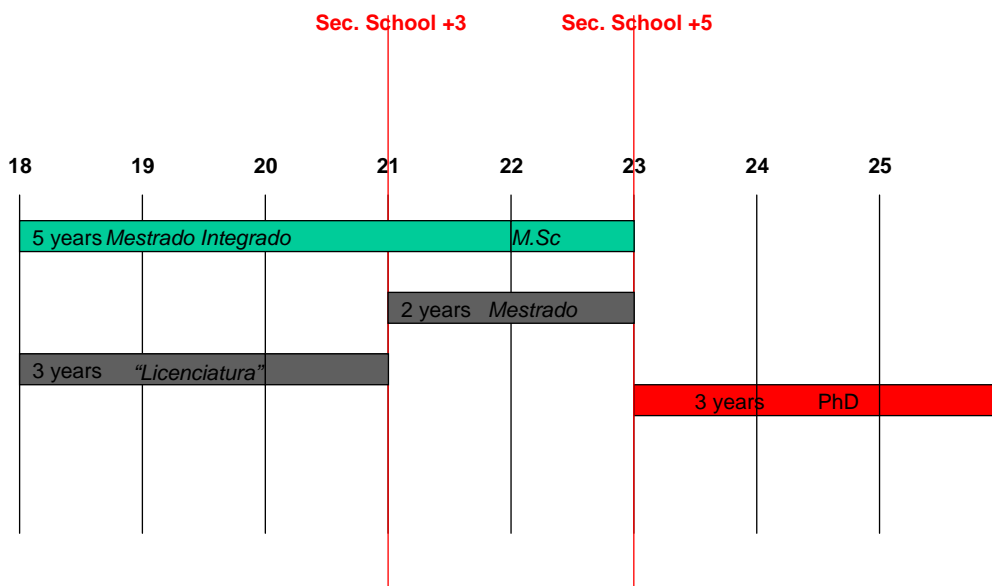
Figure 19.1: Portuguese Higher Education System in EIE disciplines.

In Portuguese Universities there are are two kinds of courses: *"Licenciatura" (Bachelor),* with a duration of 3 years and *"Mestrado Integrado" (Integrated Master of Sciences*) which last 5 years. The students with a "*Licenciatura*" degree can continue at a post-graduate level for two more years for the degree of "*Mestrado"(Master of Science).* The "*Licenciatura*" combines a wide education in technological aspects of Electrical Engineering with a deep knowledge in mathematics and physics.

At the Polytechnic, undergraduate studies in Electrical Engineering take three years leading to the "*Licenciatura*" (1st cycle) and continue for 2 more years (2nd cycle) for the degree of "*Mestrado*". The

first cycle of the course at the Polytechnic has mathematics and physics as well as technological subjects to prepare the students to get a job. At the second cycle at the Polytechnic the students complete their education in mathematics and physics so as their technological subjects. Most of the students that study at the second cycle can get a job, so they work and study simultaneously. After the students have finished the "*Licenciatura"* they can apply for a "*Mestrado"* course either at a Univerty or at a Polytechnic.

20.1.1 *Electrical and Information Engineering in Portugal, boundaries of the field of study*

- • Electrical Engineering
- • Electronics/Microelectronic
- • Telecommunications/Communications Technology
- • Power Systems
- • Automation/Control and Robotics
- • Computer Networks
- • Computer Science

20.1.2 *Content, degrees and accreditations*

The curriculum for each course is defined by a scientific committee at each University/Polytechnic.

20.1.3 *Implementation of the Bologna-BMD system in Portugal*

The Bologna structure is implemented since the academic year 2007/08

20.2. Location of the Universities and Polytechnics offering Electrical and Information (EIE) engineering courses in Portugal

The figure below shows the location of the Universities and Polytechnics offering Electrical and Information (EIE) engineering courses in Portugal.
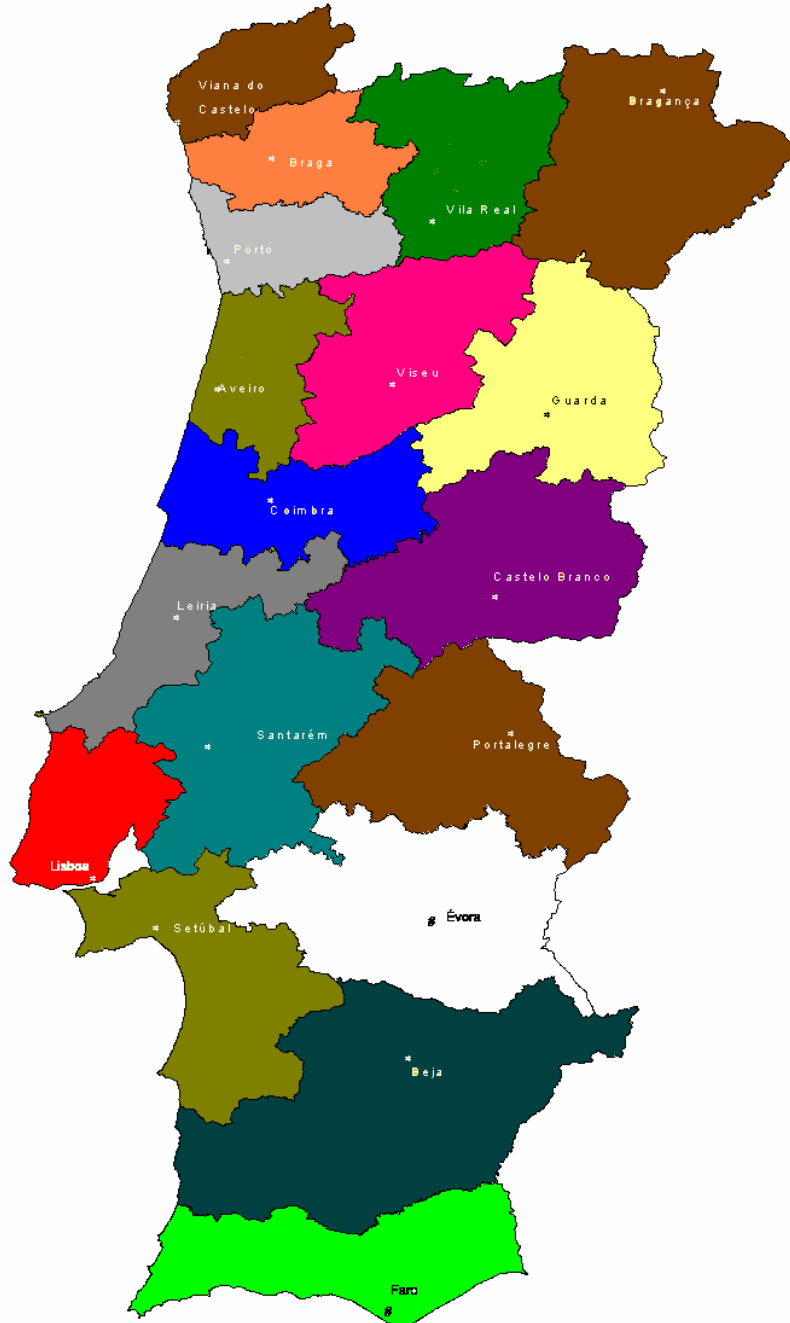
Figure 19.2: Location of the Universities and Polytechnics offering Electrical and Information (EIE) Engineering courses in Portugal.

20.3. Degrees in EIE in Portugal

20.3.1 Before "Licenciatura" (Bachelor)- technician level

After nine years at the secondary school the students can choose to go for a technical course with the duration of three years. After these three years the student can get a job or if he/she prefers he can choose to go to the University or to a Polytechnic School. There are some different courses in the EIE area.

20.3.2 "Licenciatura" (Bachelor level)

"Licenciatura" (Secondary School + 3 years) is a title that is given by the Universities or the Polytechnics, for a course program of nominally three years.

20.3.3 "Mestrado" level (Master))

"Mestrado" (5 years) is a title that is given by the University or the Polytechnics, for a course program of nominally five years or a title that is given by for a course program of nominally two years after a "*Licenciatura*".

"*Engenheiro* (engineer)" is a title awarded by a specific professional board ("*Ordem dos Engenheiros*") that recognizes the "*Mestrado*" at a national level, as a professional one.

20.3.4 "Doutoramento" (Ph. D)

"*Doutoramento* (Ph.D.)" is a title that is given by the University, after the "*Mestrado*" and a post-graduate course with a minimum duration of three years with a public discussion of a thesis.

20.4. References

The information given in this monograph is based on the following document:

[1] – "Ministério da Ciência e da Tecnologia" http://www.mces.pt/

[2] – "Ordem dos Engenheiros" http://www.ordeng.pt/

[3] – European Qualifications Framework

http://ec.europa.eu/education/policies/educ/eqf/index_en.html

[4] – Dublin descriptors,

www.upc.edu/eees/contingut/arxius/Descriptors_dublin%255B1%255D_2004.pdf

Doctoral
Studies

20.5. Doctoral Studies in Portugal

20.5.1. Supervision

Scientific Board or Supervisor

The Scientific board is composed by three members appointed by the Department or Faculty. The student, in most cases, has the same personal supervisor during its thesis work on an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Any professor in the department.

Tasks of Scientific Board/Supervisor

1.	General management/monitoring	**YES**
2.	Deciding/advising layout of course	**YES**
3.	Assigning a thesis subject	**YES**
4.	Responsible for monitoring student's progress.	**YES**

Duration

Three years.

20.5.2. Development

Courseware?

YES.

Course Work

1.   The students have to take course work during their doctoral degree preparation.

2.   Extension: **1 year**.

3.   Credit system: **60 ECTS**.

4.   Monitoring: **YES**.

Contribution to Teaching

1.   Optional supervision of undergraduate laboratory work (typically. 4/6 hours per week).

2.   In general, no teaching of undergraduate courses.

Presentation of Work

In the department.

In national and international conferences

In national and international journals

20.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   Language normally used: English. Alternative language: Portuguese

2.   Credits allocated to the doctoral thesis- 120

3.   The doctoral thesis is a previously unpublished, as a whole, substantial written report with an innovative contribution.

Oral Presentation of Thesis Work

1.   Language normally used: English. Alternative language: Portuguese.

2.   Oral presentation with oral examination for an open/public audience.

3.   Duration: typical duration of 2 hours with an upper time limit of 3 hours. Public presentation of the thesis by the candidate during half an hour and a cross examination period that can last up to 2.5 hours.

20.5.4. Examination

Thesis Examination Board

1.   Composition: four internal examiners and two external examiners (six members).

2.   Selection by the supervisor and approved by the Scientific Board of the institution and the Rector of the University.

Evaluation

1.   Composition: four internal examiners and two external examiners (six members).

2.   Selection by the examination board..

20.6. Questionnaires

Portugal

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	± 6
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	YES
3.1.3.2	Chosen by the student?	NO
3.1.3.3	Chosen in another way? Please specify:	NA
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	YES
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	YES
3.1.5.1	Does the same person supervise her/his thesis work?	**YES**
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	**YES**

3.1.7

3.1.7.1   At the beginning of the doctoral studies?

3.1.7.2   After a specified period of coursework?

3.1.7.3   Other. Please specify:

3.1.8

3.1.8.1   Any professor or lecturer in the department?

3.1.8.2   Any researcher in the department?

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

3.1.8.4   Other methods. Please specify:

3.1.9

3.1.9.1   Agreement between the student and the proposed supervisor?

3.1.9.2   Other methods. Please specify:

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

3.2.2

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**
12 h/week	**O hrs**	**0 hrs**

3.2- COURSE WORK

3.2.2.2 **In which form is this coursework offered?**

      - As specialist graduate course units.   YES

      - As course units taken from the undergraduate programme.   NO

      - Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?   YES
If not, please give details:

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?   YES

3.2.3.2 Is it the ECTS system?   YES

If not, what is the relationship with ECTS?

3.2.3.3 How many credits are allocated to coursework?   60ECTS

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking
coursework?   YES

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

      - Retake the exam.   YES

      - Take a different course unit.   NA

3.3- PRESENTATION OF WORK RESULTS:

3.3.1 In the department.   YES

3.3.2 At national conferences.   YES

3.3.3 At international conferences.   YES

3.4- CONTRIBUTION TO TEACHING:

3.4.1 Supervision of undergraduate laboratory.   YES

3.4.2 Teaching undergraduate courses.   YES/NO

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	**English**
4.1.2	Are alternative languages used for the thesis? Please Specify:	YES **Portuguese**
4.1.3	Which language is normally used for the oral presentation and/or examination?	English
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	YES **Portuguese**
4.1.5	Are credits allocated to the doctoral thesis?	YES
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	YES
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	NO
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	4
4.2.2.2	External examiners.	2
4.2.2.3	TOTAL.	6

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   YES[1]

4.2.3.2   By the scientific committee of the institution.   YES[1]

4.2.3.3   By the rector or equivalent.   YES[1]

4.2.3.4   By the national ministry.   NO

4.2.3.5   Other. Please specify:

[1] By the supervisor and by the scientific committee of the institution.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   YES

4.2.4.2   The oral presentation of the thesis work.   YES

4.2.4.3   Both.   YES

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if   2 hours
applicable?

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   YES

4.2.5   Is the oral part of the examination taken behind closed doors?   NO

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   NO

4.2.6.2   May resubmit revised thesis.   YES

4.2.6.3   May do further work as specified by examination board.   YES

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   YES
Please specify:

4.2.7   Is there a grading system for the doctoral degree based on the quality of the   NO
work?

21. RO: Romania

Author: Prof. Dorin Popescu, (dorinp@robotics.ucv.ro)

21.1. General information

Since 2005/2006 the EIE higher education system in Romania has changed.

Main changes:

1. Two cycles

- Bachelor: duration 8 semesters (4 years) for technical higher education

- Master: duration 3 or4 semesters (1.5 or 2 years, minimum 90 credits)

2. Generalization of European Credits Transfer System (ECTS)

3. Doctoral studies: with attendance (3 years) or without attendance/part-time attendance (3...5 years)

The old EIE higher education system in Romania:

- undergraduate programmes, duration 3 years or 5 years (degrees awarded: "Bachelor of Engineering" or "Diplomat Engineer" respectively)

- postgraduate programmes, duration 1…2 years or 4…6 years (degrees awarded: M.Sc., or Ph.D. respectively).

The old and the new EIE higher education system in Romania is going concomitant, but since 2005 has organized admission only for new undergraduate programme and new doctoral studies. Master degree is organized under the old rules (for 2007 and 2008).

The higher education in Romania is public and private, but private universities don't cover Electrical and Information Engineering education domain. Each year Minister of Education and Research establish a number of students which will be admitted without fee by public Romanian universities. But each university can enrol a limited number of students with fee.

Figure 21.1: Romanian Higher Education System in EIE disciplines

21.1.1 Electrical and Information Engineering in Romania, boundaries of the field of study

In Romania there are more than 20 public universities that cover the EIE domain. Next table presents some of them.

"Transilvania" University of Brasov
"Politehnica" University of Bucharest
University of Bucharest
"Babes-Bolyai" University of Cluj-Napoca
Technical University of Cluj-Napoca
"Ovidius" University of Constanta
University of Craiova
"Gh. Asachi" Technical University of Iasi
"Alexandru Ioan Cuza" University of Iasi
University of Oradea
"Politehnica" University of Timisoara
West University of Timisoara
"Dunarea de Jos" University of Galati
Petroleum - Gas University of Ploiesti
University of Pitesti
"Lucian Blaga" University of Sibiu
University of Bacau
"Petru Maior" University of Targu-Mures
North University of Baia Mare
"Constantin Brancusi" University of Targu Jiu
"Stefan cel Mare" University of Suceava
"Aurel Vlaicu" University of Arad
"Vasile Goldis" University of Arad

Some universities are technical universities and cover all EIE domains (Bachelor, Master and Ph.D.). Other universities cover only informatics domain (Bachelor, possible Master).
Usually, in Romania there are the following faculties that cover EIE domain:
- Faculty of Automation and Computers
- Faculty of Electrical Engineering
- Faculty of Electronics and Telecommunications Engineering

Next section will present some examples of EIE domain covered by new higher education system in some Romanian universities.

"Transilvania" University of Brasov
Faculty of Electrical Engineering and Computer Science offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specializations: Electrical Engineering; Electromechanics; Electrical Engineering & Computers (in English language); Instrumentation and Data Acquisition.
Domain: Electronics and Telecommunications Engineering. Specializations: Applied Electronics; Telecommunications.
Domain: Systems Engineering. Specializations: Automation and Applied Informatics.
Postgraduate courses: M.Sc., 1-2 years. Specializations: Information & Communications Systems and Technologies; Converter - Electrical Machine Systems Control; Computer Systems for Process Control; Electronic Design Automation Techniques.
Doctoral studies: 3 - 4 years
Domains: Electrical Engineering; Computer Science; Electronic Engineering & Telecommunications; Automation; Industrial Engineering.
Faculty of Mathematics and Computer Science offers undergraduate programmes (Bachelor): 3 years for specialization Computer Science (in German language).

"Politehnica" University of Bucharest

Faculty of Electrical Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specializations: Electrical Equipment; Electrical Drive Systems; Electrical Engineering; Metrology and Measuring Systems.
Faculty of Power Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Power Engineering.
Faculty of Automatic Control and Computers offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Systems Engineering. Specialization: Automation and Industrial Informatics.
Domain: Computer Science and IT.
Faculty of Electronics, Telecommunications and Information Technology offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electronics and Telecommunications Engineering. Specializations: Applied Electronics; Telecommunications; Microelectronics; Physics Engineering.

University of Bucharest

Faculty of Mathematics and Computer Science offers undergraduate programmes (Bachelor): 3 years for specialization Information Technology*.*

"Babes-Bolyai" University of Cluj-Napoca

Faculty of Mathematics and Computer Science offers undergraduate programmes (Bachelor), 3 years (series 2005-2008, 2006-2009, 2007-2010), specialization Computer Science (Romanian, Hungarian, English).
Bachelor 4 years (series 2004-2008) – Domain: Computer Science (Romanian, Hungarian, English).
Master 1 year. Domain: Computer Science (series 2007-2008).
PhD Programmes in Computer Science.

"Ovidius" University of Constanta

The Faculty of Mechanical, Industrial and Maritime Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Power Engineering. Specialization: Power Engineering.
The Faculty of Mathematics and Informatics offers undergraduate programmes (Bachelor), 3 years: Computer Science.

University of Craiova

Faculty of Mathematics and Informatics offers undergraduate programmes (Bachelor), 3 years.
Domain: Informatics. Specializations: Informatics; Applied Informatics.
Master: Artificial Intelligence.
PhD Programmes in Informatics.
Faculty of Electrical Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specializations: Electrical Engineering and Computers (Romanian, French); Electrical Systems.
Domain: Power Engineering. Specializations: Power Systems Engineering; Thermoenergetics.
Domain: Engineering and Management.
Domain: Aerospace Engineering.
Master in domain of Electrical Engineering.
PhD Programmes in: Electrical Engineering, Power Engineering.
Faculty of Electromechanics, Environmental and Industrial Informatics Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specializations: Electromechanics; Applied Engineering Sciences; Industrial Informatics; Environmental Engineering.
Master: Complex Electromechanical Systems.
PhD Programmes in domain of Electrical Engineering.
Faculty of Automation, Computers and Electronics offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Systems Engineering. Specializations: Automation and Applied Informatics; Multimedia Systems Engineering.
Domain: Computers and IT. Specialization: Computer Science (Romanian and English).
Domain: Electronics and Telecommunications Engineering. Specialization: Applied Electronics.
Domain: Mechatronics and Robotics. Specialization: Robotics.

Master in domain of Systems Engineering (Automation) and Computer Science.
PhD Programmes in: Systems Engineering (Automation) and Computer Science.

"Gh. Asachi" Technical University of Iasi

Faculty of Automatic Control and Computer Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Systems Engineering. Specialization: Automation and Applied Informatics.
Domain: Computers and IT. Specializations: Computer Science; IT.
Master in domain of Systems Engineering (Automation) and Computer Science.
PhD Programmes in Systems Engineering (Automation) and Computer Science.
Faculty of Electrical Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specializations: Instrumentation and Data Acquisition; Electrical Systems.
Domain: Power Engineering. Specializations: Power Systems Engineering; Power Management; Thermoenergetics.
Domain: Engineering and Management.
Domain: Applied Engineering Sciences. Specialization: Applied Informatics for Electrical Engineering.
Master in domain of Electrical Engineering and Power Engineering.
PhD Programmes in: Electrical Engineering, Power Engineering.
Faculty of Electronics and Telecommunications Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electronics and Telecommunications Engineering. Specializations: Electronics; Telecommunications; Electronics Microtechnologies.
Master in domain of Electronics and Telecommunications Engineering.
PhD Programmes in Electronics and Telecommunications Engineering.

"Alexandru Ioan Cuza" University of Iasi

Faculty of Informatics offers undergraduate programmes (Bachelor), 3 years.
Specialization: Informatics.

University of Oradea

The Faculty of Electrical Engineering and Information Technology offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specializations: Electromechanics; Electrical Systems.
Domain: Electronics and Telecommunications Engineering. Specializations: Applied Electronics; Software and Networks for Telecommunications Engineering.
Domain: Computers and IT. Specializations: IT; Computers.
Domain: Engineering and Management.
Domain: Applied Engineering Sciences. Specialization: Medical Engineering.
Domain: Systems Engineering. Specialization: Automation and Applied Informatics.
The Faculty of Power Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Specializations: Power Engineering; Thermal Energy Engineering; Industrial Engineering and Management.
Faculty of Science offers undergraduate programmes (Bachelor), 3 years.
Specialization: Computer Science.
Master (4 semesters) in specialization of Information Technology and Multimedia.

"Politehnica" University of Timisoara

Faculty of Automation and Computers offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Computers and IT, Systems Engineering, Informatics.
Faculty of Electronics and Telecommunications Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electronics and Telecommunications Engineering.
Master: Electronics and Telecommunications Engineering.
Faculty of Electrical Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Electrical Engineering, Power Engineering.

West University of Timisoara

Faculty of Matehmatics and Informatics offers undergraduate programmes (Bachelor), 3 years.

Specialization: Informatics (Romanian and English).
Master: Informatics.
Ph.D. Programme: Informatics.

"Dunarea de Jos" University of Galati
Faculty of Computer Science offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Systems Engineering. Specialization: Automation and Industrial Informatics.
Domain: Computers and IT. Specialization: Computers.
Master in domains: Systems Engineering, Computers and IT.
Ph.D. programmes for Systems Engineering and Computer Science.
Faculty of Electrical and Electronics Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specialization: Electromechanics.
Domain: Electronics and Telecommunications Engineering. Specializations: Applied Electronics, Telecommunications Technologies and Systems.
Master: Electrical Engineering, Electronics and Telecommunications Engineering.
Faculty of Sciences offers undergraduate programmes (Bachelor), 3 years.
Specialization: Informatics.

Petroleum - Gas University of Ploiesti
Faculty of Mechanical and Electrical Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domain: Electrical Engineering. Specialization: Electromechanics.
Domain: Electronics Engineering and Telecommunications. Specialization: Applied Electronics.
Domain: System Engineering. Specialization: Automation and Applied Informatics.
Domain: Computers and Information Technology. Specialization: Computers.
Master: domain Engineering Science. Specializations: Management of Electric and Electronics Systems, Advanced Automation and Programmable Structures.
Faculty of Letters and Sciences offers undergraduate programmes (Bachelor), 3 years.
Specialization: Informatics.
Master's degree programmes: Informatics, 3 semesters.

University of Pitesti
Faculty of Electronics Communications and Computers offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Electronics and Telecommunications Engineering, Electrical Engineering, Computers and IT.

"Lucian Blaga" University of Sibiu
"Hermann Oberth" Faculty of Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Electrical Engineering (specialization Electromechanics), Computers and IT (specialization IT).
"Hermann Oberth" Faculty of Engineering offers undergraduate programmes (Bachelor), 3 years.
Specializations: Informatics, Applied Informatics.

University of Bacau
Faculty of Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Power Engineering, Computers and IT (specialization IT).
Faculty of Sciences offers undergraduate programmes (Bachelor), 3 years.
Specializations: Informatics.

"Petru Maior" University of Targu Mures
Faculty of Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Power Engineering, Systems Engineering (specialization Automation and Applied Informatics).
Faculty of Sciences offers undergraduate programmes (Bachelor), 3 years.
Specializations: Informatics.

North University of Baia Mare

Faculty of Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Electrical Engineering (specialization Electromechanics), Power Engineering, Computers and IT (specialization Computers), Electronics and Telecommunications Engineering (specialization Electronics).
Faculty of Sciences offers undergraduate programmes (Bachelor), 3 years.
Specializations: Informatics.

"Constantin Brancusi" University of Targu Jiu

Faculty of Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Power Engineering, Systems Engineering (specialization Automation and Applied Informatics).

"Stefan cel Mare" University of Suceava

Faculty of Electrical Engineering and Computers Science offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Power Engineering, Computers and IT (specialization Computers), Systems Engineering (specialization Automation and Applied Informatics).

"Aurel Vlaicu" University of Arad

Faculty of Engineering offers undergraduate programmes (Bachelor): engineers, 4 years.
Domains: Systems Engineering (specialization Automation and Applied Informatics), Engineering and Management.

"Vasile Goldis" University of Arad

Faculty of Informatics offers undergraduate programmes (Bachelor), 3 years.
Specializations: Informatics.

21.2. Degrees in EIE in Romania

1st and 2nd years of study in the selected domain represent the common core of the curricula for the 4 years programme. After the first two years, the student makes the choice for his direction of speciality. The next table presents an example of the common core for two domains of EIE education from two Romanian universities. For the first two years each university has a small independence in order to choose the courses. For the last two years (3rd and 4th year of study) this independence increases.

Year of study	Semester	Course Name	
		Domain: Systems Engineering Specialization: Automation and Applied Informatics	**Domain: Computers and IT**
1st	1st	Mathematical Analysis	Mathematical Analysis
1st	1st	Linear Algebra	Linear Algebra
1st	1st	Materials/Chemistry	Operating Systems
1st	1^{s}	Physics	Physics
1st	1st	Computers Programming	Computers Programming
1st	2nd	Programming Techniques	Data Structures
1st	2nd	Electrotechnics Fundamentals	Electrotechnics Fundamentals
1st	2nd	Mechanics Fundamentals	Digital System Design
1st	2nd	Special Mathematics	Special Mathematics
1st	2nd	Numerical Methods	Numerical Methods
2nd	1st	Linear Electronic Circuits	Algorithms Analysis
2nd	1st	Analysis and Design of Digital Systems	Object Oriented Programming
2nd	1st	Signals, Circuits and Systems	Systems Theory
2nd	1st	Databases	Electronics
2nd	1st	Object Oriented Programming	Computer Architecture
2nd	2nd	Digital Electronic Circuits	Algorithms Design

2nd	2nd	Electrical Actuators	Communication Protocols
2nd	2nd	Systems Theory	Digital Electronics
2nd	2nd	Robotics Fundamentals	Assembly Language Programming
2nd	2nd	Computer Architecture	Numerical Computers

21.3 EIE Education in Romania – detailed information

Since 2005/2006 the EIE higher education system in Romania has changed.
Main changes:
1. Two cycles
- Bachelor: duration 8 semesters (4 years) for technical higher education
- Master: duration 3 or4 semesters (1.5 or 2 years, minimum 90 credits)
2. Generalization of European Credits Transfer System (ECTS)
3. Doctoral studies: with attendance (3 years) or without attendance/part-time attendance (3...5 years)

The old EIE higher education system in Romania:
- undergraduate programmes, duration 3 years or 5 years (degrees awarded: "Bachelor of Engineering" or "Diplomat Engineer" respectively)
- postgraduate programmes, duration 1…2 years or 4…6 years (degrees awarded: M.Sc., or Ph.D. respectively).

The old and the new EIE higher education system in Romania is going concomitant, but since 2005 has organized admission only for new undergraduate programme and new doctoral studies. Master degree is organized under the old rules (for 2007 and 2008).

The higher education in Romania is public and private, but private universities don't cover Electrical and Information Engineering education domain. Each year Minister of Education and Research establish a number of students which will be admitted without fee by public Romanian universities. But each university can enrol a limited number of students with fee.

The Faculties from EIE domain aim the training electrical, electronic, automation, information technologies, and electromechanical engineers able to function in all sectors of economy. The EIE faculties further ensures, with few exceptions, the training in electrical engineering, electronics, automation and computers science of the students of the other, non-electrical faculties of engineering from universities.

Currently more than 30,000 students are registered for the EIE education offered by the Romanian faculties.

The teaching staff of the EIE faculties comprises more than 2000 professors, associate professors, lecturers, assistants and junior assistants, of which more than 1000 hold Ph.D. degrees.

Since the academic year 1998 the ECTS has been adopted at the Romanian Universities and till 2005 the engineering curricula for undergraduate programmes was based on the structure that consists of 2 cycles:
 1.   first cycle of 2 years (4 semesters);
 2.   second cycle of 3 years duration (6 semesters).
Since the academic year 2005 the engineering curricula for undergraduate programmes are based on the structure that consists of 2 cycles:
 1.   first cycle of 2 years (4 semesters);
 2.   second cycle of 2 years duration (4 semesters).
The program of the first cycle envisages fundamental technical education. At the EIE Faculties, the first cycle curricula are not individualized on specialization branches and consist of general engineering education courses.

Usually, taking a competitive written test in algebra and mathematical analysis, geometry, trigonometry or physics ensures entry in the first year of undergraduate studies (Bachelor). Selection

of candidates for the advanced studies programme (Master) is performed also by a written examination, while Ph.D. students are selected by an oral examination by a committee of specialists. Evaluation of acquired knowledge is based on a 1 to 10 scale (and with a number of credits) and is performed during written or oral examinations, presentation of projects, laboratory reports and homework. During the 4 years of studies, the students must pass more than 40 examinations for the compulsory and optional disciplines, and examinations for projects, practical activities, and the free chosen disciplines.

For a full academic recognition for student mobility in the framework of different programmes, a credit transfer system was introduced. In this credit transfer system, 60 credits represent the workload of an academic year of study and normally 30 credits for a semester.

Today the Faculties of Electrical Engineering offer higher education curricula in theoretical and applied Electrotechnics, mainly in the field of low frequency, low voltage, medium and high currents, including: electromagnetic field and electric circuits, electromagnetic energy conversion and sources, metrology, electrical machines and apparatus, electric drives and motion control, power electronics, CAD for electrical engineering, management in electrical industries.

The Faculties of Automation and Computers prepare graduates able to work in the following fields: the structure and the architecture of computer systems, microprocessors-based systems, system software, application software systems, artificial intelligence and expert systems (students from Computer Science specialization), and control system engineering, computer controlled processes, robots and flexible systems manufacturing, bioengineering and intelligent systems, industrial automation (students from Automation and Applied Informatics specialization). The actual curricula is the result of more than 30 years of expertise and evolution, during which it has suffered many adjustments and up-dating, closely following the progress registered in System and Computer Science. Given the quality of the courses offered by the Faculties of Automation and Computers, the diplomas obtained here are compatibles with those of the most prestigious universities from all over the world.
The Faculties of Automation (Automatic Control) and Computers offer degrees in an enormously vibrant field: "Computer Science and System Science", which has become the defining support of the Information Society and the primary engine behind much of the world's economic growth.
Students may enroll in several types of undergraduate and postgraduate programmes, the basic one being the 4 (5 for old system) years programme which leads to an Engineering Diploma in one of the two specializations: Computers or Automation and Applied Informatics, each specialization having several elective directions of studies. Besides this basic programme, the faculties also offers the advance studies programme, which consists in one or two additional years after completing the engineering diploma courses (Master degree), and a Ph.D. programme.

The Faculties of Electronics and Telecommunication Engineering offer to theirs undergraduate and graduate students a unique blend of educational advantages. Faculty members with outstanding research reputation teach both undergraduate and graduate courses in the areas of Electronics, Microelectronics, Computing Engineering and Telecommunications. In all these, the emphasis is on the vocational application of acquired knowledge. All courses are designed to meet the education and training needs of today's high technology society, and to assist in the appropriate recruitment of technology-based business and industry in Romania. Major fields of study: Applied Electronics, Telecommunications, Microelectronics, Physics Engineering, Economical Engineering for Electronics and Telecommunications.

The Power Engineering Faculties continuously shaped theirs training system, according to the needs of modern power engineering and to its environmental and economical aspects. Major fields of study: Thermal power plants; Nuclear power plants; Hydro power plants; Environment engineering; Energy use; Electric power engineering; Power process control.

Among the EIE faculty's strategic objectives are the following:
1) Development of curricula in close correlation with the market demands and with the contents and style of those of the most prestigious universities from abroad, both in Europe and the USA;
2) Maintaining an outstanding record in teaching, research and innovation, with close interaction between research activities and the educational process, to keep pace with the latest developments in

the field of electrical engineering, automatic control and information technology and to increase the faculty reputation;

3) In depth awareness of the students' social and training problems and the development of a partnership relation with the students;

4) Growing a stimulating learning environment and a collection of various resources to support classroom and individual work, research and self instruction;

5) Recruiting and promoting the best graduates as faculty teaching staff to ensure the perpetual renewal of the academic personnel;

6) Development of national and international academic and scientific cooperation.

The EIE curriculum of all specializations comprises courses, seminars, practical work sessions and semester projects, the second semester of the final year being dedicated to the development of the diploma project, too. The curriculum includes traditional and modern subjects scheduled as compulsory, optional and free categories of courses in order to ensure a solid professional education and to respond to the students' interests and employers' demands from industry and research. Cooperation with the industry and research environments is constantly ensured. Some of the taught disciplines benefit from the participation of research and industry specialists as associate professors. A large number of specialists and managers from industry, research or economic bodies are invited to debate actual or prospective problems with the students and the teaching staff, and are consulted for syllabi development. There are also long distance education centres for the EIE education.

The EIE faculties offer Ph.D. programmes leading to a doctoral degree in the fields of EIE.
Ph.D. student programmes consist of:

1. Advanced University Study Programme – includes both advanced knowledge disciplines within the doctoral study domain and complementary training disciplines. Disciplines are modules structured.
2. Scientific research project – the finality of the Advanced University Study Programme. Project theme is established by agreement between the Ph.D. student and the supervisor and it is correlated with Advanced University Study Programme, with the competence area of the supervisor and with research project promoted by the institution. Project theme is approved by the Scientific Committee of the Doctoral School.
3. Scientific Research Programme – is organized in the competence area of the supervisor.
4. Intermediary results of the Scientific Research Programme are presented by the Ph.D. student as scientific reports.

Besides the dedicated professional training, the students of Romanian EIE faculties have the opportunity to fully express their personality. Thus, they have the opportunity to participate in national and international professional contests of computer programming, mathematics, electronics, electrotechnics, etc, a significant number of our students having obtained outstanding results.

We must also mention the activities initiated by the students professional association (for example BEST), the purpose of which is to establish connections with young people from abroad through summer schools and workshops, as well as the accomplishment of a more active student involvement in the professional life.

The laboratories are all connected to Internet through LAN and RoEduNet. The faculties also have libraries providing books, technical reviews and all kind of other documentation in the field of EIE. The students have also access to the others libraries, as well.

The students completing one of EIE programmes can find a job in competitive industrial and economic environments; many are employed by multi-national companies or work abroad and are highly valued for their knowledge. More than 300 EIE graduates were or are currently enrolled in Ph.D. programmes in universities from the USA and other western countries. Every year a number of students are called upon to prepare their diploma projects by the universities from abroad which Romanian faculties have cooperation agreements.

21.4. References

http://www.edu.ro/ -- site of Education and Science Ministry in Romania

Doctoral

Studies

21.5. Doctoral Studies in Romania

21.5.1. Supervision

Scientific Board or Supervisor

The <u>Scientific board</u> is composed by approximately twenty members. The members of the Scientific Board are proposed by Scientific Committee of University and the Scientific Board is approved by the Senate of University. The student, <u>in most cases,</u> has the same personal supervisor during its thesis work on an <u>active</u> research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between the student and the supervisor.

Who can be a Supervisor

Any professor or researcher of the Doctoral School who received attestation from National Council for Attestation of Academic Titles, Diplomas and Certificates.

Tasks of Scientific Board/Supervisor

1.	General management	YES

2.	Deciding/advising layout of course	YES

3.	Assigning a thesis subject	YES

Duration

Three to four years.

21.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation and offered as specialist graduate course units. The course work is assessed by examinations. If the student fails in the course work, he/she must retake the exam.

2. Extension: 240 hours on the first year and 120 hours in the second year.

3. Credit system: ECTS - 60 credits are allocated to course work.

4. The course work of the doctoral student is monitored.

Contribution to Teaching

Within doctoral studies contract, the university can require the scholar Ph. D. student to supervise undergraduate laboratory work (4-6 hours per week).

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

21.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   <u>Languages</u> normally used: Romanian. The Ph. D. student can present a resume of the thesis in a foreign language (English, French, and German).

2.   <u>No</u> credits allocated to the doctoral thesis.

3.   The doctoral thesis is a substantial written report (a part previously unpublished, but another part with published work results).

Oral Presentation of Thesis Work

1.   <u>Languages</u> normally used: Romanian.

2.   Oral presentation with oral examination for an open audience.

3.   <u>Duration</u>: typical duration of 2 hours no upper time limit.

21.5.4. Examination

Thesis Examination Board

1.   <u>Composition</u>: from ten to twenty internal examiners and five external examiners, in a total of 20 members. The five "*rapporteurs*" should comment deeply on the content of the thesis.

2.   <u>Selection:</u> the Examination Board is proposed by the supervisor and approved by the Faculty's Council.

Evaluation

1.   <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with a grading system: *very good, good* or *satisfactory.* In special circumstances there can be "felicitation of the jury" in extra.

2.   If the student gets a *satisfactory* degree, the board will specify the elements to be re-made or completed in the thesis and will require a new examination for an open audience. If, at the re-examination, the student gets the *satisfactory* degree again, the thesis will be *repelled* and the Ph. D. student will be expelled.

21.5. **Questionnaires**

Romania

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	Approx. 20
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	N
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	Y
	The members of the Scientific Board are proposed by Scientific Committee of University and the Scientific Board is approved by the Senate of University.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	Y
3.1.4.4	Assigning the thesis subject.	Y
3.1.4.5	Other. Please specify:	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7 The doctoral thesis subject is normally assigned:

3.1.7.1 At the beginning of the doctoral studies?

Y

3.1.7.2 After a specified period of coursework?

-

3.1.7.3 Other. Please specify:

-

3.1.8 The thesis supervisor of a doctoral student can be:

3.1.8.1 Any professor or lecturer in the department?

N

3.1.8.2 Any researcher in the department?

N

3.1.8.2.1 In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

-

3.1.8.3 Any researcher in another institution?

N

3.1.8.3.1 In the latter case, is there a need for an internal supervisor?

-

3.1.8.4 Other methods. Please specify:

Y

Any professor or researcher of the Doctoral School who received attestation from National Council for Attestation of Academic Titles, Diplomas and Certificates.

3.1.9 The thesis subject is assigned by:

3.1.9.1 Agreement between the student and the proposed supervisor?

Y

3.1.9.2 Other methods. Please specify:

N

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
max. 240 hrs	**max. 120 hrs**	**hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

- As specialist graduate course units.   Y

- As course units taken from the undergraduate programme.

- Other. Please specify.

3.2.2.3   Is the coursework assessed by examinations?   Y
If not, please give details:

3.2.3   **Credit system**

3.2.3.1   Is the coursework in your institution described by a credit system?   Y

3.2.3.2   Is it the ECTS system?   Y

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?   60
credits

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking   Y
coursework?

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

- Retake the exam.   Y

- Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.   Y

3.3.2   At national conferences.   Y

3.3.3   At international conferences.   Y

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   Y/N

3.4.2   Teaching undergraduate courses.   N

Within doctoral studies contract, the university can require the scholar Ph. D. student to supervise undergraduate laboratory work (4-6 hours per week).

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Romanian
4.1.2	Are alternative languages used for the thesis? Please Specify:	Y

Ph. D. student can present a resume of the thesis in a foreign language (English, French, and German).

4.1.3	Which language is normally used for the oral presentation and/or examination?	Romanian
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	-
4.1.5	Are credits allocated to the doctoral thesis?	N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	N
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	N
4.1.6.3	Other. Please specify:	Y

A substantial written report (a part previously unpublished, but another part with published work results).

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	Y
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	10-20
4.2.2.2	External examiners.	5
4.2.2.3	TOTAL.	20

Five "rapporteurs" who should comment deeply on the content of the thesis.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify: Y

It is proposed by supervisor and approved by the Faculty's Council.

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   -

4.2.4.2   The oral presentation of the thesis work.   -

4.2.4.3   Both.   Y

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   2 hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   N

4.2.5   Is the oral part of the examination taken behind closed doors?   N

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   -

4.2.6.2   May resubmit revised thesis.   -

4.2.6.3   May do further work as specified by examination board.   -

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?   -
Please specify:

Evaluation: Result based on the reading of the thesis and on the oral presentation of the thesis work, with a grading system: very good, good or satisfactory. In special circumstances there can be "felicitation of the jury" in extra.
Failure: if the student gets a satisfactory degree, the board will specify the elements to be re-made or completed in the thesis and will require a new examination for an open audience. If, at the re-examination, the student gets the satisfactory degree again, the thesis will be repelled and the Ph. D. student will be expelled.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   Y

Evaluation: Result based on the reading of the thesis and on the oral presentation of the thesis work, with a grading system: very good, good or satisfactory. In special circumstances there can be "felicitation of the jury" in extra.

22. SK: Slovensko (Slovak Republic)

Coordinating author: Jozef JASENEK (Slovak University of Technology Bratislava, jozef.jasenek@elf.stuba.sk)
Other contributors: L. Jurisica (FEI, STU Bratislava), J. Turán (FEI, TU Košice), V. Hrabovcová
(FEI, University of Zilina)

Review: Jozef JASENEK (Slovak University of Technology Bratislava,*)*

22.1. General information

According to the new HE (Higher Education) law there are public (20), state (3) and private (10) HE institutions in Slovakia. Only 4 public HE institutions ffer education in EIE. These are - Slovak University of Technology Bratislava (Faculty of Electrical Engineering and Information Technology, Faculty of Informatics and Information Technologies), Alexander Dubček University in Trenčín (Faculty of Mechatronics), University of Žilina (Faculty of Electrical Engineering, Faculty of Management Science and Informatics), and Technical University of Košice (Faculty of Electrical Engineering and Information Technology).
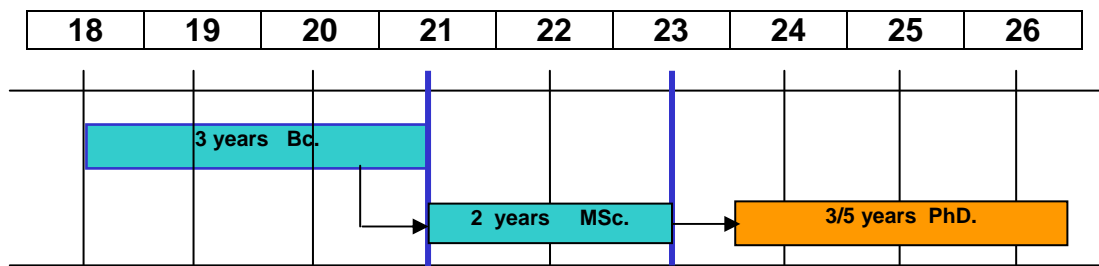
Figure 22.1: Simplified Scheme of Slovakian Higher Education System in EIE disciplines

All study programs provided by the HE institutions have to be approved by the Scientific Board of the HE institution and accredited by the Accreditation Commission, which

is a body established by the government. Accreditation of the programme should guarantee that certain minimum quality criteria of the education provided are obeyed.

Higher education institutions provide the study programmes at three levels:

The Bachelor's study programme which according to the HE law can take three years at least and four years at most. But really the standard length of first cycle study program is 3 years.

The Magister's, Engineer's (equivalent to MSc.) and Doctor's (RNDr.) study programmes. In EIE there are only Engineer's (MSc.) programs. The study takes one year at least and three years at most so that the standard length of study according to the Bachelor's study programme and the continuing second level study programme in the same or relative main field of study is in total five years at least.

The PhD. study programme. The standard length in full-time form is three years at least.

The general condition for admission to the first-degree program is secondary school-leaving certificate (vysvedčenie o maturitnej skúške) issued after passing the secondary school-leaving examination taken upon completing 13, exceptionally, 12 years of study.

The school-leaving certificates are issued by the following types of secondary schools:

gymnasium – the study takes 4 or 8 years depending on the grade of the basic school it follows,

specialized secondary school – 4 or 5 years of study,

vocational secondary school – only the certificates issued after 4 or 5 years of study,

Higher education institutions organise as a rule the admission examination.

The general condition for the admission to the second-degree program is the successful completion of the first-degree programme in the same main field of study (specialization) or a related one and the successful completion of the programme entrance examination.

The general condition for the admission to the PhD. programme is the successful completion of an appropriate second-degree programme and the completion of the programme entrance examination.

The education in the area of EIE at the level of "technicians" is briefly described in section 11.2.2.

Electrical and Information Engineering in Slovakia, boundaries of the field of study

According to the new HE law (No. 131/2002) passed in February 2002, study programmes in the academic year 2007/8, are based on a new "system of study fields in HE" issued by the Ministry of Education of the Slovak Republic in December 2002 [see http://www.minedu.sk/index.php?lang=sk&rootId=413]. Following this document the study programs in EIE at the level of the first degree (Bc.), the second degree (MSc.) and the third degree (PhD.) are based on the "main fields of study" as defined by the document "Sústava študijných odborov Slovenskej republiky" (The System of Main Fields of Study of the Slovak Republic [see: ttp://www.minedu.sk/data/USERDATA/VysokeSkolstvo/SSOSR/Sustava_studijnych_odborov_SR.xls)],

issued by the Ministry of Education of the SR in 2002. Each "Study Program" has to be designed and realized in the frame of the particular "Main field of study" which is described in the above mentioned document. Several programmes can be designed and realized in the same field of study focusing its contents on some closer specialization but containing necessary "core knowledge" of the main field. The EIE relevant main fields of study can be seen in the table shown below.

Doctorate	Master	Bachelor	Level of the Degree
X			**Electrical Engineering**
X	X	X	**Electrical Power Engineering**
	X	X	**Power Electrical Devices**
X			**Nuclear Power Engineering**
X	X	X	**Theoretical Electromagnetic Engineering**
	X	X	**Physical Engineering**
X			**Physics of Condensed Matter and Acoustics**
X	X	X	**Material Science and Electrotechnology**
	X	X	**Applied Informatics & Automation**
X			**Automation**
X	X	X	**Automation and Measurement**
	X	X	**Cybernetics**
X			**Mechatronics**
X	X	X	**Electronics**
	X	X	**Instrumentation**
X			**Metrology**
X	X	X	**Telecommunications**
	X	X	**Computer Engineering**
X			**Software Engineering**
X	X	X	**Applied Informatics**

	X	X	Applied Informatics & Automation
X			Artificial Intelligence
X	X	X	Information Systems
	X	X	Applied mathematics
X			Business Informatics

Content, degrees and accreditation

The curricula of all HE study programs are designed by the professors who are employed at the particular HE institutions that will offer the programme, in cooperation with the professionals from the industry at home and from abroad. The process of the curricula design takes into account the internal HE institution quality assurance criteria. The final version of the program has to be approved by the Scientific Board of the HE institution and is also discussed in the HE institution Academic Senate. After that the program has to be accredited by the Accreditation Commission that is the advisory body of the Slovak Government.

Implementation of the Bologna-BMD system in Slovakia

In February 2002 new HE law was accepted by the Parliament and a few of new amendments were accepted later. All substantial features of the Bologna mainframes were built into the new law. It concerns mainly the implantation of the three cycle system of study [Bc., Mgr. or Ing. and PhD.], the implementation of the ECTS, the limits of length of the first and second cycle of the HE programs and the doctoral programs (PhD.). Generally one can state that the scheme Bologna-BMD in Slovakia has been legally accepted and is already introduced into practical life.

22.2. Figures on the weight of EIE in Slovakia

Statistical figures concerning the 1-st and 2-nd cycles study programs at Slovak HE institutions in the field of EIE – academic year 2006/2007			
Total number of students:		13711	
In daily study: 11724		In external study: 1987	
Man: 10367	Woman: 1357	Man: 1365	Woman: 624
Total numbers of new admitted students into the 1-st and 2-nd cycles study programs:			
Daily study: 4203		External study: 932	
Total numbers of graduates from the 1-st and 2-nd cycles study programs:			
Daily study: 1697		External study: 135	
Man: 1541	Woman: 156	Man: 113	Woman: 22

**The total numbers of students in Slovak HE
as to October 30, 2007**

38923   56830

72144   18021

Dayly Form - Men   External Form - Men
Dayly Form - Women   External Form - Women
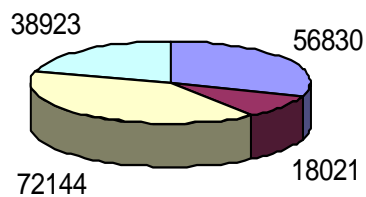
**The total numbers of students in Slovak HE
engaged in EIE as to October 30,2007**

736   130

584

9249

Dayly Form - Men   External Form - Men
Dayly Form - Women   External Form - Women
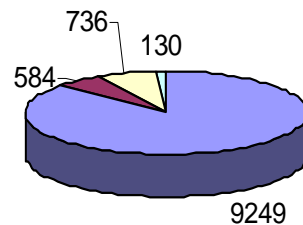
22.3. Degrees in EIE in Slovakia

Higher education institutions engaged in EIE award the following academic degrees:

1st level
bakalár (Bc. - bachelor)

2nd level
inžinier (Ing. - Engineer)

3rd level
philosophiae doctor (PhD.)

Technician program

The education in the area of EIE at the level of "technicians" is provided by the special industrially oriented secondary grammar schools (*Stredna priemyselna skola*). The nominal duration of the program at these schools are 4 years. The programme is completed by the "School-leaving examination" (*Maturita*). After the

program completion the students look for a job (can be added "as a technician") or can apply for admission to the university program.

There is also another possibility to obtain the technical education at the level of "technician" - the "Vocational Schools" (*Stredne odborne ucilistia* – Apprentice Professional Schools) with the nominal program duration of 3 years. After the program completion one can go for a job or continue in the program for another two years (that is a total of 5 years) and complete the program by the "School-leaving examination" (*Maturita*). These people can then apply for the admission to the university program."

22.4. References

The information given in this monograph is based on the following documents and weblinks:

http://www.fei.stuba.sk
http://www.fiit.stuba.sk
http://www.tnuni.sk
http://www.uniza.sk
http://www.tuke.sk
http://www.minedu.sk
http://www.uips.sk
http://www.minedu.sk/index.php?lang=sk&rootId=413

List of "Study programs" and corresponding "Main Fields of Study" in EIE offered by Slovak Technical Universities

University/Faculty:	Cycle:	Name of the "Study Program":	Name of the corresponding "Main Field of Study":
Slovak University of Technology in Bratislava Faculty of Electrical Engineering and Information Technology	**1. (Bc.)**	Electrical Engineering	Electrical Engineering
		Electronics	Electronics
		Telecommunications	Telecommunications
		Industrial Informatics	Applied Informatics & Automation
		Applied Informatics	Applied Informatics
		Automobile Electronics	Electrical Engineering
	2. (Ms.)	Robotika, Robotics	Automation
		Measurement and Infornmation Technology	Automation and Measurement
		Cybernetics	Cybernetics
		Electrical Power Engineering	Electrical Engineering
		Radioelectronics	Electronics
		Microelectronics	Electronics
		Telecommunications	Telecommunications
		Physical Engineering	Physical Engineering
		Applied Informatics	Applied Informatics
	3. (PhD.)	Physics of Condensed Matter and Acoustics	Physics of Condensed Matter and Acoustics
		Applied Mechanics	Applied Mechanics
		Theoretical Electromagnetic Engineering	Theoretical Electromagnetic Engineering
		Power Electrical Devices	Power Electrical Devices
		Material Science and Electrotechnology	Material Science and Electrotechnology
		Radioelectronics	Electronics
		Microelectronics	Electronics
		Automation and Control	Automation
		Telecommunications	Telecommunications
		Mechatronics	Mechatronics
		Electrical Power Engineering	Electrical Power Engineering
		Nuclear Power Engineering	Nuclear Power Engineering
		Instrumentation	Instrumentation
		Metrology	Metrology
		Physical Engineering	Physical Engineering
		Applied mathematics	Applied mathematics
		Cybernetics	Cybernetics

EIE-Surveyor

Slovak University of Technology in Bratislava Faculty of Informatics and Information Technologies	1. (Bc.)	Informatics	Informatics
		Computer Systems and Networks	Computer Engineering
	2. (Ms.)	Computer Systems and Networks	Computer Engineering
		Software Engineering	Software Engineering
		Information Systems	Information Systems
	3. (PhD.)	Computer Systems and Networks	Computer Engineering
		Softwere Systems	Software Engineering
		Artificial Intelligence	Artificial Intelligence

Trenčín University of Alexander Dubček in Trenčín Faculty of Mechatronics	1. (Bc.)	Management of Production Quality	Business Informatics
		Mechatronics	Mechatronics
		Mechatronics of motorway vehicles	Mechatronics
	2. (Ms.)	Management of Production Quality	Business Informatics
		Mechatronics	Mechatronics
	3. (PhD.)	Mechatronics	Mechatronics

University of Žilina Faculty of Electrical Engineering	1. (Bc.)	Automobile electrotechnics	Electrical Engineering
		Electrical Engineering	Electrical Engineering
		Komerčná elektrotechnika	Electrical Engineering
		Elektrotechnické systémy v mechatronike. Electrical Systems in Mechatronics	Mechatronics
		Telekomunikácie, Telecommunications	Telecommunications
		Multimedia Technologies	Electronics
		Safety Control Engineering	Automation
		Biomedical Engineering	Theoretical Electromagnetic Engineering
	2. (Ms.)	Electric Traction	Power Electrical Devices
		Electric Drives	Power Electrical Devices
		Electric Power Systems	Electrical Power Engineering
		Power Electronics	Power Electrical Devices
		Electrical Systems in Mechatronics	Mechatronics
		Telecommunication and Radiocommunication Engineering	Telecommunications
		Safety Control Engineering in Transport	Automation
		Safety Control Engineering in Industry	Automatiaion
		Biomedical Engineering	Theoretical electromagnetics
		Physical Engineering	Physical Engineering

	3. (PhD.)	Power Electrical Devices	Power Electrical Devices
		Telecommunications	Telecommunications
		Theoretical Electromagnetic Engineering	Theoretical Electromagnetic Engineering

University of Žilina Faculty of Management Science and Informatics	**1. (Bc.)**	Informatics	Informatics
		Management	Business Informatics
		Computer Engineering	Computer Engineering
	2. (Ms.)	Information Systems	Iinformatics
		Information management	Business Informatics
		Economy Information	Business Informatics
		Computer Engineering	Computer Engineering
	3. (PhD.)	Management	Business Informatics
		Control and Management of Transportation Systems	Automation
		Applied Informatics	Applied Informatics

Technical University in Košice Faculty of Electrical Engineering and Information Technology	**1. (Bc.)**	Automobile electronics	Electronics
		Managing Systems in Power Engineering	Electrical Engineering
		Electrical Power Engineering	Electrical Engineering
		Electrical Power Engineering in Environment	Electrical Engineering
		Elektronika	Electronics
		Electrical Engineering	Electrical Engineering
		Smart Systems	Cybernetics
		Aplikovaná informatika	Applied Informatics
		Počítačové modelovanie	Applied Informatics
		Information Systems in Mechatronics	Mechatronics
		Informatics	Informatics
		Engineering of Industry Control	Industrial Engineering
		Kybernetika	Cybernetics (main) and Automation (Subsidiary)
		Telekomunikácie	Telecommunications
		Automobilová mechatronika	Mechatronics
		Fyzikálne inžinierstvo moderných materiálov	Physical Engineering
		Hospodárska informatik	Business Informatics
	2. (Ms.)	Automation	Automation
		Electrical Power Engineering	Electrical Engineering
		Electronic Measurement	Measurement
		Electrical Engineering	Electrical Engineering
		Information Elctronics	Electronics
		Informatics	Informatics
		Industry Control Engineering	Industrial Engineering
		Cybernetics	Cybernetics
		Multimedia Telecommunications	Telecommunications
		Computer Engineering	Computer Engineering

		Production Technoilogies in Electronics	Electronics
		Artificial Inteligence	Artificial Intelligence
		Physical Engineering of Modern Materials	Physical Engineering
		Economy Informatics	Business Informatics
	3. (PhD.)	Automation	Automation
		Electrical Power Engineering	Electrical Power Engineering
		Electrical Engineering Systems	Power Electrical Devices
		Material Science and Electrotechnology	Material Science and Electrotechnology
		Information Electronics	Electronics
		Informatika	Informatics
		Cybernetics	Cybernetics
		Instrumentation	Instrumentation
		Telecommunications	Telecommunications
		Artificial Inteligence	Artificial Inteligence

Doctoral

Studies

22.5. Doctoral Studies in the Slovak Republic

22.5.1. Supervision

Scientific Board or Supervisor

The Scientific board is composed by twenty four members chosen by the Dean of the Faculty. Then the Scientific Board must be approved by the Academic Senate. The student, in most cases, has the same personal supervisor during its thesis work on an active research area of the supervisor.

Subject Assignment

The subject is assigned at the beginning of the doctoral studies. Thesis subjects are proposed by the eligible supervisors and published; students interested in doctoral studies can choose one subject before they apply for admission. The title of the thesis work can be modified but not later then after the third semester.

Who can be a Supervisor

Only persons having rank of full professor and associated professor are eligible to serve as a supervisor without further conditions.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	NO
3.	Assigning a thesis subject	NO

The documentation needed for the accreditation of the PhD study programmes (by the Accreditation Commission) has to be approved by Scientific Board of the Faculty.

Duration

Three years.

22.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation and offered as specialist graduate course units. With exception of lectures that form of special seminars and special laboratory exercises, the course work is assessed by examinations. If the student fails in the course work, he/she must retake the exam in the case of an obligatory course unit or in the case of optional one it is possible to take a different course unit.

2. Extension: 480 hours in the first year.

3. Credit system: ECTS. Forty credits are allocated to course work.

4. Monitoring of the doctoral student when the course work is assessed by examinations.

Contribution to Teaching

1. Supervision of undergraduate laboratory work.

2. Coaching of master thesis work.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

22.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. <u>Languages</u> Slovak. Alternative languages: English and German.

2. Credits are allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report, or a collection of individual or co-authored scientific papers with an introduction and/or commentary.

Oral Presentation of Thesis Work

1. <u>Languages</u> Slovak. Alternative languages: English and German.

2. Oral presentation with oral examination for an open audience.

3. <u>Duration</u>: typical duration of 1 hour to 2 hours including examination. There is no upper time limit, but it does not take more than 2 hours. The chairman of the examination commission has the right to stop the student if necessary.

22.5.4. Examination

Thesis Examination Board

1. <u>Composition</u>: four internal examiners and four external examiners in a total of eight members. In the Dutch part of the country there is also an independent chairman.

2. <u>Selection</u>: the examination board is chosen by the person responsible for the general organization of studies in a given study field; the board must be then approved by the dean.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with two possible final decisions: "Completed" or "Not completed".

2. <u>If the student fails</u>, he/she may resubmit a revised thesis within a time limit or do further work as specified by the examination board.

22.6. Questionnaires

Slovak Republic

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	YES
3.1.2	**How many members are in the Scientific Board?**	24

3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	N
3.1.3.2	Chosen by the student?	N
3.1.3.3	Chosen in another way? Please specify:	Y
	Members of the Scientific Board are chosen by the Dean of the Faculty, and then the Scientific Board must be approved by the Academic Senate.	
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	Y
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	N
3.1.4.4	Assigning the thesis subject.	N
3.1.4.5	Other. Please specify:	
	The documentation needed for the accreditation of the PhD study programmes (by the Accreditation Commission) has to be approved by Scientific Board of the Faculty.	
3.1.5	Does the student need a personal supervisor during her/his studies?	Y
3.1.5.1	Does the same person supervise her/his thesis work?	Y
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	Y

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

Y

3.1.7.2   After a specified period of coursework?

N

3.1.7.3   Other. Please specify:

Y

The title of the thesis work can be modified but not later then after the third semester.

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or associated professor (docent) in the department?

N

3.1.8.2   Any researcher in the department?

N

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

3.1.8.3   Any researcher in another institution?

N

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

N

3.1.8.4   Other methods. Please specify:

Y

Only persons having rank of full professor and associated professor are eligible to serve as a supervisor without further conditions.

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

N

3.1.9.2   Other methods. Please specify:

Y

Thesis subjects are proposed by the eligible supervisors and published; students interested in doctoral studies can choose one subject before they apply for admission.

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

Y

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
480	**0**	**0**	**Does not exist**

3.2- COURSE WORK

3.2.2.2   **In which form is this coursework offered?**

        - As specialist graduate course units.   Y

        - As course units taken from the undergraduate programme.

        - Other. Please specify.

        Except the lectures we use also the form of special seminars and special laboratory exercises.

3.2.2.3	Is the coursework assessed by examinations? If not, please give details:	Y
3.2.3.1	Is the coursework in your institution described by a credit system?	Y
3.2.3.2	Is it the ECTS system?	Y

        If not, what is the relationship with ECTS?

3.2.3   **Credit system**

3.2.3.3   How many credits are allocated to coursework?   40

3.2.4   **Monitoring**

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   Y

3.2.4.2   **What regulations apply in case of failure in one or more course units?**

        - Retake the exam.   Y[1]

        - Take a different course unit.   Y[1]

    [1] Retake the exam in the case of an obligatory course unit or in the case of optional one it is possible to take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.   Y

3.3.2   At national conferences.   Y

3.3.3   At international conferences.   Y

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   Y

3.4.2   Teaching undergraduate courses.   Y

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Slovak
4.1.2	Are alternative languages used for the thesis? Please Specify: **English(German)**	Y
4.1.3	Which language is normally used for the oral presentation and/or examination?	Slovak
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English (German)**	YES
4.1.5	Are credits allocated to the doctoral thesis?	Y
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Y
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	Y (may be)
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	Y
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	4
4.2.2.2	External examiners.	4
4.2.2.3	TOTAL.	8

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3 How is the examination board chosen?

4.2.3.1 By the supervisor.

4.2.3.2 By the scientific committee of the institution.

4.2.3.3 By the rector or equivalent.

4.2.3.4 By the national ministry.

4.2.3.5 Other. Please specify:

Y

The examination board is chosen by the person responsible for general organization of studies in a given study field, the board must be then approved by the dean.

4.2.4 Do the examiners base their evaluation mark on:

4.2.4.1 Reading the thesis.

Y

4.2.4.2 The oral presentation of the thesis work.

Y

4.2.4.3 Both.

4.2.4.4 What is the typical duration of the oral part of the thesis examination, if applicable?

1 hour

4.2.4.5 Is there an upper limit to the duration of the thesis examination?

N

But it does not take more than 2 hours. The chairman of the examination commission has the right to stop the student if necessary.

4.2.5 Is the oral part of the examination taken behind closed doors?

N

4.2.6 What happens if the student fails?

4.2.6.1 May not resubmit for doctorate.

N

4.2.6.2 May resubmit revised thesis.

Y

4.2.6.3 May do further work as specified by examination board.

Y

4.2.6.4 If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:

Y

The Examination Commission decides about the extent of thesis revision and determines new date for exam.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.7 Is there a grading system for the doctoral degree based on the quality of the work? N

Only one of two possible final decisions: "Completed" or "Not completed".

23. TR: Turkey

Coordinating Author: Bahar KARAOĞLAN (Ege University, bahar.karaoglan@ege.edu.tr)

Review: Dervis DENIZ (Eastern Mediterranean University)

23.1. General Information

General Structure of Turkish Educational System

The educational system in Turkey is structured under pre-school, primary, secondary and higher education levels as seen in Fig. 30.1.
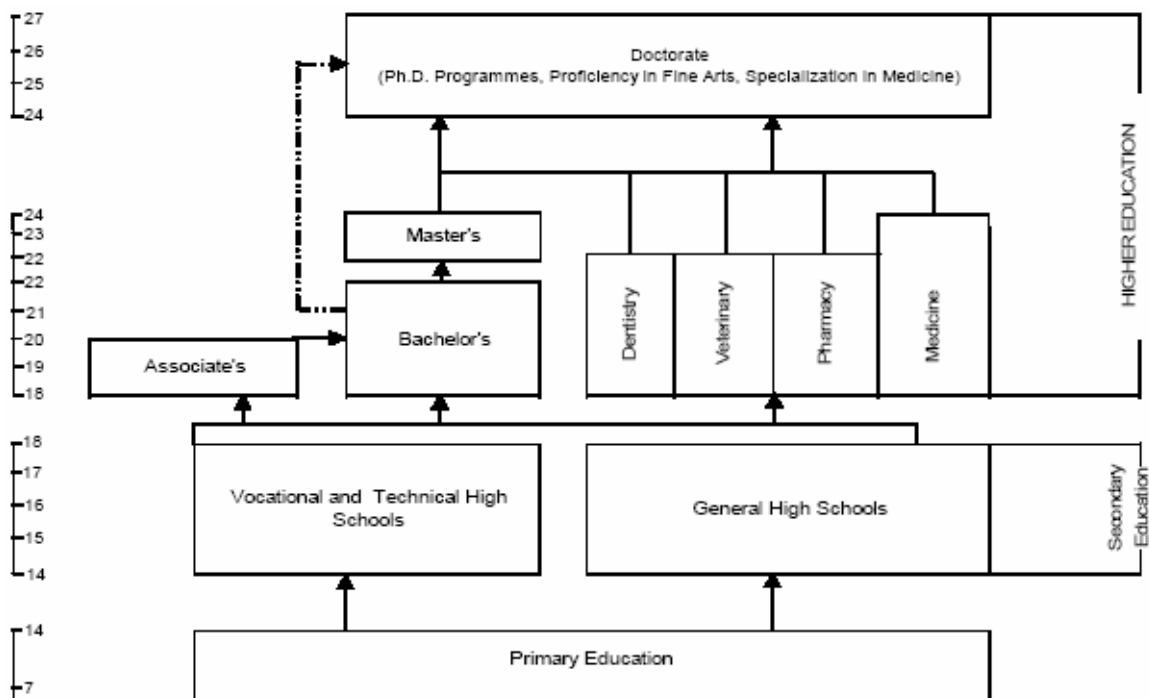
Figure 22.1: Structure of Turkish Educational System (Age shown on the left)

Admission to higher education is based on a nation-wide Student Selection Examination. The examination is held once a year by the Student Selection and Placement Centre. Candidates are admitted to the institutions of higher education based on their composite scores calculated based on their scores on the selection examination and their high school grade point averages.

To increase the capacity of higher education open education is started in Anadolu University in 1982 reaching a 845,411 students in 2006-2007. Another solution is the adoption of "2nd Education – Evening Education" based on saving on investments.

There are total of 93 higher educational institutions in Turkey. 68 of these educational institutions are public universities, 25 are private universities. Schooling rates in higher education in Turkey in 2005 are 25% in formal education and39% together with open education. The total number of students in higher education in the year 2006-2007 is 2,453,664.

Organization of a course of study
- The academic year is divided into two semesters as fall and spring.
- The academic year begins in September and ends in the beginning of June. In general it takes around 36 weeks of lecture, laboratory work, seminars and two examination periods.
- The capacity of studies is measured in credits. 3 credits (7.5 ECTS) corresponds to 45 hours (3 hours per week) of lecture. The nominal academic year consists of 24 credits (60 ECTS).

23.1.1 *Electrical and Information Engineering in Turkey: Boundaries of the Field of Study*

Specialties related to Electrical and Electronics Engineering, Computer Sciences and Engineering are very favorable in Turkey. For this reason most of the universities have Electrical and Electronics Engineering and Computer Engineering departments under the Engineering (Engineering and Architecture) Faculties. By the year 2007, 63 universities host Electrical and Electronics Engineering department and 56 host Computer Sciences / engineering Departments. The specialties under Information Technologies are Management Informatics, Information Technologies, Computer Systems, Software Engineering, Hardware Systems, Control and Command Systems. In some universities Computer Sciences Departments appears under Electrical and Electronics Engineering Departments.

Specialties related to Electrical and Electronics engineering are: Electromagnetic Fields and Microwave Techniques, Circuits and Systems, Electronics, Telecommunication, Electrical Machines, Computer Sciences, Control and Command, Electric Power Systems, Electomagnetic fields and microwave.

23.1.2 Content, degree and accreditations

The Higher Education Council (YÖK) established in 1981 is responsible for the planning, coordination and supervision of higher education in Turkey. The Minister of National Education represents higher education in the Parliament and can chair the meetings of the Higher Education Council but has no right of vote. Neither the decisions of the Council nor those of the universities are subject to ratification by the Ministry.

Since quality assurance in universities has gained importance both at international level in general and in frame of Bologna Process for the last ten years, the attention of Turkish universities to quality assurance has significantly increased. Since the first years of 1990s, engineering programs of long-established universities have passed ABET (Accreditation Board for Engineering and Technology, USA) evaluation process and received equivalency accreditation issued by ABET for countries other than the USA and obtained a quality assurance that is internationally valid. Based upon this experience, Engineering Accreditation Board was established in scope of Engineering Deans' Council in 2002. This unit has been evaluating engineering programs even though it does not have a legal entity status yet. In 1997, the Council of Higher Education and British Council started the "Project on Determining the Quality of Turkish Universities", completed its pilot studies and prepared a report on the process but could not implement the project. Starting from 1998-99 academic year, accreditation was envisaged for the academic staff in faculties of education, which were restructured and in this context regulations have been realized in order to increase quality.

In the last years, 7 universities passed institutional evaluation process of the European Universities Association (EUA). They participated in quality culture project of EUA since 2002. This project targets to develop and share quality culture among Bologna countries.

In accordance with the "Regulations on Academic Assessment and Quality Improvement at Higher Education Institutions" that was prepared by the Council of Higher Education and took force on September 20, 2005, the **Commission on Academic Assessment and Quality Improvement in Higher Education (YÖDEK)** composed of 9 members selected by Interuniversity Board started its works. "Guide on Academic Assessment and Quality Improvement at Higher Education Institutions" completed by this Commission in May 2006, was prepared by considering the developments in the world and Europe dimension, especially in Bologna Process and in this context it determines duties and responsibilities of the upper bodies of higher education and higher education institutions, internal and external assessment principles and criteria as well as details regarding the process.

The Council of Higher Education started works on national qualifications framework for higher education in the scope of Bologna Process and Lisbon strategy. In this context, studies regarding the descriptors of sectoral qualifications on the programme basis, and as well as the level descriptors of the qualifications and ensuring quality assurance of learning outcomes will be realized in stages until the end of 2007.

23.1.3 Implementation of the Bologno-BMD System in Turkey

Integration of Turkey with European Higher Education Area started with its official
participation to Bologna Process in 2001. In scope of 10 action lines of Bologna Process the following activities have been realized until now:

1. Works related to Diploma Supplement and European Credit Transfer System: Diploma Supplement and European Credit Transfer System became mandatory for all higher education institutions since the end of 2005-2006 academic year.

2. The establishment of national student's union:
   "Regulations for student councils of higher education institutions and the national student council of higher education institutions" took effect after published in the Official Gazette of September 20, 2005 and No. 25942.

3. The establishment of quality assessment and improvement systems that are fully compatible with the principles and procedures determined at European level. "Regulations on Academic Assessment and Quality Improvement at higher education institutions" prepared by the Council of Higher Education was published in the Official Gazette of September 20, 2005 and no. 25942 and took effect.

4. The work on Bologna Process action line related to national qualifications framework for higher education: higher education competencies, engineering competencies and other sectors

5. Lisbon Convention on "the Recognition of Qualifications concerning Higher Education in the European Region (1997)" signed by Turkey on December 1, 2004 was approved with the Law No. 5463 of February 23, 2006 and came into force after published in the Official Gazette No. 26094 of December 28, 2006.

Performance of Turkey has been assessed as "excellent" for two- cycle degree system; "very good" for recognition of degrees and study periods; and "some progress" for quality assurance in the Report from a Working Group Appointed by the Bologna
Follow-up Group (Bologna Process Stocktaking; Bergen, May 2005, page 104)

23.2. Figures on the weight of EIE in Turkey

To give some idea about the weight of EIE in the higher education of Turkey some tables and charts are given. In Table 1 figures for the last 7 academic years are listed. The first row gives the number of educational staff that includes the professors, associate professors, assistant professors, instructors, language instructors, specialists and research assistants. In the second row total number of students in formal and second higher education (excluding the two year vocational higher education and open education) is given. The third and fourth rows give the total number of master's and doctoral students. In the fifth and sixth rows number of students in Electrical and Electronic Engineering and Computer Engineering are listed.

Table 22.1.   Some Statistics about the Number of Students and Staff for the Last 7 years.

	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Total number of staff	67,880	71,290	76,090	78,804	82,096	84,785	89,329
Total number of undergrad students	745,377	775,139	793,906	823,740	862,948	915,043	937,317
Total number of students in master's	65,068	73,466	82,277	90,057	92,566	111,814	108,683
Total number of students in doctorate	21,739	22,514	23,176	24,835	27,335	32,503	33,711
Number of students in EE	16,689	17,304	18,027	18,820	19,558	20,312	20,953
Number of Students in CS	8,577	9,994	10,987	12,589	14,073	15,118	16,180

Table 22.2   compares the number of graduate students in EIE to the total number of graduate students in technical sciences that include the disciplines: Engineering Sciences, Environmental Studies, Aeronautics and Space Sciences, Geology, Geophysics, Mining, Petroleum Studies, Metallurgy, Mechanical Engineering, Marine Sciences and Naval Architecture, Nuclear Sciences, Electric-Electronics, Defense Technology, Computer Sciences, Civil Engineering, Architecture, Industrial Engineering, Food, Chemical Engineering, Agriculture and Forestry.

Table 23.2   Comparison of Number of Graduate Students in EIE Field to the Total Number of Graduate Students in Technical Sciences for the Last 7 Years.

	Technical Sciences		EE		Informatics	
	Master	doctorate	Master	Doctorate	Master	Doctorate
2000 – 2001	16,967	4,704	2,235	617	1,330	221
2001 - 2002	17,880	4,817	2,194	647	1,492	237
2002 - 2003	18,473	5,055	2,237	706	1,767	309
2003 – 2004	19,322	5,790	2,358	844	1,955	353
2004 – 2005	19,305	6,450	2,401	953	2,119	457
2005 – 2006	21,258	7,601	2,723	1,138	2,537	571
2006 - 2007	20,655	8,028	2,646	1,186	2,558	584

Distribution of the students in EIE specialties

The distribution of undergraduate students in EIE specialties for the academic year 2006-2007 is shown in figure 2. Here, only the students who are in the formal education engineering discipline are considered.
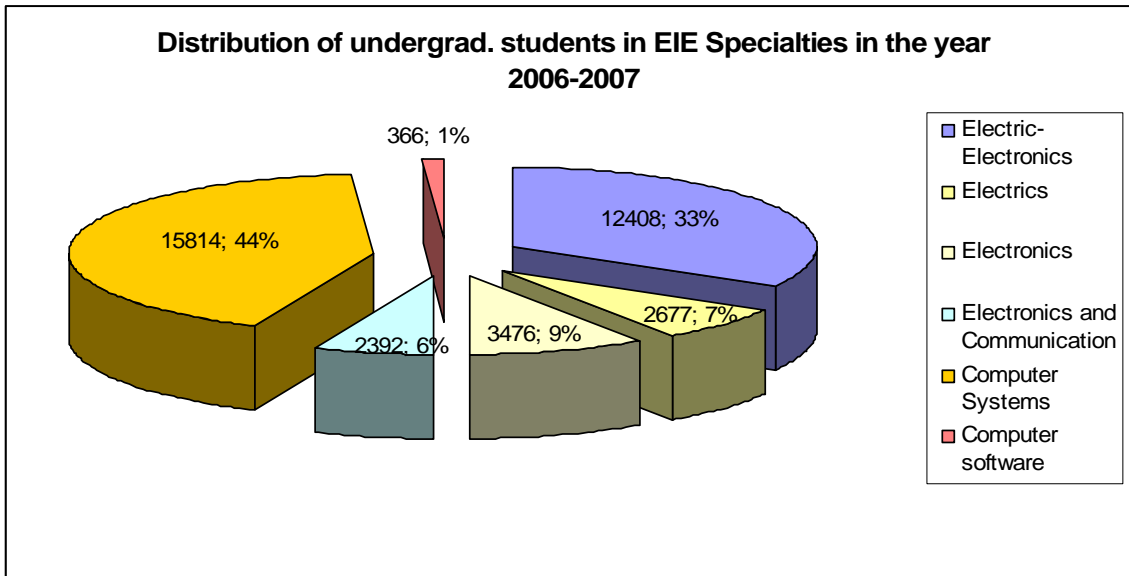
Figure 23.2.   The distribution of undergraduate students in EIE specialties in the academic year 2006 – 2007.
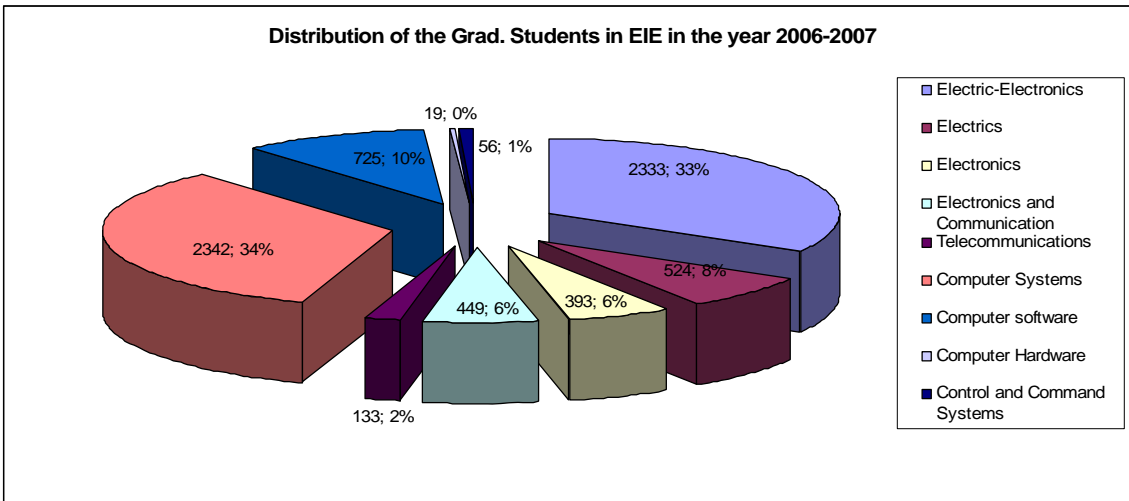
Figure 23.3.   The distribution of graduate (master's and doctoral) students in EIE specialties for the academic year 2006-2007

23.3. Degrees in EIE in Turkey

Undergraduate level of study consists of two levels; Associate's Degree and the Bachelor's Degree. Associate's Degree is awarded after the successful completion of a full-time two-year study. Bachelor's degree is awarded after the successful completion of full-time four-year university study. The durations of Dentistry, Pharmacy and Veterinary Medicine programmes are five years, and that of Medicine is six years. The qualifications in Dentistry, Medicine and Veterinary Medicine are equivalent to the Bachelors plus Masters Degree. The establishment of any new degree programme at any level is subject to approval by YÖK. Graduate level of study consists of the Master's Degree and the Doctorate Degree. There are two types of Master's programmes: with and without a thesis. The duration of the master's programmes with theses is two years, whereas the duration of the programmes without theses is one and half years. Doctorate programmes have a duration of four years which consists of completion of courses, passing a qualifying examination, and preparing and defending a dissertation. A recent change on the Regulations on Graduate Education permits the Bachelor's degree holders to be admitted directly to Doctorate programmes. Graduate level programmes are coordinated by graduate schools.

23.3.1 *Degrees in EIE in Bachelor Level*

Bachelor in Electrical and Electronics Engineering

Bachelor in Electrical Engineering

Bachelor in Electronics Engineering

Bachelor in Electronics and Communication

Bachelor in Computer Engineering

Bachelor in Computer Sciences

Bachelor in Computer Software

23.3.2 *Degrees in EIE in Graduate Level*

Mater's (Ph. D.) in Electric-Electronics

Master's (Ph. D.) in Electrics

Master's (Ph. D.) in Electronics

Master's (Ph. D.) in Electronics and Communication

Master's (Ph. D.) in Telecommunications

Mater's (Ph. D.) in Computer Sciences

Master's (Ph. D.) in Computer systems

Master's (Ph. D.) in Control and Computer

Master's (Ph. D.) in Theoretical Foundations of Computer Engineering

Master's (Ph. D.) in Computer Software

Master's (Ph. D.) in Information Systems

Master's (Ph. D.) in Informatics

Master's (Ph. D.) in Computer Networks and Internet Technologies

Master's (Ph. D.) Control and Command Systems

Master's (Ph. D.) in Cognitive Sciences

23.4. References

- Online Statistical reports of Student Selection and Placement Centre of Turkey http://www.osym.gov.tr/BelgeGoster.aspx?F6E10F8892433CFFAAF6AA849816B2EF8F59EC4393613791

- Higher Education Strategy for Turkey (Draft Report), Republic of Turkey The Council of Higher Education, June 2006, Ankara. Available online at http://www.yok.gov.tr/duyuru/2006/turkey_higher.pdf

Doctoral

Studies

23.5. Doctoral Studies in Turkey

23.5.1. Supervision

Scientific Board or Supervisor

The <u>Scientific board</u> is composed by at least three members where one must be from another university. The student, <u>in most cases,</u> has the same personal supervisor during its thesis work not necessarily on an <u>active</u> research area of the supervisor. There may be co-supervisor.

Subject Assignment

Subject assigned after a period of coursework, by agreement between the student and the supervisor. In most cases the student and the supervisor decide roughly on the subject before the student is admitted to the program. After the coursework they finalize the problem and the student proposes the problem to the steering committee.

Who can be a Supervisor

Any professor or lecturer in the department can be a supervisor. There may be a co-advisor form another university but (s)he is required to have PhD degree.

Tasks of Scientific Board/Supervisor

1.   General management   YES

2.   Deciding/advising layout of course   YES

3.   Assigning a thesis subject   YES

In the end, advise the faculty if the student may present the thesis.

Duration: three to four years.

23.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation and is offered as specialist graduate course units. The course work in some cases can be assessed by examinations. Writing a paper or projects can be tools for evaluation. If the student fails in the course work, he/she must, take a different course unit. The student has to complete 21 credits in at most two years.

2. Extension: 252 hours or more, in the first year.

3. Credit system: 21 credits are allocated to course work. Three credits correspond to 7.5 ECTS**.**

4. Monitoring of the doctoral student when the course work is assessed by examinations.

Contribution to Teaching

Supervision of undergraduate: teaching is not allowed before getting Ph.D. degree. Tutoring**,** grading and lab assistance can be done by the doctorate students.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

23.5.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language: Turkish. Alternative languages: English and French.

2. No credits allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1. <u>Language</u> Turkish. Alternative languages: English and French..

2. Oral presentation with oral examination for an open audience behind close doors or not depending on the examination committee.

3. <u>Duration</u>: typical duration from 1 hour to 2 hours for the oral part of the examination. The commission will give the student an indication for the duration of his contribution and the president of the commission will lead the exam in general.

23.5. 4. Examination

Thesis Examination Board

1. <u>Composition</u>: the Dissertation committee consists of at least 5 members where 3 are internal and 2 are from other universities.

2. <u>Selection</u> by the scientific committee of the institution.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with no grading system. But in special circumstances there can be "felicitations of the jury" in extra (seldom).

2. <u>If the student fails</u>, he/she may resubmit a revised thesis within three months.

23.6. Questionnaires

Turkey

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	<u>YES</u>/NO
3.1.2	**How many members are in the Scientific Board?**	3- 5
	Steering committee consists of at least 3 members where one must be from another university. Dissertation committee consists of at least 5 members where 3 are internal and 2 are from other universities.	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	<u>YES</u>/NO
3.1.3.2	Chosen by the student?	YES/<u>NO</u>
3.1.3.3	Chosen in another way? Please specify:	YES/<u>NO</u>
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	<u>YES</u>/NO
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	<u>YES</u>/NO
3.1.4.4	Assigning the thesis subject.	<u>YES</u>/NO
3.1.4.5	Other. Please specify:	<u>YES</u>/NO
	In the end, advise the faculty if the student may present the thesis.	
3.1.5	Does the student need a personal supervisor during her/his studies?	<u>YES</u>/NO
3.1.5.1	Does the same person supervise her/his thesis work?	<u>YES</u>/NO
	There may be co-supervisor.	
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	YES/<u>NO</u>[1]

[1] But this is the case for more then 99%.

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

YES/<u>NO</u>

3.1.7.2   After a specified period of coursework?

<u>YES</u>/NO

3.1.7.3   Other. Please specify:

In most cases the student and the supervisor decide roughly on the subject before the student is admitted to the program. After the coursework they finalize the problem and the student proposes the problem to the steering committee.

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

<u>YES</u>/NO[2]

3.1.8.2   Any researcher in the department?

YES/<u>NO</u>

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

<u>YES</u>/NO

3.1.8.3   Any researcher in another institution?

YES/<u>NO</u>

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

<u>YES</u>/NO[3]

3.1.8.4   Other methods. Please specify:

[2] Minimum PhD level is required.
[3] There may be a co-advisor form another university but (s)he is required to have Ph.D degree.

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

<u>YES</u>/NO

3.1.9.2   Other methods. Please specify:

YES/NO

3.2- COURSE WORK

3.2.1 Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.   <u>YES</u>/NO

3.2.2 **Extension and assessment.**

3.2.2.1 What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
252 hrs	**hrs**	**hrs**	**hrs**

The student is required to take at least 7 courses each 3 hours a week. Taking each semester as 12 weeks this makes 7*12*3=252 hours.

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.   <u>YES</u>/NO

- As course units taken from the undergraduate programme.   YES/<u>NO</u>

- Other. Please specify.

At least 5 of the courses must be at the doctorate level (code 600) and 2 may be from graduate level (code 500).

3.2.2.3 Is the coursework assessed by examinations? If not, please give details: YES/NO

Examination is not required for the final evaluation. It totally depends on the professor. Writing a paper, projects can be tools for evaluation.

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?   <u>YES</u>/NO

3.2.3.2 Is it the ECTS system?   YES/<u>NO</u>

If not, what is the relationship with ECTS?

3 credits corresponds to 7.5 ECTS

3.2.3.3 How many credits are allocated to coursework?   **21 credits**

See above.

3.2- COURSE WORK

3.2.4   Monitoring

3.2.4.1   Do you monitor the performance of the doctoral student taking coursework?   <u>YES</u>/NO

3.2.4.2   What regulations apply in case of failure in one or more course units?

- Retake the exam.   YES/<u>NO</u>

- Take a different course unit.   <u>YES</u>/NO

The student has to complete 21 credits in at most two years. If not he is stopped.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.   <u>YES</u>/NO

3.3.2   At national conferences.   <u>YES</u>/NO

3.3.3   At international conferences.   <u>YES</u>/NO

Minimum requirements: one publication at international level, two seminars about the PhD work.

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.   <u>YES</u>/NO

3.4.2   Teaching undergraduate courses.   YES/<u>NO</u>

Teaching is not allowed before getting Ph.D. degree. Tutoring**,** grading and lab assistance can be done by the doctorate students.

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1 Which language is normally used for the thesis?

Turkish

4.1.2 Are alternative languages used for the thesis?
Please Specify:

YES/No

It depends on the language of education. There are universities which are teaching in English and French.

4.1.3 Which language is normally used for the oral presentation and/or examination?

Turkish

4.1.4 Are alternative languages used in the oral presentation and examination?
Please Specify:

<u>YES</u>/NO

All written and oral presentations are done in the language of education. So it can be in Turkish, English or French.

4.1.5 Are credits allocated to the doctoral thesis?

YES/<u>NO</u>

4.1.6 **The doctoral thesis is:**

4.1.6.1 A previously unpublished substantial written report.

<u>YES</u>/NO

4.1.6.2 A collection of individual or co-authored scientific papers with an introduction and/or commentary.

YES/<u>NO</u>

4.1.6.3 Other. Please specify:

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1 Is there an oral presentation of the thesis work or an open audience as part of the evaluation procedure?

<u>YES</u>/NO

4.2.2 Composition of the thesis examination board. Please, give the typical number of:

4.2.2.1 Internal examiners.

At least 3

4.2.2.2 External examiners.

At least 2

4.2.2.3 TOTAL

5

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.

4.2.3.2   By the scientific committee of the institution.   YES/NO

4.2.3.3   By the rector or equivalent.

4.2.3.4   By the national ministry.

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   YES/NO

4.2.4.2   The oral presentation of the thesis work.   YES/NO

4.2.4.3   Both.   YES/NO

Thesis is evaluated based on its originality and novelty.
Examiners also base their evaluation on: answers given to the examination board,
answers given to the general audience, an oral examination of the candidate, including
detailed questions on the thesis.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if   1 to 2
applicable?   hours

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   YES/NO

**The commission will give the student an indication for the duration of his
contribution and the president of the commission will lead the exam in general.**

4.2.5   Is the oral part of the examination taken behind closed doors?

Depends on the examining committee.

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.   YES/NO

4.2.6.2   May resubmit revised thesis.   YES/NO

4.2.6.3   May do further work as specified by examination board.   YES/NO

There may be three outcomes. Accept, reject or accept with revision and/or further work.

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.6   What happens if the student fails?

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur?
Please specify: <u>YES</u>/NO

The student is given at most 3 months to do the revisions.

4.2.7   Is there a grading system for the doctoral degree based on the quality of the
work?   YES/NO

**Basically it is Yes Or NO. But in special circumstances there may be" felicitations of
the jury" in extra (seldom).**

24. UA: Україна (Ukraine)

Coordinating author: Andriy ZYNOVCHENKO (EAEEIE, Priazovskyi State Technical University, Mariupol, and Universität Ulm, Deutschland, andriy.zynovchenko@e-technik.uni-ulm.de)
Other contributors: Oleksandr ZYNOVCHENKO (EAEEIE, Priazovskyi State Technical University, Mariupol, aazyn@yahoo.com), Yuriy SAYENKO (Priazovskyi State Technical University, Mariupol)
Review: Jan LIGUŠ (EAEEIE, Technical University of Košice, Slovakia)

24.1. General information

The structure of the higher education of Ukraine was built according to the structure of education in the developed countries of the world as determined by UNESCO, UN and other international organizations. The higher education constitutes integral part of the system of education of Ukraine as provided for by the Law of Ukraine "On Education".
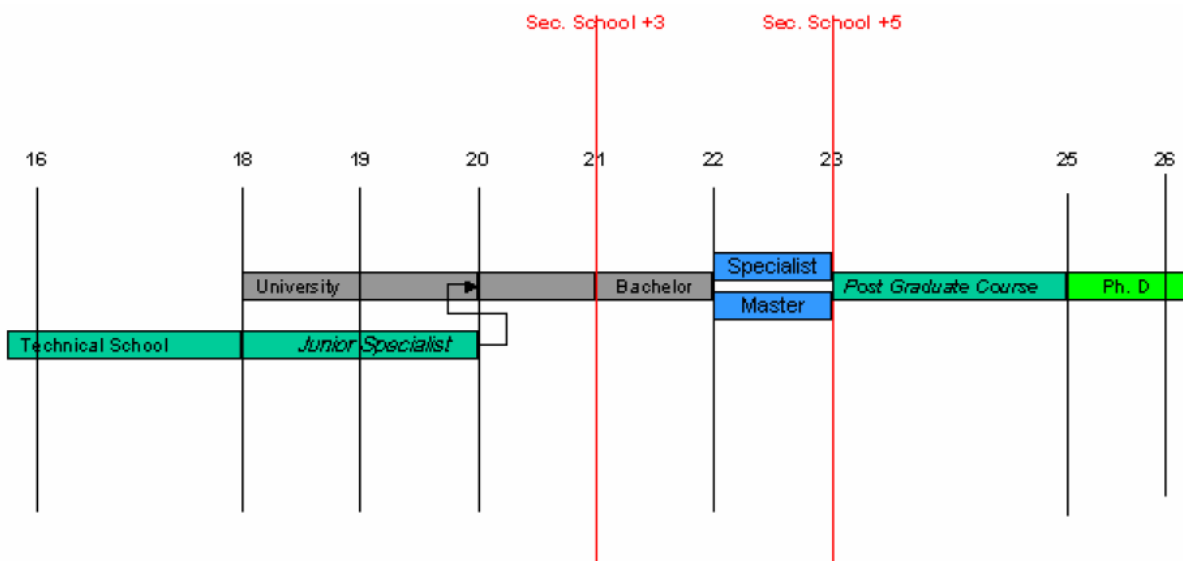
Figure 24.1: Ukrainian Higher Education System in EIE disciplines

Training of specialists in higher educational institutions may be carried out full-time or part-time (evening, correspondence education), by combining these two forms or, for certain professions, without attending classes.

Diplomas in EIE-specialities can be obtained from a Technical School, from an Institute or from a University. The structure of educational institutions of Ukraine is presented below:
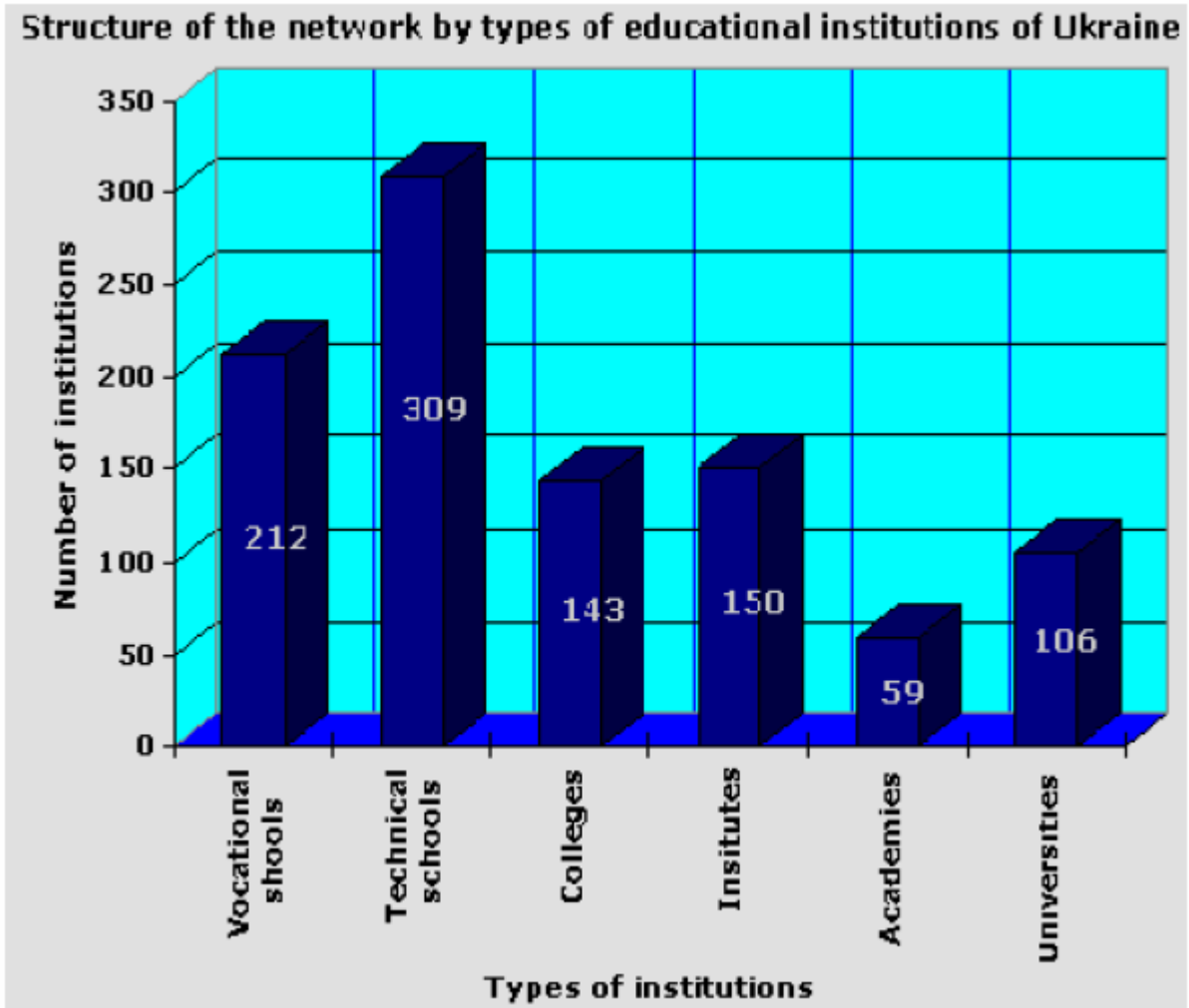
Figure 24.2: The structure of educational institutions of Ukraine

24.1.1 *Electrical and Information Engineering in Ukraine, boundaries of the field of study*

In Ukraine there are three main disciplinary fields:
- • Electrical Engineering (including varieties)
- • Informatics (with varieties)
- • Automatics and Control in various technical fields

24.1.2 *List of general EIE specialities*:

- Computer Systems and Networks
- Information Control Systems and Technologies
- Software of Automated Systems
- Computer Science
- Electromechanical systems of Automation and Electric Drive
- Electrical Engineering Systems of Power Consumption
- Radioelectronic Devices, Systems and Complexes
- Electronic Systems
- Radio Engineering
- Manufacturing of Radio Electronic Devices
- Radio Communication, Broadcasting and TV Equipment
- Information Technologies
- Microelectronics and Semiconductor Devices
- Dedicated Computer Systems
- Power Stations
- Radiophysics and Electronics
- Electric Machines and Apparatus
- Telecommunication Systems and Networks
- Electric Systems and Networks
- System Programming
- Technologies and Telecommunication Means
- Electric Machines and Apparatus
- Power Engineering in Agriculture
- Household Electronic Appliances
- Thermoelectric Power Stations
- Flexible Computer Systems and Robotics
- Robotized Systems and Complexes
- Information Communication Networks
- Electronic Home Appliances
- Atomic Power Engineering

24.1.3 <u>Content, degrees and accreditation</u>

The curriculum of diplomas is defined as follows:

- Obligatory part (1/3 of the whole curriculum) is defined by the Ministry of Education and Science of Ukraine.

- 1/3 part of the curriculum is defined by the University Council.

- 1/3 part of the curriculum for the concrete speciality is defined by the department leading this speciality and then approved by the University Council.

24.1.4 <u>Implementation of the Bologna-BMD system in Ukraine</u>

There is a negligible number of students who graduate with the 4-year Bachelor diploma, so it can be considered the system implemented in Ukraine is close to the Bologna-BMD system.

24.2. Figures on the weight of EIE in Ukraine

The structure of the students' admission by areas of training is shown.
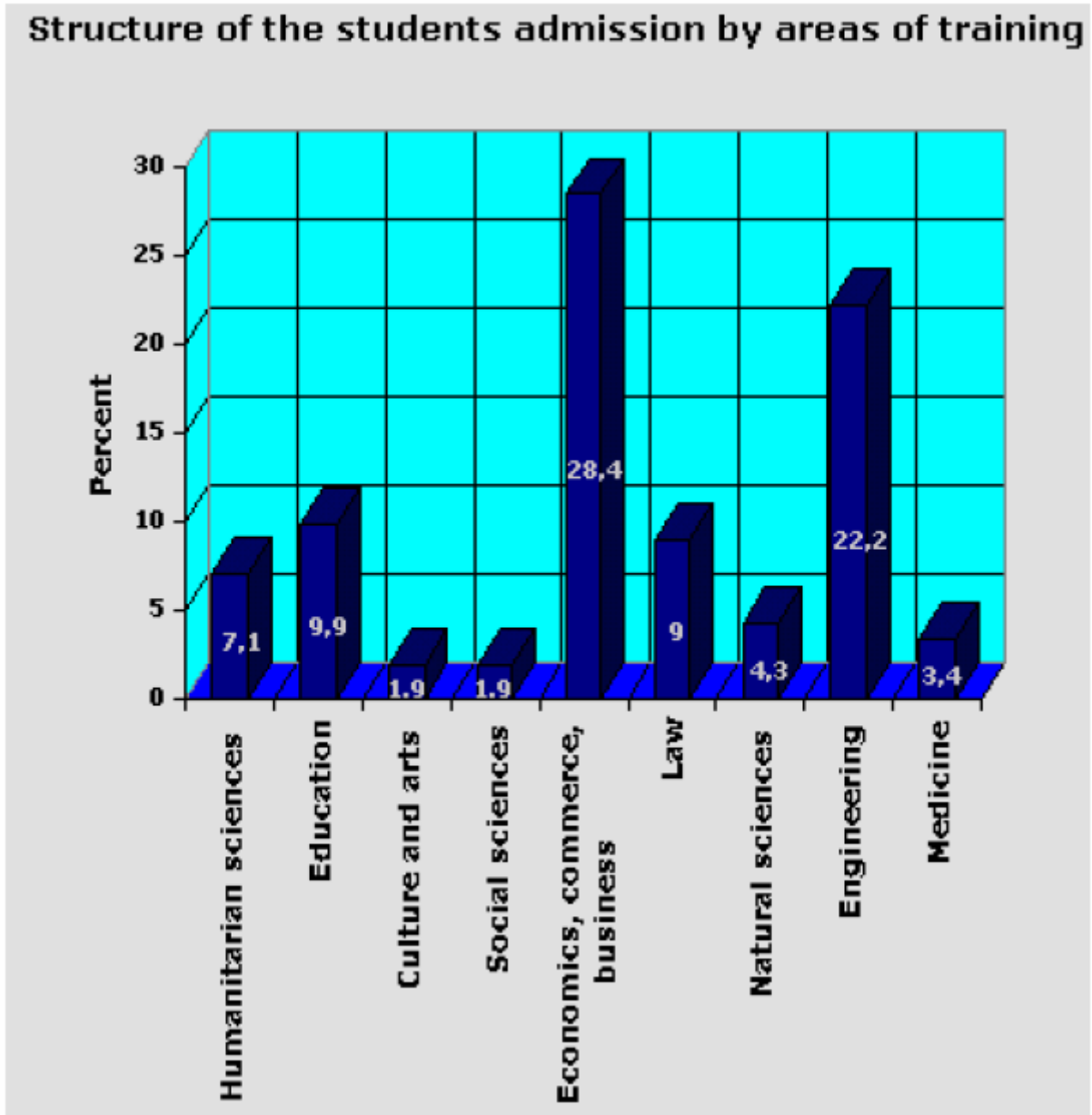
Figure 24.3: The structure of the students' admission by areas of training

EIE subjects are also found in the curricula of some specialities other than EIE specialities.

24.3. Degrees in EIE in Ukraine

• Secondary school + 3 years: Junior Specialist degree in one of the specialities listed in 24.3.2.

• Secondary school + 4 years: Bachelor degree in one of the specialities listed in 24.3.2.

• Secondary school + 5 years: Specialist or Master degree in one of the specialities listed in 24.3.2.

Remarks:

1. The overwhelming majority of students continue their studies after having obtained the Bachelor's degree in order to get the Master's or Specialist's Degree.

2. The exact title of a 5 year degree (Specialist or Master) is different in different institutions. In industry all these degrees have nearly the same value.

In each of the specialties listed below a student can obtain either Junior Specialist or Bachelor, Specialist or Master degree. The Specialist and Master degrees can be awarded only after the Bachelor degree has been earned. Educational institutions giving only Junior Specialist or only Bachelor degree are usually not independent, but they are integrated in one or another high school giving Specialist or Master degree. That is why such educational institutions and high schools can be considered together as a single whole.

All percentages below are given related to a whole degree curriculum taken as 100%.

24.3.1 *General elements, social and behavioural skills*

Curricula percentages in general elements and social and behavioural skills are equal across all of the listed specialties, but are different for different degrees.

- Junior Specialist degree: Foreign language 5%; social sciences 13%; projects 10%; industrial training period 15%.
- Bachelor, Specialist, Master degrees: Foreign language 7%; social sciences 13%; projects 15%; industrial training period 12%.

24.3.2 *EIE Specialties.*

Percentages in EIE-curricula are equal across Junior Specialist, Bachelor, Specialist and Master degrees, but are different for different specialities.

Computer Systems and Networks: Informatics/Computer 28%; Networks 14%; Electronics 7%; Telecommunications 7%;

Information Control Systems and Technologies: Informatics/Computer 18%; Telecommunications 15%; Networks 10%; Electronics 12%;

Software of Automated Systems: Informatics/Computer 18%; Telecommunications 15%; Networks 10%; Electronics 12%;

Computer Science: Informatics/Computer 28%; Networks 14%; Electronics 7%; Telecommunications 7%;

Electromechanical systems of Automation and Electric Drive: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

Electrical Engineering Systems of Power Consumption: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

Radio Electronic Devices, Systems and Complexes: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Electronic Systems: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Radio Engineering: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Manufacturing of Radio Electronic Devices: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Radio Communication, Broadcasting and TV Equipment: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Information Technologies: Informatics/Computer 28%; Networks 14%; Electronics 7%; Telecommunications 7%;

Microelectronics and Semiconductor Devices: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Dedicated Computer Systems: Informatics/Computer 28%; Networks 14%; Electronics 7%; Telecommunications 7%;

Power Stations: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

Radio physics and Electronics: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

Electric Machines and Apparatus: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

Telecommunication Systems and Networks: Informatics/Computer 18%; Telecommunications 15%; Networks 10%; Electronics 12%;

Electric Systems and Networks: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

System Programming: Informatics/Computer 28%; Networks 14%; Electronics 7%; Telecommunications 7%;

Technologies and Telecommunication Means:

Electric Machines and Apparatus: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

Power Engineering in Agriculture: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

<u>Household Electronic Appliances</u>: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

<u>Thermoelectric Power Stations</u>: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%;

<u>Flexible Computer Systems and Robotics</u>: Informatics/Computer 11%; Networks 7%; Electronics 12%; Automation 14%; Electrical engineering 12%;

<u>Robotized Systems and Complexes</u>: Informatics/Computer 11%; Networks 7%; Electronics 12%; Automation 14%; Electrical engineering 12%;

<u>Information Communication Networks</u>:

<u>Electronic Home Appliances</u>: Informatics/Computer 12%; Networks 9%; Electronics 22%; Telecommunications 12%;

<u>Atomic Power Engineering</u>: Informatics 7%; Electrical networks 8%; Electronics 9%; Automation 10%; Electrical engineering and electrical equipments 21%.

24.4. References

The information given in this monograph is based on the following documents and web links:

Ministry of Education and Science of Ukraine http://www.education.gov.ua

Doctoral

Studies

24.5. Doctoral Studies in Ukraine

24.5.1. Supervision

Scientific Board or Supervisor

Scientific board appointed by the head of the Department. The student, in most cases, has the same personal supervisor during its thesis work on an active research area of the supervisor.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Any professor or lecturer in the department.

Tasks of Scientific Board/Supervisor

1. General management   NO

2. Deciding/advising layout of course   YES

3. Assigning a thesis subject   NO

Duration

Four years.

24.5.2. Development

Courseware?

Yes.

Course Work

1. The students have to take course work during their doctoral degree preparation. The course work is assessed by examinations and is offered as specialist graduate course units.

2. Extension: no information mentioned.

3. Credit system: not ECTS.

4. Monitoring of the doctoral student. In case of failure the student must retake the exam or take a different course unit.

Contribution to Teaching

1. Supervision of undergraduate laboratory work.

2. Teaching of undergraduate students.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

24.5.3. Thesis Work

Submission of Doctoral Written Thesis

1.   <u>Languages</u> normally used: Ukrainian or Russian. Alternative language: English.

2.   There <u>are</u> credits allocated to the doctoral thesis.

3.   The doctoral thesis is a previously unpublished substantial written report or a collection of individual or co-authored scientific papers with an introduction and/or commentary.

Oral Presentation of Thesis Work

1.   <u>Languages</u> normally used: Ukrainian or Russian. Alternative language: English.

2.   Oral presentation with oral examination for an open/public audience.

3.   <u>Duration</u>: typical duration of 2 hours including examination with no upper time limit.

24.5.4. Examination

Thesis Examination Board

1.   <u>Composition</u>: three internal examiners and three external examiners (six members).

2.   <u>Selection</u> by the supervisor and/or by the scientific committee of the institution.

Evaluation

1.   <u>Result</u> based on the reading of the thesis and the oral presentation of the thesis work, with no grading system.

2.   <u>If the student fails</u>, he/she may resubmit a revised thesis or do further work as specified by the examination board.

24.6. Questionnaires

Ukraine

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1   Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.   <u>YES</u>/NO

3.1.2   **How many members are in the Scientific Board?**

3.1.3   How are the members of the Scientific Board chosen?

3.1.3.1   Elected by the Faculty, Department?   Y/<u>N</u>

3.1.3.2   Chosen by the student?   Y/<u>N</u>

3.1.3.3   Chosen in another way? Please specify: <u>Y</u>/N

    Appointed by the head of the department.

3.1.4   Which are the main tasks of the Scientific Board/ Supervisor?

3.1.4.1   General management of the doctoral studies.   Y/<u>N</u>

3.1.4.2   Deciding the layout of the course, advising the students on their coursework.   <u>Y</u>/N

3.1.4.4   Assigning the thesis subject.   Y/<u>N</u>

3.1.4.5   Other. Please specify:

3.1.5   Does the student need a personal supervisor during her/his studies?   <u>Y</u>/N

3.1.5.1   Does the same person supervise her/his thesis work?   <u>Y</u>/N

3.1.6   Must the subject of the doctoral thesis be an active research area in the department?   <u>Y</u>/N

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

<u>Y</u>/N

3.1.7.2   After a specified period of coursework?

Y/<u>N</u>

3.1.7.3   Other. Please specify:

Y/<u>N</u>

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

<u>Y</u>/N

3.1.8.2   Any researcher in the department?

Y/<u>N</u>

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

<u>N</u>

3.1.8.3   Any researcher in another institution?

Y/<u>N</u>

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

Y/<u>N</u>

3.1.8.4   Other methods. Please specify:

Y/N

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

<u>Y</u>/N

3.1.9.2   Other methods. Please specify:

The thesis subject must be approved by the Scientific Board.

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

<u>Y</u>/N

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**
30 hrs	**15 hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2 **In which form is this coursework offered?**

- As specialist graduate course units.

<u>Y</u>

- As course units taken from the undergraduate programme.

<u>N</u>

- Other. Please specify.

3.2.2.3 Is the coursework assessed by examinations?
If not, please give details:

<u>Y</u>/N

3.2.3 **Credit system**

3.2.3.1 Is the coursework in your institution described by a credit system?

<u>Y</u>/N

3.2.3.2 Is it the ECTS system?

Y/<u>N</u>

If not, what is the relationship with ECTS?

3.2.3.3 How many credits are allocated to coursework?

credits

3.2.4 **Monitoring**

3.2.4.1 Do you monitor the performance of the doctoral student taking coursework?

<u>Y</u>/N

3.2.4.2 **What regulations apply in case of failure in one or more course units?**

- Retake the exam.

<u>Y</u>/N

- Take a different course unit.

<u>Y</u>/N

3.3- PRESENTATION OF WORK RESULTS:

3.3.1 In the department.

<u>Y</u>/N

3.3.2 At national conferences.

<u>Y</u>/N

3.3.3 At international conferences.

<u>Y</u>/N

3.4- CONTRIBUTION TO TEACHING:

3.4.1 Supervision of undergraduate laboratory.

<u>Y</u>/N

3.4.2 Teaching undergraduate courses.

<u>Y</u>/N

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	Ukrainian or Russian
4.1.2	Are alternative languages used for the thesis? Please Specify: **English.**	Y/N
4.1.3	Which language is normally used for the oral presentation and/or examination?	Ukrainian or Russian
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify: **English.**	YES/NO
4.1.5	Are credits allocated to the doctoral thesis?	Y/N
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	Y/N
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	Y/N
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	YES/NO
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	3
4.2.2.2	External examiners.	3
4.2.2.3	TOTAL.	6

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3   How is the examination board chosen?

4.2.3.1   By the supervisor.   Y/<u>N</u>

4.2.3.2   By the scientific committee of the institution.   <u>Y</u>/N

4.2.3.3   By the rector or equivalent.   Y/<u>N</u>

4.2.3.4   By the national ministry.   Y/<u>N</u>

4.2.3.5   Other. Please specify:

4.2.4   Do the examiners base their evaluation mark on:

4.2.4.1   Reading the thesis.   <u>Y</u>/N

4.2.4.2   The oral presentation of the thesis work.   <u>Y</u>/N

4.2.4.3   Both.

4.2.4.4   What is the typical duration of the oral part of the thesis examination, if applicable?   20'

4.2.4.5   Is there an upper limit to the duration of the thesis examination?   Y/<u>N</u>

4.2.5   Is the oral part of the examination taken behind closed doors?   Y/<u>N</u>

4.2.6   What happens if the student fails?

4.2.6.1   May not resubmit for doctorate.

4.2.6.2   May resubmit revised thesis.   <u>Y</u>/N

4.2.6.3   May do further work as specified by examination board.   <u>Y</u>/N

4.2.6.4   If the thesis is to be re-submitted is there a time limit for this to occur? Please specify: Y/<u>N</u>

4.2.7   Is there a grading system for the doctoral degree based on the quality of the work?   Y/<u>N</u>

25. UK: United Kingdom

Coordinating authors:Tony WARD (EAEEIE, University of York, aew@ohm.york.ac.uk)
Review: Jan LIGUŠ (EAEEIE, Technical University of Košice, Slovakia)

25.1. General information

This description commences with a summary of the conventional Higher Education system in the UK. This is then followed by an overview of some of the variations on the theme that can occur. The general view of the UK higher education (HE) system is described in figure 25.1 although this is a simplified version of the real picture of access to higher education. A fuller description is given in section 25.X. The UK has been using a National Qualifications Framework (NQF)[1] for a number of years now and this is described after figure 25.1 together with a comparison of the UK NQF with the European Qualifications Framework (EQF)[2] and the Dublin Descriptors[3]. Also referenced are the UK's specific output standards for Engineering[4]. Following this general national context information, specific and detailed information is presented about the undergraduate and postgraduate (masters and doctoral) levels of education and of programmes generally available in the three HE levels.
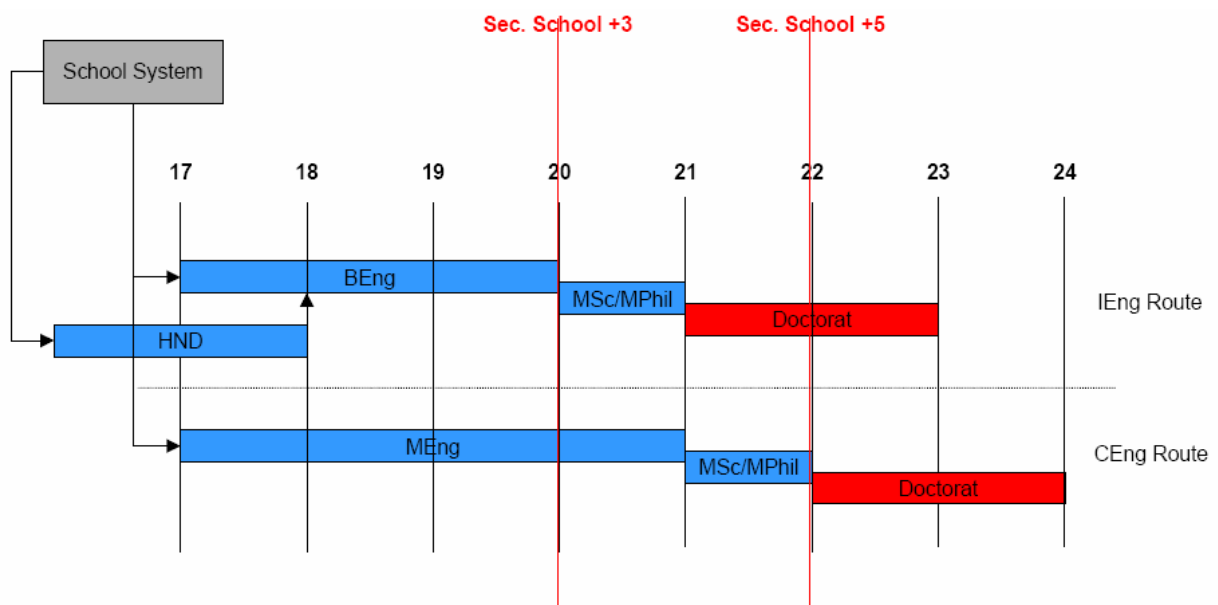
Figure 25.1: UK Higher Education System in EIE disciplines (General picture).

Firstly to clarify terminology, in the UK the whole degree is usually referred to as a programme of study rather than a course although in the UCAS[5] (Universities and Colleges Admission System) guide below the term course is used. Programmes comprise a number of modules. In this section the terms programme and module will be used in favour of courses.

Frameworks for higher education qualifications in the UK.

Responsibility for the development and maintenance of the overall education system in the UK rests with the Government through the Quality Assurance Agency[6] (QAA). The QAA has produced two qualifications frameworks that describe the achievement represented by higher education qualifications, they are:

- The framework for HE qualifications in England, Wales and Northern Ireland[7]
- The framework for HE qualifications in Scotland[8]

It is important to understand the place of these frameworks with respect to the European Qualifications Framework (EQF) and the Dublin Descriptors and the compatibility of the NQF with the Bologna Process. The following is a precise of the frameworks and the UK's stance on the issue of compatibility.

A revised version of the framework for higher education qualifications (FHEQ) in England, Wales and Northern Ireland was published for consultation in April 2008[9]. Point 3 of this document states: *"The fundamental premise of the FHEQ is that qualifications should be awarded on the basis of achievement of outcomes and attainment rather than years of study. Qualification descriptors are key to this. Qualification descriptors set out the generic outcomes and attributes expected for the award of qualifications. The qualification descriptors contained in the FHEQ exemplify the outcomes and attributes expected of learning resulting in the award of higher education qualifications; as distinct from higher level skills awards."*

This point clearly states the outputs orientation of the UK's Government, higher education institutions and overall approach to programme accreditation and sets the scene for the positioning of the UK NQF against the Bologna Process and the EQF. In the UK higher education sector position paper[10] the UK welcomes the broad objectives and purpose behind the EQF. In the detailed response it states: *"If the EQF is to be successful, it is essential that it complements existing arrangements within the Bologna Process to create the European Higher Education Area (EHEA). … The reference levels and descriptors in the EQF are **generic** descriptors which encompass the spectrum of lifelong learning and are neither suitable nor intended to replace the Dublin Descriptors within the Framework for Qualifications of the EHEA. The Dublin Descriptors were developed specifically for HE and are of use for the majority of HE qualifications."*

To understand the UK HE provision, it is useful to compare the level descriptors appropriate at the HE levels between the UK NQF, the EQF and the Dublin Descriptors. Boxes 25.1, provides, by way of example, a comparison of these descriptors at the Bachelor level, reference can be made to the qualifications for the other levels.

.

Box 25.1 Bachelor Degree / First Cycle Degree

EQF:

Knowledge: Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles.
Skills: Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study.
Competence: Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts. Take responsibility for managing professional development of individuals and groups.

UK NQF

An Honours graduate will have developed an understanding of a complex body of knowledge, some of it at the current boundaries of an academic discipline. Through this, the graduate will have developed analytical techniques and problem-solving skills that can be applied in many types of employment. The graduate will be able to evaluate evidence, arguments and assumptions, to reach sound judgements, and to communicate effectively.

An Honours graduate should have the qualities needed for employment in situations requiring the exercise of personal responsibility, and decision-making in complex and unpredictable circumstances.

Dublin Descriptor

Have demonstrated knowledge and understanding in a field of study that builds upon and supersedes their general secondary education, and is typically at a level that, whilst supported by advanced textbooks, includes some aspects that will be informed by knowledge of the forefront of their field of study.
Can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation, and have competences typically demonstrated through devising and sustaining arguments and solving problems within their field of study.
Have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues.
Can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.
Have developed those learning skills that are necessary for them to continue to undertake further study with a high degree of autonomy.

The final level of detail worth reference to is the subject benchmark statements for Engineering[4]. These benchmark statements clearly articulate what is expected of the outcome of an engineering degree programme in the UK and form the basis for the design and quality assurance of engineering degrees.

Higher Education usually commences with students aged 17 or 18 immediately after A-level education within a school or sixth form college, during which students will usually study 3 or more subjects. There are, in addition to the A level entry route, alternative routes into UK HE including Foundation years, Foundation Degrees, Access programmes and, as a result of the most recent change to the pre-University education system, the School's Diploma. These entry routes offer access to the full breadth and depth of potential candidates and embrace the academic and vocational HE routes. The overall picture of access is complex but has been summarized in pictorial form in the 'progression map' (Figure 25.2) produced by Higher York's working group in Electrical and Electronic Engineering[11].
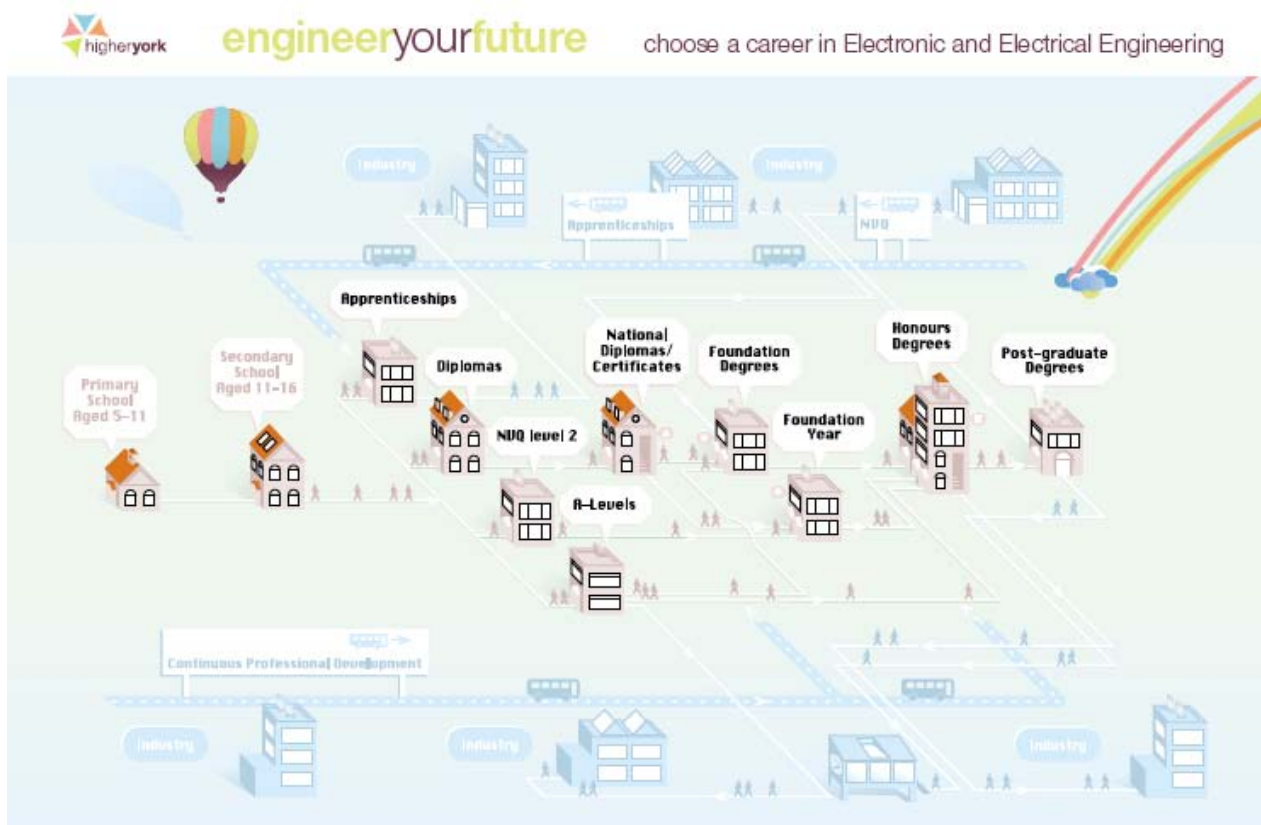
Figure 25.2 'Progression map' for Electrical and Electronic Engineering[11]

In the application for places in the HE system, students can choose from a range of durations of degree programmes, from the minimum of three years to a current maximum of five years (assuming no agreed period of absence). The three-year variant of the programme will be either a Bachelor of Science (BSc) or Bachelor of Engineering (BEng). Both these programmes can, when agreed by the academic institution, be increased to four years by adding a year in industry to form a 'sandwich' degree.

The four-year variant of the undergraduate programme will typically be a Master of Engineering (MEng). This programme can also be increased to five years by adding a year in industry to form a 'sandwich' degree. The Bachelor of Science, Bachelor of Engineering and Master of Engineering are all undergraduate or First Cycle programmes (FCD).

FCDs are typically graded using pass, ordinary, third class, lower second class, upper second class and first class classifications, although not all academic institutions use all of them. Some institutions use a Pass/Fail classification for MEng programmes.

Upon completion of an undergraduate programme any student can, subject to meeting certain conditions, undertake a postgraduate Masters programme, the duration of which is usually one-year full time. The conditions of progression relate to the relevance of the first cycle degree to the subject of the second cycle degree and to the level of academic achievement of the student in the first cycle degree, entry conditions are all set by the HE institution offering the higher degree. Masters degrees in the United Kingdom can be either taught or by research. Also, upon completion of an undergraduate programme and subject to the student achieving upper second or first class honours, a student can undertake a three-year Doctoral programme. Both the Master and Doctorate programmes are Second Cycle Degrees (SCD).

A wide range of variations is possible. Students can defer entry to higher education after school/college in favour of employment, returning to the academic system at any stage. In a similar way, a break can be taken between the FCD and the SCD. Both the FCD and SCD can be taken part time, although part time FCDs are less common. The Open University also offers the facility to undertake modules of study and build up a FCD over a larger number of years.

25.1.1 _Electrical and Information Engineering in United Kingdom, boundaries of the field of study_

One of the definitions possible for EIE lies in the way in which a student would select a course within an academic institution. The source for this information is the Universities & Colleges Admission System (UCAS)[5]. UCAS organises the first cycle degrees offered by UK institutions using a hierarchy within discipline areas. A search of related key words to EIE reveals the following hierarchy and hence list of courses that lie within the EIE general area. In the following list the numbers in brackets refer to the number of courses under that name that are offered within the UK.

Electronic/Electrical (866 courses)
- Aeronautical electronics (7 courses)
- Applied electronic (5 courses)
- Automotive electronic (4 courses)
- Automotive electronic engineering (4 courses)
- Communications Electronic Graphics (1 course)

- Computer Electronics (16 courses)

- Consumer Electronics (2 courses)

- Digital electronics (32 courses)

- Electronic / electrical engineering (787 courses)

- Electronic Art (4 courses)

- Electronic business (2 courses)

- Electronic communications (22 courses)

- Electronic communications engineering (16 courses)

- Electronic communications systems (12 courses)

- Electronic computer aided design (8 courses)

- Electronic computer systems (12 courses)

- Electronic control (36 courses)

- Electronic design (45 courses)

- Electronic engineering management (25 courses)

- Electronic engineering systems (42 courses)

- Electronic graphics (13 courses)

- Electronic imaging (9 courses)

- Electronic manufacturing (12 courses)

- Electronic media (10 courses)

- Electronic media design (2 courses)

- Electronic music (33 courses)

- Electronic power engineering (19 courses)

- Electronic power systems (11 courses)

- Electronic product design (7 courses)

- Electronic product engineering (9 courses)

- Electronic publishing (5 courses)

- Electronic systems (71 courses)

- Electronic systems design (19 courses)

- Electronic systems engineering (29 courses)

- Electronic visual communications (1 course)

- Embedded electronic systems engineering (12 courses)

- Environmental electronics (1 course)

- Industrial electronics (5 courses)

- Instrumentation electronics (1 course)

- Integrated electronic systems engineering (3 courses)

- Marine electronics (1 course)

- Mechanical electronic systems engineering (14 courses)

- Medical electronics (14 courses)

- Multimedia electronics (2 courses)

- Power electronic (5 courses)

- Power electronic systems (12 courses)

- Transport electronic engineering (6 courses)

Computer Science (326 courses)
- • Business systems engineering (4 courses)
- • Computing (3321 courses)
- • Information (1070 courses)
- • Information systems (561 courses)
- • Information technology (58 courses)
- • Information engineering (694 courses)

Computer Systems Engineering (177 courses)

Telecommunications (82 courses)
Information Communications Technology (ICT) (162 courses)

As can be seen from the list there is a great variety in the general naming of courses/programmes. A detailed look at the particular courses within each subheading reveals an even greater range of programme titles with programmes including combinations with other subjects. The naming of degree programmes is controlled by the academic institution only. Dual titles for some programmes occur, usually for marketing purposes.

A directory of Postgraduate level programmes is available on the Prospects website[12]. A search of Electrical/Electronic Engineering reveals 453 programmes offered within the United Kingdom, 365 in England, 56 in Scotland, 27 in Wales and 5 in Northern Ireland. Some of the 453 programmes are available in a number of optional levels. In total there are 302 at Master of Science level, 116 at Postgraduate Diploma, 113 at PhD, 97 at MPhil and 51 at Postgraduate Certificate level. The programmes offered are a mix of taught programmes and qualifications achieved by research.

25.1.2 *Content, degrees and accreditation*

The UK higher education system consists of two main cycles, undergraduate and graduate (or postgraduate), these correspond to the European First Cycle Degree (FCD) and Second Cycle Degree (SCD). FCDs are typically of 3-year or 4-year duration and classified as Bachelor of Science or Bachelor of Engineering usually, but not always, indicative of a scientific or engineering basis. SCDs are typically of 1-year or 3-year duration classified as Master of Science (MSc) or Master of Philosophy (MPhil) for the 1-year duration degrees and Doctor of Philosophy (PhD) for the 3-year degrees.

The 'value' of the FCDs is defined by the Quality Assurance Agency (QAA) in terms of credits. A FCD consists of 3 or 4 years of studies where each year must comprise 120 credits. A 3-year BSc or MEng therefore comprises 360 credits. This compares directly with the 180 ECTS for the same programme. The conversion is therefore 1 ECTS is equivalent to 2 UK credits. Masters level degrees are slightly different because the QAA defines that a Masters year should comprise **140 credits** (70 ECTS) to

reflect the increased period of time spent studying for the qualification. One UK credit is approximately equivalent to an expected student workload of 10 hours, so one ECTS is equivalent to 20 student hours. This time comprises lectures, laboratories, assessments, lecture preparation, assessment preparation, assignments, etc.

Within the general quality and accreditation frameworks, each University has full autonomy to decide on the contents of each degree. Comparison between institutions and, to some extent courses within each Institution, cannot therefore be generalised too far. General comparability between the level of achievement between institutions is helped through the use of external examiners. The external examiner system was introduced into the UK during the 19th century. The general purpose of the external examiner is to ensure that standards of assessment and outcomes are kept in balance and to ensure that the examination practices in all institutions are fair to the students.

Basic studies in engineering include mathematics, basic sciences and computer technology. After two years the studies become more subject-related. Students can choose specific study options within the degree programme. A Master's thesis is usually written during the final year of the studies.

Responsibility for the assurance of quality within higher education rests with the Quality Assurance Agency (QAA). In the UK quality assurance is very closely aligned with the applicable qualification framework. Point 4 of the revised framework for higher education qualifications (FHEQ) in England, Wales and Northern Ireland (published for consultation in April 2008)[9] states: "*The FHEQ is also used as a reference point in institutional audit and other forms of external review. Audit and review teams will examine the means which higher education providers employ for ensuring that their awards and qualifications are of an academic standard at least consistent with those referred to in the FHEQ, and that higher education providers are, where relevant, exercising their powers as degree awarding bodies in a proper manner. In particular, audit and review teams will wish to look at how higher education providers check the alignment between the academic standards of their awards and the levels referred to in the FHEQ. In this regard it should be regarded as a framework, not as a straightjacket.*"

Assurance of quality was introduced into higher education in the UK in 1993 through the Higher Education Funding Council. Assessment of quality was judged on a three grade system, 'excellent', 'satisfactory' or 'unacceptable'. In 1995 a more indepth subject review process was introduced that graded 6 aspects of provision, each on a 1 to 4 scale. The resulting 'profile' was a single number from 1 to 24 with 24 representing excellence. The assessment was carried out by a panel of experts none of whom were from the institution being audited. Since this initial assessment, a more 'light touch' assessment system has been adopted in which the Institution is audited, as a whole, by an audit team and the Institution itself is responsible for establishing quality assurance procedures that it uses to assure the quality in each academic discipline.

An outcome of the QAA subject reviews was a move towards the establishment of assessment frameworks within HE institutions in the UK. These frameworks establish the principles and practies associated with assessment to help to ensure the fair and equitable treatment of all students.

25.1.3 *Implementation of the Bologna-BMD system in the United Kingdom*

The current structure of higher education in the UK in which the first cycle degree is either 3 years (BSc, BEng) or 4 years (MEng) followed by a one year Master and a three-year Postgraduate PhD second cycle degree has a limited fit to the Bologna-BMD model.

25.2. Degrees in EIE in United Kingdom

The general requirement for entry to a first cycle degree in a higher education institution is the acquisition of the required UCAS Tariff points at a secondary school or college. The value of this tariff will depend on the programme and the University or College selected. There are no general rules that would be useful and the reader is recommended to refer to the UCAS web site and from there the specific academic institution for details of entry requirements. The number of students entering an electrical/electronic engineering first cycle degree in the UK has fallen over the past years. Figure 25.3 shows the decline since 2002.
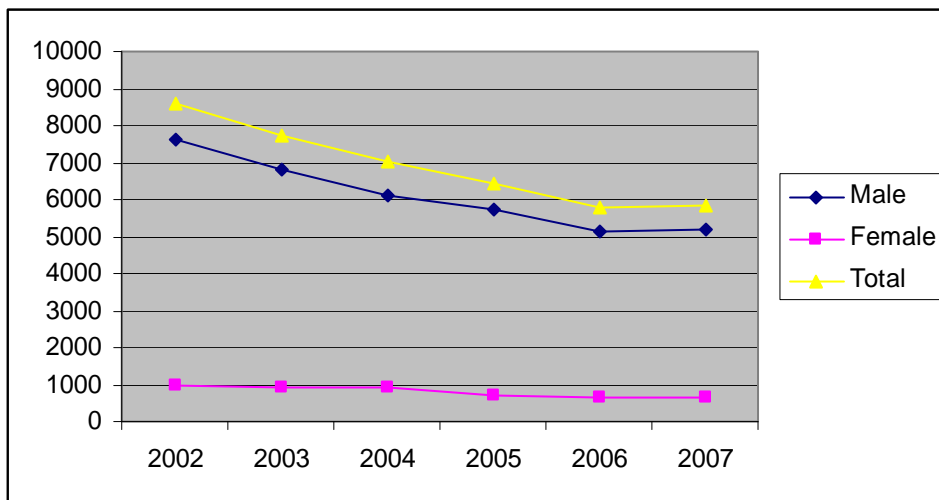
Figure 25.3 Number of students entering fist cycle engineering degrees

Figure 24.4 shows the trend in the total number of students accepting a first cycle degree in the UK over the same time period. From these two figures the overall trend in applications for engineering is clear.

EIE-Surveyor
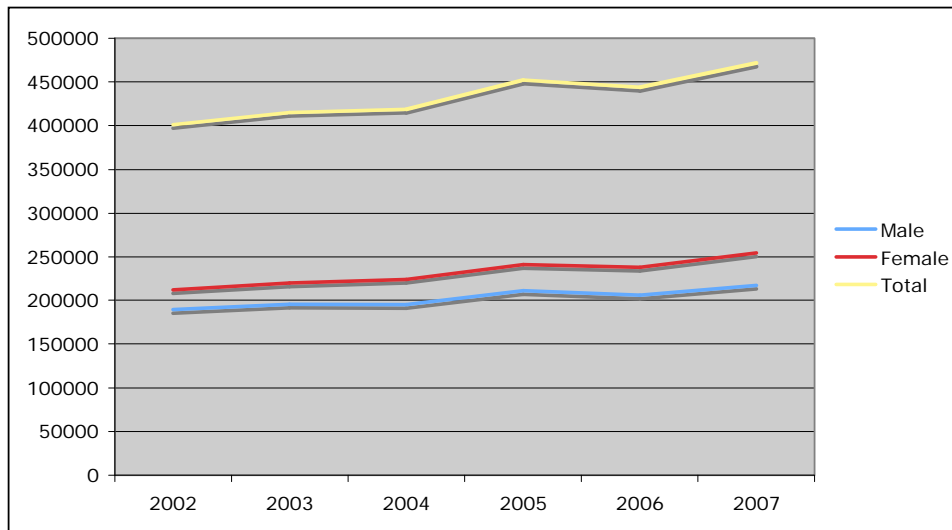
Figure 25.4 Total number of first cycle degree students (all subjects)

25.3. References

[1]. UK National Qualifications Framework, http://www.qca.org.uk/qca_5967.aspx

[2]. European Qualifications Framework,

 http://ec.europa.eu/education/policies/educ/eqf/index_en.html

[3]. Dublin descriptors,

 www.upc.edu/eees/contingut/arxius/Descriptors_dublin%255B1%255D_2004.pdf

[4]. Subject benchmark statements for Engineering,

http://www.qaa.ac.uk/academicinfrastructure/benchmark/honours/engineering.asp

[5]. Universities and Colleges Admission System (UCAS), http://www.ucas.ac.uk

[6]. UK government Quality Assurance Agency: http://www.qaa.ac.uk.

[7]. The framework for HE qualifications in England, Wales and Northern Ireland,

 http://www.qaa.ac.uk/academicinfrastructure/FHEQ/EWNI/default.asp

[8]. The framework for HE qualifications in Scotland,

http://www.qaa.ac.uk/academicinfrastructure/FHEQ/SCQF/default.asp

[10]. Draft revised version of the framework for HE qualifications in England, Wales and Northern

Ireland, April 2008. www.qaa.ac.uk/academicinfrastructure/FHEQ/EWNI08/FHEQ.pdf

[11]. Higher York 'Progression Map' for Electrical and Electronic Engineering, available from

Higher York, http://www.higheryork.org/

[12]. Prospects, http://www.prospects.ac.uk

Doctoral

Studies

25.4. Doctoral Studies in the United Kingdom

25.4.1. Supervision

Scientific Board or Supervisor

Supervisor - same personal supervisor for the student's thesis work on an active/new research area of the department.

Thesis Advisory Panel – Typically each MPhil and PhD student will have a Thesis Advisory Panel (TAP) consisting of their Supervisor and another member of academic staff. The purpose of this panel is to advise, guide and supervise the student throughout his/her period of research study until completion and submission of the thesis. In some circumstances additional persons may join the TAP, for example where the subject matter relates to other Departments.

Subject Assignment

Subject assigned at the beginning of the doctoral studies, by agreement between student and supervisor.

Who can be a Supervisor

Any professor/lecturer in the department approved to supervise at this level by the Institution.

Tasks of Scientific Board/Supervisor

1.	General management	YES
2.	Deciding/advising layout of course	YES
3.	Assigning a thesis subject	YES

Duration

Three years (typically).

25.4.2. **Development**

Courseware?

No.

Course Work

1. The students don't have to take course work during their doctoral degree preparation.

2. Extension: not relevant.

3. Credit system: not relevant.

4. Monitoring: not relevant.

Contribution to Teaching

1. Supervision of undergraduate laboratory work (typ. 4/6 hours per week).

2. Tutoring of undergraduate groups.

Presentation of Work

1. In the department.

2. At national conferences.

3. At international conferences.

25.4.3. Thesis Work

Submission of Doctoral Written Thesis

1. Language normally used: English. No alternative languages.

2. <u>No credits</u> allocated to the doctoral thesis.

3. The doctoral thesis is a previously unpublished substantial written report.

Oral Presentation of Thesis Work

1. <u>Language</u> normally used: English. No alternative languages.

2. Oral presentation to interested staff and/or a closed audience.

3. Oral examination with only student and examiners present.

4. <u>Duration</u>: typical duration of 3 hours with no upper time limit.

25.4.4. Examination

Thesis Examination Board

1. <u>Composition</u>: one internal examiner, one external examiner (2 members).

2. <u>Selection</u> by the supervisor but approved by the Scientific Committee.

Evaluation

1. <u>Result</u> based on the reading of the thesis and the oral examination of the candidate, with no grading system for the doctoral degree.

2. <u>If the student fails</u>, he/she may resubmit a revised thesis within a time limit of usually one year. He/she may also do further work as specified by the examination board or may be awarded a lower level qualification.

25. 5. Questionnaires

United Kingdom

3 – ACTIVITIES DURING DOCTORAL STUDIES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.1	Are the doctoral studies supervised by a Scientific Board/supervisor? If no, please proceed to 3.1.5.	NO
3.1.2	**How many members are in the Scientific Board?**	
3.1.3	How are the members of the Scientific Board chosen?	
3.1.3.1	Elected by the Faculty, Department?	YES/NO
3.1.3.2	Chosen by the student?	YES/NO
3.1.3.3	Chosen in another way? Please specify:	YES/NO
3.1.4	Which are the main tasks of the Scientific Board/ Supervisor?	
3.1.4.1	General management of the doctoral studies.	YES
3.1.4.2	Deciding the layout of the course, advising the students on their coursework.	YES
3.1.4.4	Assigning the thesis subject.	YES
3.1.4.5	Other. Please specify:	YES
	Advising the students on their coursework.	
3.1.5	Does the student need a personal supervisor during her/his studies?	YES
3.1.5.1	Does the same person supervise her/his thesis work?	YES
3.1.6	Must the subject of the doctoral thesis be an active research area in the department?	YES

3.1- SUPERVISION OF DOCTORAL STUDIES

3.1.7   The doctoral thesis subject is normally assigned:

3.1.7.1   At the beginning of the doctoral studies?

YES

3.1.7.2   After a specified period of coursework?

NO

3.1.7.3   Other. Please specify:

3.1.8   The thesis supervisor of a doctoral student can be:

3.1.8.1   Any professor or lecturer in the department?

YES

3.1.8.2   Any researcher in the department?

NO

3.1.8.2.1   In this case, is there a need for a second supervisor who is a professor or lecturer in the department?

YES/NO

3.1.8.3   Any researcher in another institution?

NO

3.1.8.3.1   In the latter case, is there a need for an internal supervisor?

YES/NO

3.1.8.4   Other methods. Please specify:

3.1.9   The thesis subject is assigned by:

3.1.9.1   Agreement between the student and the proposed supervisor?

YES

3.1.9.2   Other methods. Please specify:

NO

3.2- COURSE WORK

3.2.1   Do the students have to take coursework during their doctoral degree preparation? If no, please proceed to 3.3.

NO

3.2.2   **Extension and assessment.**

3.2.2.1   What is the number of contact hours spent in coursework in each year?

Year 1	**Year 2**	**Year 3**	**Year 4**
hrs	**hrs**	**hrs**	**hrs**

3.2- COURSE WORK

3.2.2.2   In which form is this coursework offered?

      - As specialist graduate course units.

      - As course units taken from the undergraduate programme.

      - Other. Please specify.

3.2.2.3   Is the coursework assessed by examinations?
If not, please give details: YES/NO

3.2.3   Credit system

3.2.3.1   Is the coursework in your institution described by a credit system?

                                                                                   YES/NO

3.2.3.2   Is it the ECTS system?

                                                                                    YES/NO

If not, what is the relationship with ECTS?

3.2.3.3   How many credits are allocated to coursework?

                                                                                    credits

3.2.4   Monitoring

3.2.4.1   Do you monitor the performance of the doctoral student taking
coursework?   YES/NO

3.2.4.2   What regulations apply in case of failure in one or more course units?

      - Retake the exam.

      - Take a different course unit.

3.3- PRESENTATION OF WORK RESULTS:

3.3.1   In the department.

                                                                                   YES

3.3.2   At national conferences.

                                                                                   YES

3.3.3   At international conferences.

                                                                                  YES

3.4- CONTRIBUTION TO TEACHING:

3.4.1   Supervision of undergraduate laboratory.

                                                                                   YES

3.4.2   Teaching undergraduate courses.

                                                                                   In some
cases

4 - AWARDING OF DOCTORAL DEGREE

4.1- SUBMISSION OF DOCTORAL THESIS

4.1.1	Which language is normally used for the thesis?	English
4.1.2	Are alternative languages used for the thesis? Please Specify:	NO
4.1.3	Which language is normally used for the oral presentation and/or examination?	English
4.1.4	Are alternative languages used in the oral presentation and examination? Please Specify:	NO
4.1.5	Are credits allocated to the doctoral thesis?	NO
4.1.6	**The doctoral thesis is:**	
4.1.6.1	A previously unpublished substantial written report.	YES
4.1.6.2	A collection of individual or co-authored scientific papers with an introduction and/or commentary.	
4.1.6.3	Other. Please specify:	

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.1	Is there an oral presentation of the thesis work for an open audience as part of the evaluation procedure?	NO
4.2.2	Composition of the thesis examination board. Please, give the typical number of:	
4.2.2.1	Internal examiners.	ONE
4.2.2.2	External examiners.	ONE
4.2.2.3	TOTAL.	TWO

4.2- THESIS EXAMINATION AND DEGREE AWARDING

4.2.3 How is the examination board chosen?

4.2.3.1 By the supervisor.

YES[1]

4.2.3.2 By the scientific committee of the institution.

NO

4.2.3.3 By the rector or equivalent.

NO

4.2.3.4 By the national ministry.

NO

4.2.3.5 Other. Please specify:

[1](4.2.3.1) YES, but approved by the Scientific Committee.

4.2.4 Do the examiners base their evaluation mark on:

4.2.4.1 Reading the thesis.

4.2.4.2 The oral presentation of the thesis work.

4.2.4.3 Both.

YES

4.2.4.4 What is the typical duration of the oral part of the thesis examination, if applicable?

3 hours

4.2.4.5 Is there an upper limit to the duration of the thesis examination?

NO

4.2.5 Is the oral part of the examination taken behind closed doors?

4.2.6 What happens if the student fails?

4.2.6.1 May not resubmit for doctorate.

YES

4.2.6.2 May resubmit revised thesis.

YES

4.2.6.3 May do further work as specified by examination board.

YES

4.2.6.4 If the thesis is to be re-submitted is there a time limit for this to occur? Please specify:
Usually one year.

YES

4.2.7 Is there a grading system for the doctoral degree based on the quality of the work?

NO

Third Part

List of universities proposing curricula in Electrical and Information Engineering In Europe

AT: Österreich (Austria)

Before bachelor (HTL Engineer)

http://www.berufsbildendeschulen.at/schoolfinder

City	Name of the institution	http address
Braunau am Inn	Höhere Technische Bundeslehranstalt Braunau (Hermann Fuchs Bundesschulzentrum)	http://www.htl.at
Bregenz	Höhere Technische Bundes-Lehr- und Versuchsanstalt Bregenz	http://www.htl-bregenz.ac.at
Graz-Gösting	Höhere Technische Bundes-Lehr- und Versuchsanstalt (BULME)	http://www.bulme.at
Hallstatt	Höhere Technische Bundeslehranstalt Hollabrunn	http://www.eduhi.at/schule/hallstatt
Innsbruck	Höhere Technische Bundes-Lehr- und Versuchsanstalt Innsbruck	http://www.htlinn.ac.at
Kapfenberg	Höhere Technische Bundeslehranstalt Kapfenberg	http://www.htl-kapfenberg.ac.at/
Klagenfurt	Höhere Technische Bundeslehranstalt Klagenfurt	http://www.htl1-klagenfurt.at
Klagenfurt	Höhere Technische Bundeslehranstalt Klagenfurt	http://www.htblmo-klu.ac.at
Leonding	Höhere Technische Bundeslehranstalt Leonding	http://www.htl-leonding.ac.at
Linz	Höhere Technische Bundeslehranstalt, LITEC - Linzer Technikum	http://www.htl2.asn-linz.ac.at
Mödling	Höhere Technische Bundeslehranstalt Mödling	http://www.minic.ac.at
Linz	Höhere Technische Bundeslehranstalt, LITEC - Linzer Technikum	http://www.htl2.asn-linz.ac.at
Rankweil	Höhere Technische Bundes-Lehr- und Versuchsanstalt Rankweil	http://www.htl-rankweil.vol.at
Saalfelden	Höhere Technische Bundeslehranstalt Saalfelden	http://land.salzburg.at/htlsaal/
Salzburg	Höhere Technische Bundeslehranstalt	http://www.htl.fh-sbg.ac.at/
St. Pölten	Höhere Technische Bundes-Lehr- und Versuchsanstalt St. Pölten	http://www.htlstp.ac.at
Steyr	Höhere Technische Bundeslehranstalt Steyr	http://www.htl-steyr.ac.at
Waidhofen an der Ybbs	Höhere Technische Bundes-Lehr- und Versuchsanstalt Waidhofen	http://htl.waidhofen.at
Weiz	Höhere Technische Bundeslehranstalt Weiz	http://www.htbla-weiz.ac.at
Wels	Höhere Technische Bundeslehranstalt Wels	http://www.htl-wels.ac.at
Wiener Neustadt	Höhere Technische Bundes-Lehr- und Versuchsanstalt Wiener Neustadt	http://www.htlwrn.ac.at
Wien	Höhere Technische Bundeslehranstalt Wien	http://www.htlwien10.at
Wien	Höhere Technische Bundeslehranstalt Wien	http://www.htl-donaustadt.at/
Wien	Höhere Technische Bundeslehranstalt in Wien 16	http://www.htlw16.ac.at
Wien	Technologisches Gewerbemuseum (TGM), Höhere Technische Bundes-Lehr- und Versuchsanstalt	http://www.tgm.ac.at

Fachhochschule

http://www.studieren.at

City	Name of the institution	http address
Klagenfurt	Fachhochschule Technikum Kärnten / Klagenfurt	http://www.fh-kaernten.ac.at
Kapfenberg	Fachhochschule Kapfenberg	http://www.fh-joanneum.at/
Villach - St. Magdalen	Fachhochschule Technikum Kärnten /Villach	http://www.fh-kaernten.at
Wien	Fachhochschule Technikum Wien	http://www.technikum-wien.at/

Universities

City	Name of the institution	http address
Graz	Graz University of Technology	http://www.eltit.tugraz.at/
Wien	Vienna University of Technology	http://info.tuwien.ac.at/histu/15.html

BE: België - Belgique - Belgien (Belgium)

Universities

City	Name of the institution	http address
Universities (Flemish community)		
Antwerpen	Universiteit Antwerpen (UIA, RUCA, UFSIA)	http://www.ua.ac.be/
Brussel	Vrije universiteit Brussel (VUB)	http://www.vub.ac.be/
Brussel	Katholieke Universiteit Brussel (KUB)	http://www.kubrussel.ac.be/
Diepenbeek	Limburgs Universitair Centrum (LUC Diepenbeek)	http://www.luc.ac.be/
Gent	Universiteit Gent (RUG)	http://www.rug.ac.be/
Leuven	Katholieke Universiteit Leuven (KULeuven)	http://www.kuleuven.ac.be/
Universities (French community)		
Bruxelles	Université libre de Bruxelles	http://www.ulb.ac.be
Liège	Université de Liège	http://www.ulg.ac.be
Louvain	Université catholique de Louvain	http://www.ucl.ac.be
Mons	Faculté polytechnique de Mons	http://www.umh.ac.be

Universities of professional education

City	Name of the institution	http address
Universities of professional education in EIE (Flemish community)		
Antwerpen	Artesis Hogeschool Antwerpen	http://www.artesis.be
Antwerpen	Karel de Grote-Hogeschool-Katholieke Hogeschool Antwerpen	www.kdg.be
Brugge-Oostende	Katholieke Hogeschool Brugge-Oostende	http://www.khbo.be
Brugge-Oostende	Hogeschool West-Vlaanderen	http://www.hogeschool-wvl.be
Brussel	Hogeschool voor Wetenschap & Kunst	http://www.wenk.be
Brussel	Erasmushogeschool Brussel	http://www.ehb.be
Gent	Hogeschool Gent	http://www.hogent.be
Gent	Katholieke Hogeschool Sint-Lieven Gent	http://www.kahosl.be
Kempen	Katholieke Hogeschool Kempen	http://www.khk.be
Kortrijk	Katholieke Hogeschool Zuid-West-Vlaanderen	http://www.katho.be
Leuven	Groep T Hogeschool Leuven	http://www.groept.be
Limburg	Hogeschool Limburg	http://www.hogelimb.be
Limburg	Katholieke Hogeschool Limburg	http://www.khlim.be
Universities of professional education in EIE (French community)		
Arlon	Haute Ecole de la Communauté française du Luxembourg Schuman	http://www.hers.be
Bruxelles	Haute Ecole de Bruxelles	http://www.heb.be
Bruxelles	Haute Ecole de la Communauté française Paul-Henri Spaak	http://www.isib.be/spaak
Bruxelles	Haute Ecole Léonard de Vinci	http://www.vinci.be
Liège	Haute Ecole Charlemagne	http://www.hecharlemagne.be
Liège	Haute Ecole de la Province de Liège Rennequin Sualem	http://www.prov-liege.be/hers
Mons	Haute Ecole de la Communauté française du Hainaut	http://www.hecfh.be
Mons	Haute Ecole Roi Baudouin	http://www.herb.be

BG: България (Bulgaria)

City	Name of the institution (national language)	Name of the institution (English)	http address
Blagoevgrad	Югозападен университет "Неофит Рилски"	South-West University "Neofit Rilski"	http://www.swu.bg
Gabrovo	Технически университет – Габрово	Technical University – Gabrovo	http://www.tugab.bg
Plovdiv	Пловдивски университет "Паисий Хилендарски"	"Paisij Hilendarski" University of Plovdiv	http://www.uni-plovdiv.bg
Rousse	Русенски университет "Ангел Кънчев"	University of Rousse "Angel Kantchev"	http://www.ru.acad.bg
Sofia	Софийски университет "Климент Охридски"	University of Sofia "Sv.Kliment Ohridski"	http://www.uni-sofia.bg
Sofia	Технически университет-София	Technical University – Sofia	http:// www.tu-sofia.bg
Sofia	Минногеоложки университет - Сопфия	University of Mining and Geology - Sofia	http://www.mgu.bg
Sofia	Химикотехнологичен и металургичен университет	Chemical Technology & Metallurgy University - Sofia	http://www.uctm.edu
Sofia	Висше транспортно училище "Тодор Каблешков"	Higher School of Transport "Todor Kableshkov", Sofia	http://www.vtu.acad.bg
Shoumen	Шуменски университет "Еп. Константин Преславски"	University of Shoumen "Ep.Konstantin Preslavski"	http://www.shu-bg.net
Varna	Технически университет Варна	Technical University – Varna	http://www.tu-varna.bg
Varna	Икономически университет	University of Economics, Varna	http://www.ue-varna.bg
Veliko Tarnovo	Великотърновски университет "Кирил и Методий"	"Cyril i Methodius" University of Veliko Tarnovo	http://www.uni-vt.bg

CZ: Česká republika (Czech Rep.)

City	Name of the institution (national language)	Name of the institution (English)	http address
Brno	Vysoké učení technické v Brně	Brno University of Technology	*Fakulta elektrotechniky a komunikačních technologií* (Faculty of Electrical Engineering and Communication) http://www.feec.vutbr.cz
			Fakulta informačních technologií (Faculty of Information Technology) http://www.fit.vutbr.cz
Brno	Masarykova univerzita v Brně	Masaryk University Brno	*Fakulta informatiky* (Faculty of Informatics) http://www.fi.muni.cz
Ostrava	Vysoká škola báňská – Technická univerzita Ostrava	VSB – Technical University of Ostrava	*Fakulta elektrotechniky a informatiky* (Faculty of Electrical Engineering and Informatics) http://www.vsb.cz/en/vitejte_ewel.htm
Pardubice	Univerzita Pardubice	University of Pardubice	*Ústav informatiky* (Department of Informatics) http://international.upce.cz/index_eng.html
Plzeň	Západočeská univerzita Plzeň	University of West Bohemia Pilsen	*Fakulta elektrotechnická* (Faculty of Electrical Engineering) http://www.fel.zcu.cz/index-e.html
Praha	České vysoké učení technické v Praze	Czech Technical University in Prague	*Fakulta elektrotechnická* (Faculty of Electrical Engineering) http://www.cvut.cz/fee/index.html

DE: Deutschland (Germany)

Universitäten (Universities)

Länder (federal states)	City	Name of the institution	http address
Universitäten			
Nordrhein-Westfalen	Aachen	Rheinisch-WestfälischeTechnische Universität	http://www.rwth-aachen.de/
Bayern	Bamberg	Universität Bamberg	http://www.uni-bamberg.de/
Berlin	Berlin	Freie Universität Berlin	http://www.fu-berlin.de/
Berlin	Berlin	Humboldt-Universität	http://www.hu-berlin.de/
Nordrhein-Westfalen	Berlin	Technische Universität Berlin	http://www.tu-berlin.de/
Nordrhein-Westfalen	Bielefeld	University of Bielefeld	http://www.uni-bielefeld.de/
Nordrhein-Westfalen	Bochum	Universität	http://www.ruhr-uni-bochum.de/
Nordrhein-Westfalen	Bonn	Rheinische Friedrich-Wilhelms-Universität	http://www.uni-bonn.de/
Niedersachsen	Braunschweig	Technische Universität Carolo-Wilhelming zu Braunschweig	
Bremen	Bremen	Universität Bremen	http://www.stellen.uni-bremen.de/
Baden-Württemberg	Bruchsal	International University in Germany	http://www.i-u.de/
Sachsen	Chemnitz - Zwickau	Technische Universität Chemnitz-Zwickau	http://www.tu-chemnitz.de/
Sachsen-Anhalt	Clausthal	Technische Universität Clausthal	http://www.tu-clausthal.de/
Brandenburg	Cottbus	Brandenburgische Technische Universität	http://www.tu-cottbus.de/
Nordrhein-Westfalen	Dortmund	Universität Dortmund	http://www.uni-dortmund.de/
Sachsen	Dresden	Technische Universität Dresden	http://www.tu-dresden.de/
Nordrhein-Westfalen	Duisburg	Gerhard-Mercator-Universität -Gesamthochschule -	http://www.uni-duisburg.de/
Nordrhein-Westfalen	Düsseldorf	Heinrich-Heine-Universität Düsseldorf	http://www.uni-duesseldorf.de/
Bayern	Erlangen	Friedrich-Alexander Universität, Erlangen-Nürnberg	http://www.uni-erlangen.de/
Hessen	Frankfurt am Main	Universität Frankfurt am Main	http://www.uni-frankfurt.de/
Sachsen-Anhalt	Freiberg	Technische Universität Bergakademie	http://www.tu-freiberg.de/
Baden-Württemberg	Freiburg im Breisgau	Albert-Ludwigs-Universität-Freiburg	http://www.uni-freiburg.de/
Niedersachsen	Göttingen	Georg-August-Universität, Göttingen	http://www.uni-goettingen.de/
Mecklenburg-Vorpommern	Greifswald	Ernst-Moritz-Arndt-Universität	http://www.uni-greifswald.de/
Nordrhein-Westfalen	Hagen	FernUniversität -Gesamthochschule	http://www.informatik.fernuni-hagen.de/
Sachsen-Anhalt	Halle-Wittenberg	Martin Luther Universität Halle-Wittenberg	http://www.verwaltung.uni-halle.de/
Hamburg	Hamburg	Technische Universität, Hamburg-Harburg	http://www.tu-harburg.de/

Länder (federal states)	City	Name of the institution	http address
Hamburg	Hamburg	Universität Hamburg	http://www.verwaltung.uni-hamburg.de/
Niedersachsen	Hannover	Universität	http://www.uni-hannover.de/
Baden-Württemberg	Heidelberg	Ruprecht-Karls-Universität, Heidelberg	http://www.uni-heidelberg.de/
Thüringen	Ilmenau	Technische Universität Ilmenau	http://www.tu-ilmenau.de/
Thüringen	Jena	Friedrich Schiller Universität, Jena	http://www2.uni-jena.de/
Rheinland-Pfalz	Kaiserslautern	Universität Kaiserslautern	http://www.uni-kl.de/
Baden-Württemberg	Karlsruhe	Badische Landesbibliothek	
Baden-Württemberg	Karlsruhe	Universität Karlsruhe	http://www.verwaltung.uni-karlsruhe.de/
Hessen	Kassel	Universität-Gesamthochschule	http://www.uni-kassel.de/
Schleswig-Holstein	Kiel	Christian-Albrechts-Universität zu Kiel	http://www.uni-kiel.de/
Rheinland_Pfalz	Koblenz-Landau	Universität	http://www.uni-koblenz-landau.de/
Nordrhein-Westfalen	Köln	Universität zu Köln	http://www.uni-koeln.de/
Baden-Württemberg	Konstanz	Universität zu Konstanz	http://www.uni-konstanz.de/
Sachsen	Leipzig	Universität zu Leipzig	http://www.uni-leipzig.de/
Schleswig-Holstein	Lübeck	Medizinische Universität	www.mu-luebeck.de/
Sachsen-Anhalt	Magdeburg	Otto von Guericke Universität, Magdeburg	http://www.uni-magdeburg.de/
Baden-Württemberg	Mannheim	Universität zu Mannheim	http://www.uni-mannheim.de/
Hessen	Marburg	Philipps-Universität	http://www.uni-marburg.de/
Bayern	München	Ludwig Maximilians Universität, München	http://www.uni-muenchen.de/
Bayern	München	Technische Universität München	http://www.tu-muenchen.de/
Bayern	München	Universität der Bundeswehr München	http://www.unibw-muenchen.de/
Bayern	Münster	Universität Münster	http://www.uni-muenster.de/
Hessen	Oestrich-Winkel	EBS : European Business School	http://www.ebs.de/ebs/home.php
Niedersachsen	Osnabrück	Universität Osnabrück	http://www.uni-osnabrueck.de/
Nordrhein-Westfalen	Paderborn	Universität-Gesamthochschule	http://www-zv.uni-paderborn.de/
Bayern	Passau	Universität, Passau	http://www.uni-passau.de/
Brandenburg	Potsdam	Universität Potsdam	http://www.uni-potsdam.de/
Bayern	Regensburg	Universität Regensburg	http://www.uni-regensburg.de/
Mecklenburg-Vorpommern	Rostock	Universität Rostock	http://www.uni-rostock.de/
Saarland	Saarbrücken	Universität des Saarlandes	http://www.uni-saarland.de/
Nordrhein-Westfalen	Siegen	Universität Gesamthochschule Siegen	http://www.uni-siegen.de/
Baden-Württemberg	Stuttgart (see Hohenheim)	Universität Stuttgart	http://www.uni-stuttgart.de/

Rheinland-Pfalz	Trier	Universität Trier	http://www.uni-trier.de/
Baden-Württemberg	Tübingen	Eberhard-Karls-Universität, Tübingen	http://www.uni-tuebingen.de/
Baden-Württemberg	Ulm	Universität Ulm	http://www.uni-ulm.de/
Nordrhein-Westfalen	Wuppertal	Bergische Universität-Gesamthochschule (BUGH)	http://www.verwaltung.uni-wuppertal.de/
Bayern	Würzburg	Bayerische Julius-Maximilians-Universität	http://www.uni-wuerzburg.de/

Fachochschulen (Universities of applied sciences)

Länder (federal states)	City	Name of the institution	http address
Fachhochschulen			
Nordrhein-Westfalen	Aachen	Fachhochschule Aachen	http://www.fh-aachen.de/
Baden-Württemberg	Aalen	Fachhochschule Aalen	http://www.fh-aalen.de/
Bayern	Amberg	Fachhochschule Amberg	http://www.fh-amberg.de/
Sachsen-Anhalt	Anhalt	Fachhochschule Anhalt	http://www.vt-fh.de/hsliste/koethen.htm
Bayern	Ansbach	Fachhochschule Ansbach	http://www.fh-ansbach.de/
Bayern	Augsburg	Fachhochschule Augsburg	http://www.fh-augsburg.de/
Berlin	Berlin	Europäische Wirtschafthochschule	
Berlin	Berlin	Evangelische Fachhochschule	http://www.evfh-berlin.de
Berlin	Berlin	Fachhochschule für Technik und Wirtschaft Berlin	http://www.fhtw-berlin.de/
Berlin	Berlin	Fachhochschule für Wirtschaft	http://www.fhw-berlin.de/
Berlin	Berlin	Katholische Fachhochschule	http://www.kfb-berlin.de/
Berlin	Berlin	Technische Fachhochschule	http://www.tfh-berlin.de/
Baden-Württemberg	Biberach	Fachhochschule	
Nordrhein-Westfalen	Bielefeld	Fachhochschule	http://presse.fh-bielefeld.de/
Nordrhein-Westfalen	Bochum	Evangelische Fachhochschule	
Nordrhein-Westfalen	Bochum	Fachhochschule	
Nordrhein-Westfalen	Bochum	Fachhochschule Bergbau	
Nordrhein-Westfalen	Bonn	Fachhochschule für das öffentliche Bibiothekswesen	
Brandenburg	Brandenburg	Fachhochschule	http://www.fh-brandenburg.de/
Niedersachsen	Braunschweig	Fachhochschule Braunschweig/Wolfenbuettel	http://www.fh-wolfenbuettel.de/
Bremen	Bremen	Fachhochschule	http://www.hs-bremen.de/
Bremen	Bremerhaven	Fachhochschule	
Sachsen-Anhalt	Clausthal	Fachhochschule Coburg	
Bayern	Coburg	Fachhochschule	
Hessen	Darmstadt	Evangelische Fachhochschule	
Hessen	Darmstadt	Fachhochschule Darmstadt	http://www.fh-darmstadt.de/
Hessen	Darmstadt	Institute for Nuclear Physics Darmstadt	
Hessen	Darmstadt	Technische Hochschule, Darmstadt (THD)	
Hessen	Dieburg	Fachhochschule der Deutschen Bundespost Telekom	
Nordrhein-Westfalen	Dortmund	Fachhochschule Dortmund	http://www.fh-dortmund.de/
Sachsen	Dresden	Hochschule für Technik und Wirtschaft (FH)	http://www.htw-dresden.de/
Nordrhein-Westfalen	Düsseldorf	Fachhochschule	http://www.fh-duesseldorf.de/
Brandenburg	Eberswalde	Fachhochschule	
Thüringen	Erfurt	Fachhochschule	http://www.fh-erfurt.de/
Baden-Württemberg	Esslingen	Fachhochschule für Technik (FHTE)	http://www.fht-esslingen.de/
Schleswig-Holstein	Flensburg	Fachhochschule Flensburg	
Hessen	Frankfurt am Main	Fachhochschule Frankfurt am Main	http://www.fh-frankfurt.de/
Hessen	Fulda	Fachhochschule Fulda	
Baden-Württemberg	Furtwangen	Fachhochschule Furtwangen	

Länder (federal states)	City	Name of the institution	http address
Nordrhein-Westfalen	Gelsenkirchen	Fachhochschule Gelsenkirchen	http://www.fh-gelsenkirchen.de/
Hessen	Gießen	Fachhochschule Gießen - Friedberg	http://www.tzm-giessen.de/
Hamburg	Hamburg	Fachhochschule Fachhochschule Hamburg	
Niedersachsen	Hannover	Evangelische Fachhochschule	
Niedersachsen	Hannover	Fachhochschule Hannover	
Sachsen-Anhalt	Harz	Fachhochschule	
Baden-Württemberg	Heilbronn	Fachhochschule Heilbronn	
Niedersachsen	Hildesheim	Fachhochschule Hildesheim/Holzminden	http://www.fh-hildesheim.de/
Nordrhein-Westfalen	Iserlohn	Märkische Fachhochschule	http://www.mfh-iserlohn.de/
Thüringen	Jena	Fachhochschule	http://www.fh-jena.de/
Nordrhein-Westfalen	Jülich	Fachhochschule Aachen Abt. Jülich	
Baden-Württemberg	Karlsruhe	Fachhochschule Karlsruhe	http://www.fh-karlsruhe.de/
Bayern	Kempten	Fachhochschule	http://www.fh-kempten.de/
Schleswig-Holstein	Kiel	Fachhochschule Kiel	
Rheinland_Pfalz	Koblenz-Landau	Fachhochschule Rheinland-Pfalz	http://www.fh-koblenz.de/
Nordrhein-Westfalen	Köln	Fachhochschule Köln	http://www.fh-koeln.de/
Nordrhein-Westfalen	Köln	Katholische Fachhochschule	
Nordrhein-Westfalen	Köln	Rheinische Fachhochschule	
Baden-Württemberg	Konstanz	Fachhochschule	http://www.fh-konstanz.de/
Baden-Württemberg	Konstanz	Institut für Kommunikationsdesign an der Fachhochschule Konstanz	
Nordrhein-Westfalen	Krefeld	Fachhochschule Niederrhein	
Bayern	Landshut	Fachhochschule	
Brandenburg	Lausitz	Fachhochschule	
Sachsen	Leipzig	Fachhochschule der Deutschen Bundepost Telekom	
Sachsen	Leipzig	HTWK - Hochschule für Technik, Wirtschaft und Kultur (FH)	
Nordrhein-Westfalen	Lippe	Fachhochschule	
Schleswig-Holstein	Lübeck	Fachhochschule Lübeck	http://www.fh-luebeck.de/
Baden-Württemberg	Ludwigsburg	Fachhochschule für öffentliche Verwaltung	
Rheinland_Pfalz	Ludwigshafen	Evangelische Fachhochschule	
Niedersachsen	Lüneburg	Fachhochschule (FH) Nordostniedersachsen	
Sachsen-Anhalt	Magdeburg	Hochfachschule	
Rheinland_Pfalz	Mainz	Fachhochschule Rheinland-Pfalz	http://www.fh-mainz.de/
Baden-Württemberg	Mannheim	Fachhochschule Mannheim - Hochschule für Technik und Gestaltung	
Sachsen-Anhalt	Merseburg	Fachhochschule Merseburg	
Sachsen	Mittweida	Hochschule für Technik und Wirtschaft (FH)	
Bayern	München	Fachhochschule München	http://www.fh-muenchen.de/
Bayern	München	Katholische Stiftungsfachhochschule	
Nordrhein-Westfalen	Münster	Fachhochschule Münster	http://www.fh-muenster.de/
Mecklenburg-Vorpommern	Neubrandenburg	Fachhochschule	http://www.fh-nb.de/

Länder (federal states)	City	Name of the institution	http address
Bayern	Nürnberg	Evangelische Stiftungsfachhochschule	http://www.evfh-nuernberg.de/
Bayern	Nürnberg	Georg-Simon-Ohm Fachhochschule	http://www.fh-nuernberg.de/
Baden-Württemberg	Nürtingen	Fachhochschule	http://www.fh-nuertingen.de/
Baden-Württemberg	Offenburg	Fachschule Offenburg	http://www.fh-offenburg.de/
Niedersachsen	Oldenburg	Fachschule Oldenburg	http://www.fh-oow.de/
Niedersachsen	Osnabrück	Fachhochschule	http://www.fh-osnabrueck.de/
Niedersachsen	Osnabrück	Katholische Fachhochschule Norddeutschland	
Niedersachsen	Ostfriesland	Fachhochschule	http://www.fh-oow.de/
Baden-Württemberg	Pforzheim	Fachhochschule für Gestaltung, Technik und Wirtschaft	
Bayern	Regensburg	Fachhochschule Regensburg	http://www.fh-regensburg.de/
Baden-Württemberg	Reutlingen	Fachhochschule Reutlingen	http://www.fh-reutlingen.de/
Bayern	Rosenheim	Fachhochschule Rosenheim	http://www.fh-rosenheim.de/
Saarland	Saarbrücken	Hochschule für Technik und Wirtschaft des Saarlandes (HTWdS)	http://www.htw-saarland.de/
Brandenburg	Senftenberg	Fachhochschule Lausitz	
Baden-Württemberg	Sigmaringen	Fachhochschule Albstadt-Sigmaringen	
Rheinland-Pfalz	Speyer	Hochschule für Verwaltungwissenschaften Speyer	http://www.hfv-speyer.de/
Baden-Württemberg	Stuttgart (see Hohenheim)	Fachhochschule für Bibliothekwesen	
Rheinland_Pfalz	Trier	Fachhochschule Rheinland-Pfalz	
Baden-Württemberg	Ulm	Fachhochschule Ulm	
Bayern	Weihenstephan	Fachhochschule Weihenstephan	
Baden-Württemberg	Weingarten	Fachhochschule Ravensburg-Weingarten	http://www.fh-weingarten.de/
Sachsen-Anhalt	Wernigerode	Fachhochschule Harz	http://www.fh-harz.de/
Hessen	Wiesbaden	Fachhochschule Wiesbaden	
Brandenburg	Wildau	Technische Fachhochschule Wildau	
Niedersachsen	Wilhelmshaven	Fachhochschule Wilhelmshaven	
Mecklenburg-Vorpommern	Wismar	Hochschule - Fachhochschule für Technik Wirtschaft und Gestaltung	
Niedersachsen	Wolfenbüttel	Fachhochschule	
Rheinland_Pfalz	Worms	Fachhochschule Worms (Rheinland Pfalz)	http://www.fh-worms.de/
Bayern	Würzburg	Fachhochschule (FH) Würzburg-Schweinfurt-Aschaffenburg	

EE: Eesti (Estonia)

The list of universities and diplomas can be obtained easily from the Information Portal of Estonian Higher Education and Research: http://www.smartestonia.ee/

City	Name of the institution (national language)	Name of the institution (English)	http address
Universities			
Tallinn	TTÜ, Tallinna Tehnikaülikool	Tallinn University of Technology	http://www.ttu.ee/
Tallinn	TLÜ, Tallinna Ülikool	Tallinn University	http://www.tlu.ee/
Tartu	TÜ, Tartu Ülikool	Tartu University	http://www.ut.ee/
State Colleges			
Tallinn	ITK, Eesti Infotehnoloogia Kolledž	Estonian Information Technology College	http://www.itcollege.ee/
Talinn	Tallinna Polütehnikum	Tallinn Polytechnic School	http://www.tpt.edu.ee/

ES: España (Spain)

The list of universities and diplomas can be obtained easily from the web of the *Ministerio de Educación, Cultura y Deporte* (Ministry for Education, Culture and Sport) at http://www.mec.es/consejou/oferta/index.html

Region	Name of the institution	http address
ANDALUCÍA	Universidad de ALMERÍA	http://www.ual.es
ANDALUCÍA	Universidad de CÁDIZ	http://www.uca.es
ANDALUCÍA	Universidad de CÓRDOBA	http://www.uco.es
ANDALUCÍA	Universidad de GRANADA	http://www.ugr.es
ANDALUCÍA	Universidad de HUELVA	http://www.uhu.es
ANDALUCÍA	Universidad de JAÉN	http://www.ujaen.es
ANDALUCÍA	Universidad de MÁLAGA	http://www.uma.es
ANDALUCÍA	Universidad de SEVILLA	http://www.us.es
ARAGÓN	Universidad de ZARAGOZA	http://www.unizar.es
ASTURIAS	Universidad de OVIEDO	http://www.uniovi.es
BALEARS, ILLES	Universitat de les ILLES BALEARS	http://www.uib.es
CANARIAS	Universidad de LAS PALMAS DE GRAN CANARIA	http://www.ulpgc.es
CANARIAS	Universidad de LA LAGUNA	http://www.ull.es
CANTABRIA	Universidad de CANTABRIA	http://www.unican.es
CASTILLA Y LEÓN	Universidad CATÓLICA DE ÁVILA	http://www.ucavila.es/
CASTILLA Y LEÓN	Universidad de BURGOS	http://www.ubu.es
CASTILLA Y LEÓN	Universidad de LEÓN	http://www.unileon.es
CASTILLA Y LEÓN	Universidad PONTIFICIA DE SALAMANCA	http://www.upsa.es
CASTILLA Y LEÓN	Universidad de SALAMANCA	http://www.usal.es
CASTILLA Y LEÓN	Universidad de VALLADOLID	http://www.uva.es
CASTILLA-LA MANCHA	Universidad de CASTILLA-LA MANCHA	http://www.uclm.es
CATALUÑA	Universidad AUTÓNOMA DE BARCELONA	http://www.uab.es
CATALUÑA	Universidad de BARCELONA	http://www.ub.es
CATALUÑA	Universitat OBERTA DE CATALUNYA	http://www.uoc.es/
CATALUÑA	Universidad POLITÉCNICA DE CATALUNYA	http://www.upc.es
CATALUÑA	Universitat POMPEU FABRA	http://www.upf.es
CATALUÑA	Universitat RAMÓN LLULL	http://www.url.es/
CATALUÑA	Universitat de VIC	http://www.uvic.es/
CATALUÑA	Universitat de GIRONA	http://www.udg.es
CATALUÑA	Universitat de LLEIDA	http://www.udl.es
CATALUÑA	Universitat ROVIRA I VIRGILI	http://www.urv.es
EXTREMADURA	Universidad de EXTREMADURA	http://www.unex.es
GALICIA	Universidade da CORUÑA	http://www.udc.es
GALICIA	Universidade de VIGO	http://www.uvigo.es
LA RIOJA	Universidad de LA RIOJA	http://www.unirioja.es
MADRID	Universidad de ALCALÁ	http://www.uah.es
MADRID	Universidad ALFONSO X EL SABIO	http://www.uax.es/
MADRID	Universidad ANTONIO DE NEBRIJA	http://www.nebrija.es
MADRID	Universidad AUTÓNOMA DE MADRID	http://www.uam.es
MADRID	Universidad CAMILO JOSÉ CELA	http://www.ucjc.edu
MADRID	Universidad CARLOS III DE MADRID	http://www.uc3m.es

Region	Name of the institution	http address
MADRID	Universidad COMPLUTENSE DE MADRID	http://www.ucm.es
MADRID	Universidad EUROPEA DE MADRID	http://www.uem.es
MADRID	Universidad FRANCISCO DE VITORIA	http://www.mec.es/consejou/oferta/univer/ufv.html
MADRID	Universidad POLITÉCNICA DE MADRID	http://www.upm.es
MADRID	Universidad PONTIFICIA COMILLAS	http://www.mec.es/consejou/oferta/univer/upco.html
MADRID	Universidad REY JUAN CARLOS	http://www.urjc.es
MADRID	Universidad SAN PABLO C.E.U.	http://www.ceu.es
MADRID	Universidad NACIONAL DE EDUCACIÓN A DISTANCIA	http://www.uned.es
MURCIA	Universidad CATÓLICA SAN ANTONIO	http://www.ucam.edu
MURCIA	Universidad de MURCIA	http://www.um.es
MURCIA	Universidad POLITÉCNICA DE CARTAGENA	http://www.upct.es
NAVARRA	Universidad de NAVARRA	http://www.unav.es
NAVARRA	Universidad PÚBLICA DE NAVARRA	http://www.unavarra.es
PAÍS VASCO	MONDRAGÓN UNIBERTSITATEA	http://www.muni.es
PAÍS VASCO	Universidad de DEUSTO	http://www.deusto.es
PAÍS VASCO	Universidad del PAÍS VASCO/EUSKAL HERRIKO UNIBERTSITATEA	http://www.ehu.es
VALENCIANA, COMUNIDAD	Universidad de ALICANTE	http://www.ua.es
VALENCIANA, COMUNIDAD	Universidad MIGUEL HERNÁNDEZ	http://www.umh.es
VALENCIANA, COMUNIDAD	Universitat JAUME I DE CASTELLÓ	http://www.uji.es
VALENCIANA, COMUNIDAD	Universidad CARDENAL HERRERA-CEU	http://www.ceu.es
VALENCIANA, COMUNIDAD	Universidad POLITÉCNICA DE VALENCIA	http://www.upv.es
VALENCIANA, COMUNIDAD	Universitat de VALENCIA ESTUDI GENERAL	http://www.uv.es

FI: Suomi/Finland

Yliopistot (Universities)

City	Name of the institution	http address
Espoo	**Teknillinen korkeakoulu** (Helsinki University of Technology)	http://www.hut.fi/English
Lappeenranta	**Lappeenrannan teknillinen yliopisto** (Lappeenranta Univ. of Techn.)	http://www.lut.fi/english/
Oulu	**Oulun yliopisto** (University of Oulu)	http://www.ttk.oulu.fi/English/
Tampere	**Tampereen teknillinen yliopisto** (Tampere Univ. of Techn.)	http://www.tut.fi/public
Turku/Åbo	**Åbo Akademi** (ÅA University) (Swedish-language University)	http://www.abo.fi/aa/engelska/

AMK/YH (Polytechnics)

City	Name of the institution	http address
Espoo/Esbo	Arcada - Nylands svenska YH	http://www.arcadi.fi
Espoo	Espoon - Vantaan teknillinen AMK	http://www.evitech.fi/
Lappeenranta, Imatra	Etelä-Karjalan AMK	http://www.scp.fi
Helsinki	Helsingin AMK	http://www.stadia.fi/
Hämeenlinna	Hämeen AMK	http://www.hamk.fi
Jyväskylä	Jyväskylän AMK	http://www.jypoly.fi
Kajaani	Kajaanin AMK	http://www.kajak.fi
Kemi, Tornio	Kemi-Tornion AMK	http://www.tokem.fi
Kokkola	Keski-Pohjanmaan AMK	
Kotka	Kymenlaakson AMK	http://www.kyamk.fi
Lahti	Lahden AMK	http://www.lamk.fi
Mikkeli	Mikkelin AMK	http://www.mikkeliamk.fi
Oulu	Oulun seudun AMK	http://www.oamk.fi
Joensuu	Pohjois-Karjalan AMK	http://www.ncp.fi
Kuopio	Pohjois-Savon AMK	http://www.pspt.fi
Rovaniemi	Rovaniemen AMK	
Pori	Satakunnan AMK	http://www.spt.fi
Seinäjoki	Seinäjoen AMK	http://www.seamk.fi
Vaasa/Vasa	Svenska YH	http://www.syh.fi/
Tampere	Tampereen AMK	http://www.tpu.fi
Turku	Turun AMK	http://www.turkuamk.fi
Vaasa	Vaasan AMK	http://www.puv.fi
Tammisaari/ Ekenäs	YH Sydväst	http://www.sydvast.fi

FR: France

REGION	University	http address
ALSACE	Université de Mulhouse (Université de Haute-Alsace)	http://www.univ-mulhouse.fr/
	Université Louis Pasteur Strasbourg 1	http://www-ulp.u-strasbg.fr/
AQUITAINE	Université de Bordeaux 1	http://www.u-bordeaux1.fr/
	Université de Pau et des Pays de l'Adour (UPPA)	http://www.univ-pau.fr
AUVERGNE	Université Blaise Pascal, Clermont II	http://www.univ-bpclermont.fr
BOURGOGNE	Université de Bourgogne, Dijon	http://www.u-bourgogne.fr
BRETAGNE	UBO, Université de Bretagne Occidentale, Brest	http://www.univ-brest.fr
	UBS, Université de Bretagne Sud, Lorient, Vannes	http://www.univ-ubs.fr
	Université Rennes I	http://eea.univ-rennes1.fr
CENTRE	Université d'Orléans	http://www.univ-orleans.fr
	Université de Tours François Rabelais	http://www.univ-tours.fr/
CHAMPAGNE-ARDENNE	Université de Reims Champagne-Ardenne	http://www.univ-reims.fr
	Université de Technologie de Troyes (UTT)	http://www.utt.fr/
CORSE	Université Pasquale Paoli, Corse	http://www.univ-corse.fr
FRANCHE-COMTE	Université de Franche-Comté	http://www.univ-fcomte.fr/
	Université de Technologie de Belfort-Montbéliard (UTBM)	http://www.utbm.fr/
ILE DE FRANCE	Université René Descartes (Paris V)	http://www.univ-paris5.fr
	Université Pierre-et-Marie-Curie (Paris VI)	http://wwwadm.admp6.jussieu.fr
	Université Denis-Diderot (Paris VII)	http://www.sigu7.jussieu.fr
	Université Paris X-Nanterre-la Défense	http://www.u-paris10.fr
	Université Paris-Sud (Paris XI)	http://www.eea.u-psud.fr
	Université Paris XII – Val de Marne	http://www.univ-paris12.fr
	Université Paris XIII	http://www.univ-paris13.fr
	Université de Cergy-Pontoise	http://www.u-cergy.fr
	Université de Versailles Saint Quentin en Yvelines	http://www.uvsq.fr
	Université de Marne-la-Vallée	http://www.univ-mlv.fr/
	Université d'Evry Val d'Essonne	http://www.univ-evry.fr
LANGUEDOC-ROUSSILLON	Université Montpellier 2	http://www.univ-montp2.fr
	Université de Perpignan	http://www.univ-perp.fr
LIMOUSIN	Université de Limoges	http://www.unilim.fr

REGION	University	http address
LORRAINE	Université de Metz	http://www.scifa.univ-metz.fr/
	Université Henri Poincaré, Nancy 1	http://www.uhp-nancy.fr
	Institut National Polytechnique de Lorraine (INPL)	http://www.inpl-nancy.fr/
MIDI-PYRENEES	Université Paul Sabatier (Toulouse 3)	http://www.eea.ups-tlse.fr
	Institut National Polytechnique de Toulouse	http://www.inp-toulouse.fr/
	INSA-Toulouse - Institut National des Sciences Appliquées de Toulouse	http://www.insa-tlse.fr/
NORD PAS DE CALAIS	Université d'Artois,	http://www.univ-artois.fr/
	Université du Littoral Côte d'Opale à Calais et Boulogne	http://www.univ-littoral.fr/
	USTL : Université des Sciences et Technologies de Lille I (Flandres-Artois)	http://ustl.univ-lille1.fr/
	Université de Valenciennes et du Hainaut-Cambrésis (UVHC)	http://www.univ-valenciennes.fr/
BASSE-NORMANDIE	Université de Caen Basse-Normandie	http://www.unicaen.fr/
HAUTE-NORMANDIE	Université du Havre	http://www.univ-lehavre.fr/
	Université de Rouen	http://www.univ-rouen.fr/
	INSA-Rouen - Institut national des sciences appliquées de Rouen;Mont-Saint Aignant	http://www.insa-rouen.fr/
PAYS DE LA LOIRE	Université d'Angers	http://www.univ-angers.fr
	Université du Maine, Le Mans	http://www.univ-lemans.fr
	Université de Nantes	http://www.sciences.univ-nantes.fr/
PICARDIE	Université de Picardie - Jules Verne	http://www.u-picardie.fr/
	UTC - Université de Technologie de Compiègne	http://www.utc.fr/
POITOU-CHARENTE	Université de La Rochelle	http://www.univ-lr.fr/
	Université de Poitiers	http://www.univ-poitiers.fr
PROVENCE-ALPES-COTE D'AZUR	Université de la Méditerranée, Aix-Marseille-II	http://www.mediterranee.univ-mrs.fr/
	Université d'Avignon et des Pays du Vaucluse	http://www.univ-avignon.fr/
	Université d'Aix- Marseille 3	http://www.univ.u-3mrs.fr/
	UNSA : Université de Nice Sophia-Antipolis	http://www.unice.fr/fiches-ens/
	Université de Toulon et du Var	http://www.univ-tln.fr
RHONE-ALPES	Université de Savoie à Annecy	http://www.univ-savoie.fr
	Université Joseph Fourier; Grenoble 1	http://www.ujf-grenoble.fr/
	Université Claude Bernard (Lyon I)	http://www.univ-lyon1.fr/
	Université Jean Monnet de Saint-Etienne	http://www.univ-st-etienne.fr/monnet/univie4.html
	Université Pierre Mendès-France Grenoble II	http://www.upmf-grenoble.fr/upmf/
	INPG: Institut National Polytechnique de Grenoble	http://www.inpg.fr/

FR: France

	INSA l'Institut National des Sciences Appliquées	http://www.insa-lyon.fr/
Overseas dependencies	Université Antilles-Guyane	http://www.univ-ag.fr/
	Université de La Réunion	http://www.univ-reunion.fr/
	Université française du Pacifique	

GR: Ελλάς (Greece)

Universities

Town	Institute	http address
Athens	National & Capodistrian University of Athens	http://www.uoa.gr/
Athens	National Technical University of Athens	http://www.ntua.gr/
Thessaloniki	Aristotle university of Thessaloniki	http://www.auth.gr/
	Ionian University	http://www.ionio.gr/
Rethimnon, Heraklion	University of Crete	http://www.uoc.gr/
	University of West Macedonia	http://www.uowm.gr/
Patra	University of Patras	http://www.upatras.gr/
Ioannina	University of Ioannina	http://www.uoi.gr/
Xanthi, Alexandroupoli, Komotini	Democritus University of Thrace	http://www.duth.gr/
Chania	Technical University of Crete	http://www.tuc.gr/
Lesvos, Chios, Samos, Syros and Rhodes	Aegean University	http://www.aegean.gr/
Volos, Larissa	University of Thessaly	http://www.uth.gr/
Thessaloniki	University of Macedonia	http://www.uom.gr/

Technological Educational Institutes

Town	Institute	http address
Athens	Technological Educational Institute of Athens	http://www.teiath.gr/
Piraeus	Technological Educational Institute of Piraeus	http://www.teipir.gr/
Arta	Technological Educational Institute of Epirus	http://www.teiep.gr/
Thessaloniki	Technological Educational Institute of Thessalonica	http://www.teithe.gr/
Kavala	Technological Educational Institute of Kavala	http://www.teikav.edu.gr/
Kozani	Technological Educational Institute of Western Macedonia	http://www.teikoz.gr/
Lamia	Technological Educational Institute of Lamia	http://www.teilam.gr/
Larissa	Technological Educational Institute of Larissa	http://www.teilar.gr/
Chalkida	Technological Educational Institute of Chalkida	http://www.teihal.gr/
Messolonghi	Technological Educational Institute of Mesologgi	http://www.teimes.gr/
Patra	Technological Educational Institute of Patra	http://www.teipat.gr/
Serres	Technological Educational Institute of Serres	http://www.teiser.gr/

HU: Magyarország (Hungary)

State Universities

City	Hungarian name	English name	Legend	http address
Budapest	Budapesti Mûszaki és Gazdaságtudományi Egyetem	Budapest University of Technology and Economics	BME	http://www.bme.hu/en/organization/faculties/electrical/index.html
Budapest	Eötvös Loránd Tudományegyetem	Eötvös Loránd University	ELTE (ELTE-TTK)	http://teo.elte.hu/fs/
Debrecen	Debreceni Egyetem	University of Debrecen	DE (DE-MFK/TTK)	http://www.klte.hu/eng.htm
Miskolc	Miskolci Egyetem	University of Miskolc	ME (ME-GÉK)	http://www.uni-miskolc.hu/e_index.php
Pécs	Pécsi Tudományegyetem	University of Pécs	PTE (PTE-PMMFK)	http://www.ki.pte.hu/eng/
Sopron	Nyugat-Magyarországi Egyetem	University of Sopron	NYME	http://www.nyme.hu/
Veszprém	Veszprémi Egyetem	University of Veszprém	VE (VE-MK)	http://www.vein.hu/other_lang/english/english.html

Colleges

City	Hungarian name	English name	Legend	http address
Budapest	Budapesti Műszaki Főiskola	Budapest Polytechnic	BMF	http://www.bmf.hu/
Budapest	Gábor Dénes Főiskola	Gábor Dénes college	GDF	http://www.gdf-ri.hu/
Budapest	Semmelweis Egyetem	Semmelweis University	SE	http://www.sote.hu/
Budapest	Zrinyi Miklos Nemzetvedelmi Egyetem		ZMNE-BKMFK	http://www.zmne.hu/
Dunaújváros	Dunaújvárosi Főiskola		DF	http://www.poliod.hu/
Eger Eszterházy	Eszterházy Karoly Főiskola	Eszterházy Karoly College	EKF-TTK	http://www.ektf.hu/index.php
Gödöllõ	Szent István Egyetem	Szent István University	SZIE	http://www.szie.hu/
Kaposvár	Kaposvári Egyetem	University of Kaposvár	KE	http://www.kaposvar.pate.hu/
Kecskemét	Kecskeméti Főiskolán		KF-GAMFK	http://www.gamf.hu/
Gyõr	Széchenyi István Egyetem	Széchenyi István University	SZE-MTK	http://www.sze.hu/
Szeged	Szegedi Tudományegyetem	University of Szeged	SZTE	http://www.inf.u-szeged.hu

IE: Éire /Ireland

Universities

Town	Name	http address
Cork	University College Cork	http://www.ucc.ie
Dublin	Dublin City University	http://www.dcu.ie
	University College Dublin	http://www.ucd.ie
	University of Dublin, Trinity College	http://www.tcd.ie
Galway	National University of Ireland, Galway	http://www.nuigalway.ie
Limerick	University of Limerick	http://www.ul.ie
Maynooth	National University of Ireland, Maynooth	http://www.may.ie

Institutes of Technology

Town	Name	http address
Athlone	Athlone Institute of Technology	http://www.ait.ie
Carlow	Institute of Technology Carlow	http://www.itcarlow.ie
Cork	Cork Institute of Technology	http://www.cit.ie
Dublin	Dublin Institute of Technology	http://www.dit.ie
Dundalk	Dundalk Institute of Technology	http://www.dkit.ie
Galway-Mayo	Galway-Mayo Institute of Technology	http://www.gmit.ie
Letterkenny	Letterkenny Institute of Technology	http://www.lyit.ie
Limerick	Limerick Institute of Technology	http://www.lit.ie
Sligo	Institute of Technology Sligo	http://www.itsligo.ie
Tallaght	Institute of Technology Tallaght	http://www.it-tallaght.ie
Tralee	Institute of Technology Tralee	http://www.ittralee.ie
Waterford	Waterford Institute of Technology	http://www.wit.ie
Dublin	Institute of Technology Blanchardson	http://www.itb.ie

IT: Italia (Italy)

University	http addresses
Università degli Studi di ANCONA	http://www.unian.it/
Politecnico di BARI	http://www.poliba.it/
Università degli Studi di BERGAMO	http://www.unibg.it
Università degli Studi di BOLOGNA	http://www.unibo.it
Università degli Studi di BRESCIA	http://www.unibr.it
Università degli Studi di CAGLIARI	http://www.unica.it
Università degli Studi della CALABRIA	http://www.unical.it
Università degli Studi di CASSINO	http://www.unicas.it
Università degli Studi di CATANIA	http://www.unict.it
Università degli Studi "MAGNA GRAECIA" di CATANZARO	http://www.unicz.it
Università degli Studi di FERRARA	http://www.unife.it
Università degli Studi di FIRENZE	http://www.unifi.it
Università degli Studi di GENOVA	http://www.unige.it
Università degli Studi de L'AQUILA	http://www.univaq.it
Università degli Studi di LECCE	http://ww.unile.it
Università degli Studi di MESSINA	http://www.unime.it
Politecnico di MILANO	http://www.polimi.it
Università degli Studi di MODENA e REGGIO EMILIA	http://www.polimi.it
Università degli Studi di NAPOLI "Federico II"	http://www.unimo.it
Seconda Università degli Studi di NAPOLI	http://www.unina.it
Università degli Studi di NAPOLI "Parthenope"	http://www.uninav.it
Università degli Studi di PADOVA	http://www.unipd.it
Università degli Studi di PALERMO	http://www.unipa.it
Università degli Studi di PARMA	http://www.unipr.it
Università degli Studi di PAVIA	http://www.unipv.it
Università degli Studi di PERUGIA	http://www.unipg.it
Università di PISA	http://www.unipi.it
Università degli Studi MEDITERRANEA di REGGIO CALABRIA	http://www.unirc.it
Università degli Studi di ROMA "La Sapienza"	http://www.uniroma1.it
Università degli Studi di ROMA "Tor Vergata"	http://www.uniroma2.it
Università degli Studi ROMA TRE	http://www.uniroma3.it
Università degli Studi di SALERNO	http://www.unisa.it
Università del SANNIO di BENEVENTO	http://www.unisannio.it
Università degli Studi di SIENA	http://www.unisi.it

Politecnico di TORINO	http://www.polito.it
Università degli Studi di TRENTO	http://www.unitr.it
Università degli Studi di TRIESTE	http://www.univ.trieste.it/
Università degli Studi di UDINE	http://www.uniud.it

LT: Lietuva (Lithuania)

Universities

City	Name of the institution (national language)	Name of the institution (English)	http address
Kaunas	Kauno technologijos universitetas (KTU)	Kaunas University of Technology	http://www.ktu.lt
Klaipeda	Klaipedos universitetas (KU)	Klaipeda University	http://www.ku.lt
Siauliai	Siauliu universitetas (SU)	Siauliai University	http://www.su.lt
Vilnius	Vilniaus Gegimino technikos universitetas (VGTU)	Vilnius Gediminas Technical University	http://www.vtu.lt
Vilnius	Vilniaus universitetas (VU)	Vilnius University	http://www.vu.lt

Colleges

City	Name of the institution (national language)	Name of the institution (English)	http address
Kaunas	Kauno technologijos kolegija (KTK)	Kaunas Technical College	http://www.ktk.lt
Klaipeda	Klaipedos kolegija (KK)		http://www.klk.lt
Klaipeda	Klaipedos verslo ir technologijų kolegija (KVTK)		http://www.kazum.lt
Siauliai	Siaulių kolegija (SK)		http://www.siauliukolegija.lt
Vilnius	Vilniaus kolegija (VK)	Vilnius College in Higher Education	http://www.viko.lt

LU: Luxembourg

City	Name of the institution (national language)	Name of the institution (English)	http address
Luxembourg	Institut Supérieur de Technologie de Luxembourg/ Fachhochschule Luxemburg	Luxembourg university of applied sciences	http://www.ist.lu

LV: Latvia

Universities

City	Name of the institution (national language)	Name of the institution (English)	http address
Daugavpils	Daugavpils Universitāte	Daugavpils University	http://www.dpu.lv
Jelgava	Latvijas Lauksaimniecības Universitāte	Latvia University of Agriculture	http://www.llu.lv
Riga	Latvijas Universitāte	University of Latvia	http://www.lu.lv
Riga	Rīgas Stradiņa universitāte	Riga Stradiņš University	http://www.rsu.lv/
Riga	Rīgas Tehniskā universitāte	Riga Technical University	http://www.rtu.lv

Higher Education Institutions

City	Name of the institution (national language)	Name of the institution (English)	http address
Liepaja	Liepājas Pedagoģijas akadēmija	Liepaja Academy of Pedagogy	http://www.lieppa.lv
Rezekne	Rēzeknes Augstskola	Rezekne Higher Education Institution	http://www.ru.lv
Riga	Transporta un sakaru institūts	Transport and Telecommunication Institute	http://www.tsi.lv
Riga	Rīgas Aeronavigācijas institūts	Riga Aeronavigationl Institute	http://www.rai.lv
Valmiera	Vidzemes Augstskola	Vidzeme University College	http://www.va.lv
Ventspils	Ventspils Augstskola	Ventspils University College	http://www.venta.lv
Riga	Latvijas Kultūras akadēmija	Latvian Academy of Culture	http://www.lka.edu.lv
Riga	Latvijas Mākslas akadēmija	Latvian Academy of Art	http://www.lma.lv
Riga	J.Vītola Latvijas Mūzikas akadēmija	Jāzeps Vītols Latvian Academy of Music	http://www.music.lv/academy/lv/
Riga	Latvijas Sporta pedagoģijas akadēmija	Latvian Academy of Sport Education	http://www.lspa.lv

Riga	Latvijas Jūras akadēmija		http://www.aic.lv/ENIC/lat/ENIC/augst_izgl_99/LJA/default.htm
Riga	Rīgas Pedagoģijas un izglītības vadības augstskola	Riga Teacher Training and Educational Management Academy	http://www.rpiva.lv
Riga	Rīgas Ekonomikas augstskola	Stockholm School of Economics in Riga	http://www.sseriga.edu.lv
Riga	Banku augstskola	Banking Institution of Higher Education	http://www.ba.lv
Riga	Latvijas Policijas akadēmija	THE POLICE ACADEMY OF LATVIA	http://www.polak.edu.lv
Riga	Latvijas Nacionālā Aizsardzības akadēmija		http://www.naa.mil.lv
Jēkabpils	Jēkabpils Agrobiznesa koledža	Jekabpils Agrobusiness college	http://www.jak.lv
Riga	Rīgas Tehniskā koledža	RIGA TECHNICAL COLLEGE	http://www.rtk.lv
Jūrmala	Koledža RRC	College RRC	www.sic.gov.lv
Riga	Informācijas sistēmu menedžmenta augstskola	Information Systems Managment Institut	http://www.isma.lv

NL: Nederland (Netherlands)

Technical universities

All three technical universities in the Netherlands have a department named Electrotechiek (Et) These are:

City	Name of the university	http address
Delft	Technische Universiteit Delft	http://www.tudelft.nl
Eindhoven	Technische Universiteit Eindhoven	http://www.tue.nl
Enschede	Universiteit Twente	http://www.utwente.nl

Professional schools

Following high professional schools are also involved in electrical and information engineering:

City	Name of the hogeschool	http address
Alkmaar	Hogeschool Alkmaar	http://www.hsa.nl
Amsterdam	Hogeschool van Amsterdam, HVA	http://www.hva.nl
Den Haag	Haagse Hogeschool	http://www.haagsehogeschool.nl
Eindhoven	Fontys Hogescholen	http://www.fontys.nl

NO: Norge/Noreg (Norway)

Colleges and university colleges with their Norwegian names and official English names are given below with their corresponding web-pages for reference.

Universiteter (universities)

City	Name of the institution (national language)	http address
Agder	Universitetet i Agder	http://www.hials.no/
Bergen	Universitetet i Bergen	http://www.uib.no/
Oslo	Universitetet i Oslo	http://www.uio.no/
Stavanger	Universitetet i Stavanger	http://ws.uis.no/
Tromsø	Universitetet i Tromsø	http://ws.uit.no/
Trondheim	Norges teknisk-naturvitenskapelige universitet (NTNU)	http://www.ntnu.no/
Ås	Universitetet for miljø- og biovitenskap (UMB) (Norwegian University of Life Sciences)	http://www.umb.no/

Høgskoler (colleges)

City	Name of the institution (national language)	http address
Ålesund	Høgskolen i Ålesund	http://www.hials.no/
Alta	Høgskolen i Finnmark	http://www.hifm.no/
Bekkestua	Norges Informasjonsteknologiske Høgskole	http://www.nith.no/
Bergen	Norges Handelshøyskole	http://www.nhh.no/
Bergen	Høgskolen i Bergen	http://www.hib.no/
Bergen	Norsk Lærerakademi	http://www.nla.no/
Bergen	Naval Engineering College	
Bergen	Norsges Informasjonsteknologiske Høgskole	http://www.nith.no/
Bodø	Høgskolen i Bodø	http://www.hibo.no/
Borre	Høgskolen i Vestfold	http://www.hive.no/
Førde	Høgskulen i Sogn og Fjordane	http://www.hisf.no/
Gjøvik	Høgskolen i Gjøvik	http://www.hig.no/
Grimstad	Høgskolen i Agder	http://www.hia.no/
Halden	Høgskolen i Østfold	http://www.hiof.no/
Kongsberg	Høgskolen i Buskerud	http://www.hibu.no/
Levanger	Høgskolen i Nord-Trøndelag	http://www.hint.no/
Mo i Rana	Høgskolen i Nesna	
Molde	Høgskolen i Molde	http://www.himolde.no/
Narvik	Høgskolen i Narvik	http://www.hin.no/
Oslo	Høgskolen i Oslo	http://www.hio.no/
Oslo	Norges idrettshøgskole	http://www.nih.no/
Oslo	Norsges Informasjonsteknologiske Høgskole	http://www.nith.no/

Porsgrunn	Høgskolen i Telemark	http://www.hit.no/
Sarpsborg	Høgskolen i Østfold	http://www.hiof.no/
Stavanger	Høgskolen i Stavanger	http://www.his.no/
Tromsø	Høgskolen i Tromsø	http://www.hitos.no/
Trondheim	Høgskolen i Sør-Trøndelag	http://www.hist.no/

PL: Polska (Poland)

This is the full list of Polish **public** educational institutions in the field of EIE, offering in 2006/07 BSc, MSc and PhD degrees and professional title of Engineer.This is the full list of Polish state- owned institutions in the field of EIE.

Technical Universities

CityTown Name	Name of the institution (national language)	Name of the institution (English)	http HTTP address
Białystok	Politechnika Białostocka	Białystok Technical University	http://www.pb.bialystok.pl http://www.dpreview.com/
Bielsko-Biała	Akademia Techniczno-Humanistyczna w Bielsku-Białej	University of Bielsko--Biała	http://www.ath.bielsko.pl
Bydgoszcz	Uniwersytet Technologiczno--Przyrodniczy im. Jana i Jędrzeja Śniadeckich w Bydgoszczy	University of Technology and Agriculture in Bydgoszcz	http://www.atr.bydgoszcz.pl
Częstochowska	Politechnika Częstochowska	Technical University of Częstochowa	http://www.pcz.plhttp://adm.pcz.czest.pl/
Gdańsk	Politechnika Gdańska	Gdansk University of Technology	http://www.pg.gda.pl
Gliwice	Politechnika Śląska w (Gliwiceach)	Silesian University of Technology in Gliwice	http://www.polsl.gliwice.pl/http://www.polsl.pl
Kielce	Politechnika Świętokrzyska w(Kielce)ach	Kielce University of Technology	http://www.tu.kielce.pl
Koszalin	Politechnika Koszalińska	Technical University of Koszalin	http://www.tu.koszalin.pl
Kraków	Politechnika Krakowska	Cracow University of Technology University of Technology in Cracow	http://www.pk.edu.pl
Kraków	Akademia Górniczo--Hutnicza im. Stanisława Staszica w Krakowie	AGH University of Science and Technology	http://www.agh.edu.pl
Lublin	Politechnika Lubelska	Technical University of Lublin Lublin University of Technology	http://rekt.pol.lublin.pl/ http://www.pol.lublin.pl
Łódź	Politechnika Łódzka	Łódź Technical University Technical University	http://www.p.lodz.pl

		of Lodz	
Opole	Politechnika Opolska	Technical University of Opole Opole University of Technology	http://www.po.opole.pl
Poznań	Politechnika Poznańska	Poznań University of Technology	http://www.put.poznan.pl
Radom	Politechnika Radomska im. Kazimierza Pułaskiego	Radom University of Technology University of Technology in Radom	http://www.man.radom.pl/http://www.pr.radom.pl
Rzeszów	Politechnika Rzeszowska im. Ignacego Łukasiewicza	Rzeszów University of Technology	http://www.prz.rzeszow.pl
Szczecin	Politechnika Szczecińska	Technical University of Szczecin Szczecin University of Technology	http://www.ps.pl
Warszawa	Politechnika Warszawska	Warsaw University of Technology	http://www.pw.edu.pl
Warszawa	Wojskowa Akademia Techniczna im. Jarosława Dąbrowskiego w Warszawie	Military Academy of Technology in Warsaw	http://www.wat.edu.pl
Wrocław	Politechnika Wrocławska	Wroclaw University of Technology	http://www.pwr.wroc.pl

Universities

Town NameCity	Name of the institution (national language)	Name of the institution (English)	http HTTP address
Białystok	Uniwersytet w Białymstoku	University of Bialystok	http://www.uwb.edu.pl
Bydgoszcz	Uniwersytet Kazimierza Wielkiego w Bydgoszczy	Kazimierz Wielki University in Bydgoszcz	http://www.ab.edu.pl
Gdańsk	Uniwersytet Gdański	University of Gdańsk	http://www.univ.gda.pl
Katowice	Uniwersytet Śląski w Katowicach w Katowicach	University of Silesia in Katowice	http://www.us.edu.pl
Kraków	Uniwersytet Jagielloński w Krakowie	Jagiellonian University in KrakówCracow	http://www.uj.edu.pl
Łódź	Uniwersytet Łódzki	University of Łódź	http://www.uni.lodz.pl
Lublin	Uniwersytet Marii Curie--Skłodowskiej w Lublinie	Maria Curie-Sklodowska University in Lublin	http://www.umcs.lublin.pl

Lublin	Katolicki Uniwersytet Lubelski	The Catholic University of Lublin	http://www.kul.lublin.pl
Olsztyn	Uniwersytet Warmińsko--Mazurski w Olsztynie	University of Warmia and Mazury in Olsztyn	http://www.uwm.edu.pl
Opole	Uniwersytet Opolski	University of Opole	http://www.uni.opole.pl
Poznań	Uniwersytet im. Adama Mickiewicza w Poznaniu	Adam Mickiewicz University in Poznań	http://www.amu.edu.pl
Toruńń	Uniwersytet Mikołaja Kopernika w Toruniu	Nicolaus Copernicus University in Torun	http://www.uni.torun.pl
Warszawa	Uniwersytet Warszawski	Warsaw University	http://www.uw.edu.pl
Warszawa	Uniwersytet Kardynała Stefana Wyszyńskiego w Warszawie	Cardinal Stefan Wyszyński University in Warsaw	http://www.uksw.edu.pl
Wrocław	Uniwersytet Wrocławski	Wrocław University	http://www.uni.wroc.pl
Zielona Góra	Uniwersytet Zielonogórski	University of Zielona Góra	http://www.uz.zgora.pl

Pedagogical Universities

Town NameCity	Name of the institution (national language)	Name of the institution (English)	httpHTTP address
Częstochowa	Akademia im. Jana Długosza w Częstochowie	Jan Długosz Pedagogical University in Częstochowa	http://www.wsp.czest.pl http://www.ajd.czest.pl
Kielce	Akademia Świętokrzyska w Kielcach	Swietokrzyska Academy in Kielce	http://www.pu.kielce.pl
Kraków	Akademia Pedagogiczna im. Komisji Edukacji Narodowej w Krakowie	Pedagogical University in Cracow	http://www.ap.krakow.pl
Siedlce	Akademia Podlaska	University of Podlasie in Siedlce	http://www.ap.siedlce.pl

Universities of Economics

Town NameCity	Name of the institution (national language)	Name of the institution (English)	http HTTP address
Katowice	Akademia Ekonomiczna im. Karola Adamieckiego w Katowicach	The Karol Adamiecki University of Economics in	http://www.ae.katowice.pl

			Katowice	
Kraków	Akademia Ekonomiczna w Krakowie	Cracow University of Economics	http://www.ae.krakow.pl	
Poznań	Akademia Ekonomiczna w Poznaniu	The Poznań University of Economics	http://www.ae.poznan.pl	
Wrocław	Akademia Ekonomiczna im. Oskara Langego we Wrocławiu	Wrocław University of Economics	http://www.ae.wroc.pl	

Maritime and Military Higher Schools

Town Name	Name of the institution (national language)	Name of the institution (English)	HTTP address
Gdynia	Akademia Morska w Gdyni	Gdynia Maritime University	http://www.am.gdynia.pl

Public Higher Vocational Schools

Town Name	Name of the institution (national language)	Name of the institution (English)	HTTP address
Białła Ppodlaska	Państwowa Wyższa Szkoła Zawodowa im. Papieża Jana Pawła II w Białej Podlaskiej *Specialisation*: applied computer science	State Higher Vocational School in Biała Podlaska	http://www.pwsz.bialapodlaska.pl
Chełmie	Państwowa Wyższa Szkoła Zawodowa w Chełmie *Specialisation*: mathematics and computer science	State Higher Vocational School in Chełm	http://www.pwsz.chelm.pl
Elbląg	Państwowa Wyższa Szkoła Zawodowa w Gorzowie ElbląguWielkopolskim *Specialisation*: computer science in management	The State Higher School of Vocational Education in Elbląg	http://www.pwsz.elblag.pl
Gniezno	Państwowa Wyższa Szkoła Zawodowa w Gnieźnie	State Higher Vocational School in Gniezno	http://www.pwsz-gniezno.edu.pl
Jarosław	Państwowa Wyższa Szkoła Zawodowa w Jarosławiu *Specialisation*, applied computer science	State Higher Vocational School in Jarosław	http://www.pwszjar.edu.pl
Jelenia Góra	Kolegium Karkonoskie w Jeleniej Górze *Specialisation*: electrical engineering and telecommunication	Karkonosze Collegium in Jelenia Góra Kolegium Karkonoskie	http://www.kk.jgora.pl

Kalisz	Państwowa Wyższa Szkoła Zawodowa im. Prezydenta Stanisława Wojciechowskiego w Kaliszu *Specialisation*: electrical power systems	Higher Vocational State School of President Stanisław Wojciechowski in Kalisz Higher Vocational State School in Kalisz	http://www.pwsz.kalisz.pl
Krosno	Państwowa Wyższa Szkoła Zawodowa w Krośnie: *Specialisation*: networked information systems	State Higher Vocational School in Krosno	http://www.pwsz.krosno.edu.pl
Legnica	Państwowa Wyższa Szkoła Zawodowa im. Witelona w Legnicy: *Specialisation*: computer enginnering	The Higher Vocational State School in LegnicaState Higher Vocational School in Legnica	http://www.pwsz.legnica.edu.pl
Leszno	Państwowa Wyższa Szkoła Zawodowa w Lesznie: *Specialisations*: electrical engineering and technical computer science	Jan Amos Komeński State School of Higher Vocational Education in Leszno	http://www.pwsz.edu.pl
Łomża	Państwowa Wyższa Szkoła Informatyki i Przedsiębiorczości w Łomży	College of Computer Science and Business Administration in Łomża	http://www.pwsip.edu.pl
Nowy Sąacz	Państwowa Wyższa Szkoła Zawodowa w Nowym Sączu *Specialisation*: applied computer science	Nowy Sacz School of Professional and Vocational StudiesState Higher Vocational School in Nowy Sacz	http://www.pwsz-ns.edu.pl
Nysa	Państwowa Wyższa Szkoła Zawodowa w Nysie: *Specialisation*: applied computer science	The State Higher Vocational School in Nysa	http://www.pwsz.nysa.pl
Piła	Państwowa Wyższa Szkoła Zawodowa im. Stanisława Staszica w Pile	State Higher Vocational School in Piła	http://www.pwsz.pila.pl

	Specialisation: , electrical and electronic engineering		
Tarnów	Państwowa Wyższa Szkoła Zawodowa w Tarnowie *Specialisation*: electrical and electronic engineering, applied computer science	Higher Vocational School in Tarnow	http://www.wsz.tarnow.pl

PT: Portugal

Universities and Polytechnics with departments in Electrical Engineering or Electrical and Computer

Electrical Engineering or Electrical and Computer Departments exist in the following Universities and Polytechnics:

City	University, Faculty	http address
UNIVERSITIES		
Aveiro	Universidade de Aveiro	http://www.ua.pt/
Braga/Guimarães	Universidade do Minho	http://www.uminho.pt/
Coimbra	Universidade de Coimbra*	http://www.dee.uc.pt/
Covilhã	Universidade da Beira Interior	http://www.ubi.pt/
Funchal	Universidade da Madeira	http://saesc.uma.pt/
Lisboa	Universidade Técnica de Lisboa* Instituto Superior Técnico	http://www.dei.ist.utl.pt/
Porto	Universidade do Porto*, Faculdade de Engenharia	http://sifeup.fe.up.pt/
Vila Real	Universidade de Trás os Montes e Alto Douro	http://www.utad.pt/
POLYTECHNICS		
Bragança	Instituto Politécnico de Bragança	http://www.ipb.pt/
Coimbra	Instituto Superior de Engenharia de Coimbra**	http://sun.isec.pt/
Guarda	Instituto Politécnico da Guarda	http://www.ipg.pt/
Leiria	Instituto Politécnico de Leiria	http://www.ipleiria.pt/
Lisboa	Instituto Politécnico de Lisboa - Escola Superior de Engenharia de Lisboa**	http://www.ipl.pt/
Porto	Instituto Superior de Engenharia do Porto**	http://www.ipp.pt/
Setúbal	Instituto Politécnico de Setúbal	http://www.aci.pt.vu/
Tomar	Instituto Politécnico de Tomar	http://www.ipt.pt/
Viana do Castelo	Instituto Politécnico de Viana do Castelo	http://www.ipvc.nortenet.pt/
Viseu	Instituto Politécnico de Viseu	http://www.ipvc.nortenet.pt/

*In these three Faculties the courses are wider and the students can choose between several specializations. In the others the courses are more specialized.
**In these three Polytechnics there are different specializations that the students can choose. In the other there are only specialized courses (Informatics, Telecommunications, Electronics...)

Universities and Polytechnics without departments in Electrical Engineering or Electrical and Computer

City	University, Faculty	http address
Açores	Universidade dos Açores - Ponta Delgada	http://www.uac.pt/
Águeda	Universidade de Aveiro - Escola Superior de Tecnologia e Gestão de Águeda	http://www.ua.pt/
Beja	Instituto Politécnico de Beja - Escola Superior de Tecnologia e Gestão de Beja	http://www.ipleiria.pt/
Castelo Branco	Instituto Politécnico de Castelo Branco - Escola Superior de Tecnologia de Castelo Branco	http://www.ipcb.pt/
Covilhã	Universidade da Beira Interior	http://www.ubi.pt/
Évora	Universidade de Évora	http://www.uevora.pt/
Faro	Universidade do Algarve - Escola Superior de Tecnologia de Faro	http://www.ualg.pt/est/adee
Felgueiras	Instituto Politécnico do Porto - Escola Superior de Tecnologia e Gestão de Felgueiras	http://www.ipp.pt/
Lamego	Instituto Politécnico de Viseu - Escola Superior de Tecnologia e Gestão de Lamego	http://www.ipleiria.pt/
Lisboa	Academia Militar	http://www.exercito.pt/am/index.htm
	Universidade Nova de Lisboa - Faculdade de Ciências e Tecnologia	http://www.dee.fct.unl.pt/
	Instituto Militar dos Pupilos do Exército Secção de Ensino Superior	http://www.exercito.pt/am/index.htm
Portalegre	Instituto Politécnico de Portalegre - Escola Superior de Tecnologia e Gestão de Portalegre	http://www.ipportalegre.pt/

RO: România

City	University	http address
Brasov	"Transilvania" University of Brasov	http://www.unitbv.ro
Bucuresti	"Politehnica" University of Bucharest	http://www.pub.ro
	University of Bucharest	http://www.unibuc.ro
Cluj-Napoca	"Babes-Bolyai" University of Cluj-Napoca	http://www.ubbcluj.ro
	Technical University of Cluj-Napoca	http://www.utcluj.ro
Constanta	"Ovidius" University of Constanta	http://www.univ-ovidius.ro
Craiova	University of Craiova	http://www.ucv.ro
Iasi	"Gh. Asachi" Technical University of Iasi	http://www.tuiasi.ro
	"Alexandru Ioan Cuza" University of Iasi	http://www.uaic.ro
Oradea	University of Oradea	http://www.uoradea.ro
Timisoara	"Politehnica" University of Timisoara	http://www.upt.ro
	West University of Timisoara	http://www.uvt.ro
Galati	"Dunarea de Jos" University of Galati	http://www.ugal.ro
Ploiesti	Petroleum - Gas University of Ploiesti	http://www.upg-ploiesti.ro
Pitesti	University of Pitesti	http://www.upit.ro
Sibiu	"Lucian Blaga" University of Sibiu	http://www.ulbsibiu.ro
Bacau	University of Bacau	http://www.ub.ro
Targu-Mures	"Petru Maior" University of Targu-Mures	http://www.uttgm.ro
Baia Mare	North University of Baia Mare	http://www.ubm.ro
Targu-Jiu	"Constantin Brancusi" University of Targu Jiu	http://www.utgjiu.ro
Suceava	"Stefan cel Mare" University of Suceava	http://www.usv.ro
Arad	"Aurel Vlaicu" University of Arad	http://www.uav.ro
Arad	"Vasile Goldis" University of Arad	http://www.uvvg.ro

SI: Slovenija (Slovenia)

City	University	http address
Ljubljana	University of Ljubljana	Faculty of electrical engineering: http://www.fe.uni-lj.si/ Faculty of computer and information science: http://www.fri.uni-lj.si/
Maribor	University of Maribor	Faculty of electrical engineering and computer science: http://rcum.uni-mb.si/new/FERI/okv_sl.htm

SK: Slovensko (Slovak rep.)

City	Institution (Slovak)	Institution (English)	http address
Bratislava	Slovenská technická univerzita Bratislava	Slovak University of Technology Bratislava	http://www..stuba.sk
Trenčín	Trenčianska univerzita Alexandra Dubčeka v Trenčíne	Alexander Dubček University in Trenčín	http://www.tnuni.sk
Žilina	Žilinská univerzita v Žiline	University of Žilina	http://www.uniza.sk
Košice	Technická univerzita Košice	Technical University of Košice	http://www.tuke.sk

UA: Україна (Ukraine)

Table 24.1. : Table of institutions in the field of EIE in Ukraine

City	Institution	http address
Mykolajiv	Admiral Makarov Ukrainian State Maritime Technical University	http://www.usmtu.edu.ua
Cherkassy	Cherkassy Engineering-Technological Institute	http://www.cheti.uch.net
Chernihiv	Chernihiv State Technological University	http://www.stu.cn.ua
Simferopol	Crimean State Industrial-Pedagogical Institute	rector@csipi.simfi.net
Dniepro-petrovsk	Dniepropetrovsk National University	http://www.dsu.dp.ua
Dniepro-petrovsk	Dniepropetrovsk State Technical University of Railway Transport	http://www.diit.edu.ua/
Dniepro-dzerzhynsk	Dniprodzerzhinsk State Technical University	http://www.dstu.dp.ua
Alchevsk	Donbass Mining and Metallurgical Institute	http://www.dmmi.edu.ua
Kramatorsk	Donbass State Engineering Academy	http://dgma.virtualave.net/index.htm
Donetsk	Donetsk National University	http://www.Dongu.Donetsk.ua
Donetsk	Donetsk State Institute of Artificial Intelligence	http://www.iai.donetsk.ua
Donetsk	Donetsk State Technical University(DonSTU)	http://www.dgtu.donetsk.ua
Drohobych	Drohobych Ivan Franko State Teacher Training University	http://www.drohobych.net
Luhansk	East-Ukrainian National University	uni@vugu.lugansk.ua
Kremen-chuk	Institute for Economics and Advanced Technologies	ksa@ient.poltava.ua
Lviv	Institute of Business and Innovative Techologies	ippt@polynet.lviv.ua
Zaporizhia	Institute of Economics and Information	http://www.econom.zp.ua
Kyiv	International Science and Technology University	http://www.ifistu.var.net/text:ua
Kyiv	International Solomon University	univer@solomon-un.kiev.ua
Lviv	Ivan Franko National University of Lviv	http://www.franko.lviv.ua

City	Institution	http address
Ivano- Frankivsk	Ivano-Frankivsk State Technical University of Oil and Gas	http://www.ifdtung.if.ua
Kharkiv	Kharkiv Air Force Institute	46, Volodarskogo St., Kharkiv, 61064, Ukraine
Kharkiv	Kharkiv Military University	6, Ploscha Svobody, Kharkiv, 61043, Ukraine
Kharkiv	Kharkiv National V.N. Karazin University	http://www.univer.kharkov.ua
Kharkiv	Kharkiv State Grygory Skovoroda Pedagogical University	http://www.kgpu2.sa.net.ua
Kharkiv	Kharkiv State Municipal Academy	rectorat@ksame.kharkov.com
Kharkiv	Kharkiv State Technical Farm University	44, Artema St., Kharkiv, 61002, Ukraine
Kharkiv	Kharkiv State Technical University of Radio Electronics	http://www.kture.kharkov.ua
Kharkiv	Kharkiv State University of Economics	KSUE@KSUE.AC.Kharkov.ua
Kherson	Kherson State Pedagogical University	http://www.kspu.edu.ua
Kherson	Kherson State Technical University	kstu@tie.kherson.ua
Kirovograd	Kirovograd State Technical University	25006, Kirovograd, Pravda Prospect, 70A, Ukraine
Kremen-chuk	Kremenchuk State Polytechnic University	http://www.polytech.poltava.ua
Kryvyj Rih	Kryvyj Rih Technical University	ktu@alba.dp.ua
Kyiv	Kyiv Institute of Communication of the Ukranian O.S. Popov State Academy of Communication (O.S.Popov Ukranian State Academy of Telecommunication)	c_a_c@mail.ru
Kyiv	Kyiv Military Institute of Control and Communications	http://kvirtu31.kiev.ua
Kyiv	Kyiv National University of Constrution and Architecture	root@knoba.cdu-ua.net
Kyiv	Kyiv State University of Technologies and Design	http://www.kdutd.kiev.ua

City	Institution	http address
Kyiv	Kyiv Taras Shevchenko National University	http://www.univ.kiev.ua
Kyiv	Kyiv Technical School / KNUE (Kyiv National University of Economics /KNUE)	3, Verkhovynsta St., Kyiv, 04000, Ukraine
Lutsk	Lutsk State Technical University	http://www.vizor.lutsk.ua
Lviv	Lviv State Agrarian University	lday@icmp.lviv.ua
Lviv	Military Institute of the Lviv Polytechnic University	lvilp@cscd.lviv.ua
Kharkiv	National Aerospace N.E.Zhukovskiy University "Kharkiv Aviation Institute"	khai@ai.kharkov.ua
Kyiv	National Agricultural University	http://www.nauu.kiev.ua
Dniepro-petrovsk	National Metallurgical Academy of Ukraine	http://dmeti.dp.ua
Dniepro-petrovsk	National Mining University of Ukraine	http://nmuu.dp.ua
Kharkiv	National Technical University "Kharkiv Polytechnic Institute"	http://www.kpi.kharkov.ua
Kyiv	National Technical University of Ukraine "Kyiv Polytechnic Institute"	http://www.ntu-kpi.kiev.ua
Lviv	National University "Lviv Polytehnic"	12, Bandery St., Lviv, 70046, Ukraine
Odessa	Odessa Hydrometeorological Institute	http://www.ogmi.farlep.odessa.ua
Odessa	Odessa I.I. Mechnikov National University	oguint@paco.net
Odessa	Odessa State Academy of Refrigeration	http://www.osar.odessa.ua
Odessa	Odessa State Maritime Academy	http://www.paco.net/~mar.ogma
Odessa	Odessa State Polytechnic University	http://www.ospu.odessa.ua
Kyiv	Open International University of Human Developement "Ukraine"	Horyva St., 1-G, Kyiv, 04071, Ukraine
Odessa	O.S.Popov Ukranian State Academy of Telecommunication	usat@usat.ukrtel.net
Kamjanets- Podilski	Podilya State Agrarian and Engineering Academy	saea@kp.km.ua

City	Institution	http address
Poltava	Poltava Yu.Kondratyuk State Technical University	http://pstu.net.ua
Mariupol	Pryazovskyi State Technical University	http://www.pstu.edu
Rivne	Rivne State Humanitarian University	12, S.Bandera St., Rivne, 33028, Ukraine
Sevastopol	Sevastopol Institute of Nuclear Energy and Industry	http://nei.iuf.net
Sevastopol	Sevastopol Navy Institute	Sevastopol, 99035
Sevastopol	Sevastopol State Technical University	http://sevgtu.stel.sebastopol.ua
Odessa	South Ukrainian "K.D.Ushynsky" State Teachers' Training University	rector@tm.odessa.ua
Sumy	Sumy State University	kanc@ssu.sumy.ua
Melitopol	Tavrida State Agrotechnical Academy	http://www.users.melitopol.net/~tsaa
Simferopol	Tavryda V.I.Vernadsky National University	http://www.ccssu.crimea.ua
Khmelnytsky	Technological University of Podillia	http://www.tup.km.ua
Ternopil	Ternopil State Ivan Pul'uj Technical University	http://www.tu.edu.te.ua
Ivano- Frankivsk	The Carpatian Region V. Stefanyk University	http://www.pu.if.ua
Kyiv	The National Aviation University	http://www.nau.kiev.ua
Kyiv	The University of Kyiv-Mohyla Academy	http://www.ukma.kiev.ua
Dniepro-petrovsk	Ukrainian Academy of Customs	YIV@amsu.dnp.ukrpack.net
Kharkiv	Ukrainian Engineering and Pedagogical Academy (UEPA)	http://www.uipa.Kharkov.org
Dniepro-petrovsk	Ukrainian State University of Chemical Engineering	http://www.USUCE.8m.dp.ua
Kyiv	Ukrainian State University of Food Technologies	http://www.usuft.kiev.ua
Lviv	Ukrainian State University of Forestry	ukrdltu@forest.lviv.ua
Kharkiv	University of Internal Affairs (Kharkiv)	pavalo@univd.kharkov.ua
Uzhgorod	Uzhgorod State University	http://www.univ.uzhgorod.ua

City	Institution	http address
Poltava	V. Korolenko State Pedagogical University in Poltava	slpalm@kot.poltava.ua
Vinnytsia	Vinnytsia State Technical University	http://www.vstu.vinnica.ua
Kirovograd	V.Vinnijchenko Kirovograd State Pedagogical University	http://www.kspu.kr.ua
Chernivtsi	Yuriy Fed'kovijch Chernivtsi National University named after Yurij Fedkovich	http://www.chnu.cv.ua
Zaporizhia	Zaporizhzhya State Technical University	http://www.zstu.zaporizhzhe.ua
Zaporizhia	Zaporozhia State Engineering Academy	http://www.zgia.zp.ua
Zhytomyr	Zhytomyr Institute of Engineering and Technology	http://www.ziet.zhitomir.ua
Zhytomyr	Zhytomyr State Pedagogical Univercity named after Ivan Franko	http://www.zspu.edu.ua/

There are altogether 88 institutions of higher education offering diplomas in EIE-specialities.

UK: United Kingdom

The following tables show a list of institutions offering EIE courses together with the courses they offer divided up as shown in the above hierarchical structure. The information in the following tables has been taken from the UCAS database and while every effort has been taken to be accurate appologies are offered for any accidental errors that have been introduced.

Reference should be made to the UCAS website or the website of the institution for further details of actual courses offered.

The web address for each institution can also be found on the UCAS web site.

City	Institution name	http address
Aberdeen	University of Aberdeen	http://www.abdn.ac.uk/
Aberdeen	Robert Gordon University	http://www.rgu.ac.uk/
Aberystwyth	University of Wales, Aberystwyth	http://www.aber.ac.uk/
Aston	University of Aston	http://www.aston.ac.uk/
Barnsley	Barnsley College	http://www.barnsley.ac.uk/
Basingstoke	College of Technology	http://www.bcot.ac.uk/
Bangor	University of Wales, Bangor	http://www.bangor.ac.uk/
Bath	Bath Spa University College	http://www.bathspa.ac.uk
Bath	University of Bath	http://www.bath.ac.uk/
Bedford	Bedford College	http://www.bedford.ac.uk/
Belfast	Queen's University of Belfast	http://www.qub.ac.uk/
	Bell College	http://www.bell.ac.uk/
Birmingham	University of Central England	http://www.uce.ac.uk/
Birmingham	University of Birmingham	http://www.bham.ac.uk/
Birmingham	City University	
Blackburn	Blackburn College	http://www.blackburn.edu/
Bolton	Bolton Institute	http://www.bolton.ac.uk/
Bournemouth	Bournemouth University	http://www.bournemouth.ac.uk/
Bradford	University of Bradford	http://www.bradford.ac.uk/external/
Brighton	University of Brighton	http://www.brighton.ac.uk/
Bristol	University of West of England	http://www.uwe.ac.uk/
Bristol	University of Bristol	http://www.bris.ac.uk/
Bristol	City of Bristol College	http://www.cityofbristol.ac.uk/
Brunel	Brunel University	http://www.brunel.ac.uk/

City	Institution name	http address
Buckingham	University of Buckingham	http://www.buckingham.ac.uk/
	Buckinghamshire Chilterns University College	http://www.bcuc.ac.uk/
Cambridge	University of Cambridge	http://www.cam.ac.uk/
Canterbury	University of Kent at Canterbury	http://www.kent.ac.uk/
Canterbury	Christ Church University College	http://www.cant.ac.uk/
Cardiff	Cardiff University	http://www.cf.ac.uk/
Cardiff	University of Wales Institute	http://www.uwic.ac.uk/
Carmarthen	Carmarthenshire College	
Chesterfield	Chesterfield College	http://www.chesterfield.ac.uk/chesterfield-college/
Chichester	Chichester College	http://www.chichester.ac.uk/
Colchester	Colchester Institute	http://www.colch-inst.ac.uk/
Colchester , Essex	University of Essex	http://www.essex.ac.uk/
Coventry	City College	http://www.tilehill.ac.uk/
Coventry	Coventry University	http://www.coventry.ac.uk/
Cranfield	Cranfield University	http://www.cranfield.ac.uk/
De Montfort	De Montfort University	http://www.dmu.ac.uk/
Derby	University of Derby	http://www.derby.ac.uk/
Doncaster	Doncaster College	http://www.don.ac.uk/
Dudley	College of Technology	http://www.dudleycol.ac.uk/
Dundee	Dundee University	http://www.dundee.ac.uk/
Dundee	University of Abertay Dundee	http://www.abertay-dundee.ac.uk/
Durham	University of Durham	http://www.dur.ac.uk/
Edinburgh	Heriot-Watt University	http://www.hw.ac.uk/
Edinburgh	University of Edinburgh	http://www.ed.ac.uk/
Exeter	University of Exeter	http://www.ex.ac.uk/
Farnborough	Farnborough College of Technology	http://www.farn-ct.ac.uk/www/default.asp
Glamorgan	University of Glamorgan	http://www.glam.ac.uk/
Glasgow	Caledonian University	http://www.gcal.ac.uk/
Glasgow	University of Glasgow	http://www.gla.ac.uk/
Gloucester	Gloucestershire College of Arts & Technology	http://www.gloscat.ac.uk/
City	**Institution name**	**http address**

Greenwich	University of Greenwich	http://www.gre.ac.uk/
Hertfordshire	University of Hertfordshire	http://www.herts.ac.uk/
	Hopwell Hall College	
Huddersfield	University of Huddersfield	http://www.hud.ac.uk/
Hull	Hull College	http://www.hull-college.ac.uk
Hull	University of Hull	http://www.hull.ac.uk/
Inverness	UHI Millenium Institute	http://www.uhi.ac.uk/
Keele	Keele University CWIS	http://www.keele.ac.uk/
Lampeter	University of Wales, Lampeter	http://www.lamp.ac.uk/
Lancaster	Lancaster University	http://www.lancs.ac.uk/
Lancaster	University of Central Lancashire	http://www.uclan.ac.uk/
Leeds	Metropolitan University	http://www.mmu.ac.uk/
Leeds	University of Leeds	http://www.leeds.ac.uk/
Leicester	University of Leicester	http://www.le.ac.uk/
Lincoln	University of Lincoln	http://www.lincoln.ac.uk/
Liverpool	John Moores	http://www.livjm.ac.uk/
Liverpool	University of Liverpool	http://www.liv.ac.uk/
Liverpool	Liverpool Hope University College	http://www.hope.ac.uk/
London	City University	http://www.city.ac.uk/
London	University of East London	http://www.uel.ac.uk/
London	Goldsmiths College, University of London	http://www.gold.ac.uk/
London	Guildhall University	http://www.lgu.ac.uk/
London	Imperial College, University of London	http://www.ic.ac.uk/
London	Kings College, University of London	http://www.kcl.ac.uk/
London	Hammersmith & West London College	http://www.hwlc.ac.uk/
London	Queen Mary and Westfield College, University of London	http://www.qmw.ac.uk/
London	Royal Holloway, University of London	http://www.rhbnc.ac.uk/
London	South Bank University	http://www.sbu.ac.uk/
London	University College, University of London	http://www.ucl.ac.uk/
London	University of North London	http://www.unl.ac.uk/
London	University of Westminster	http://www.wmin.ac.uk/
City	**Institution name**	**http address**
London	Middlesex University	http://www.mdx.ac.uk/

London	Kingston University	http://www.kingston.ac.uk/
London	Thames Valley University	http://www.tvu.ac.uk/
Loughborough	Loughborough University of Technology	http://www.lboro.ac.uk/
Luton	University of Luton	http://www.luton.ac.uk/
Manchester	Manchester Metropolitan University	http://www.mmu.ac.uk/
Manchester	University of Manchester	http://www.man.ac.uk
Manchester	UMIST	http://www.umist.ac.uk
Napier	Napier University	http://www.napier.ac.uk/
Newcastle Upon Tyne	Newcastle College	http://www.ncl-coll.ac.uk/
Newcastle Upon Tyne	University of Newcastle upon Tyne	http://www.ncl.ac.uk/
Newcastle Upon Tyne	University of Northumbria	http://northumbria.ac.uk/
Northampton	University College	http://www.northampton.ac.uk/
Norwich	Anglia Polytechnic University	http://www.anglia.ac.uk/
Norwich	University of East Anglia	http://www.uea.ac.uk/
Nottingham	People's College Nottingham	http://www.peoples.ac.uk/
Nottingham	University of Nottingham	http://www.nottingham.ac.uk/
Nottingham	Nottingham Trent University	http://www.ntu.ac.uk/
Oldbury	Sandwell College	http://www.sandwell.ac.uk/
Oxford	Oxford Brookes University	http://www.brookes.ac.uk/
Oxford	Oxford University	http://www.ox.ac.uk/
Paisley	University of Paisley	http://www.paisley.ac.uk/
Plymouth	College of Art & Design	http://www.pcad-web.org/
Plymouth	University of Plymouth	http://www.plym.ac.uk/
Portsmouth	University of Portsmouth	http://www.port.ac.uk/
Reading	College & School of Art & Design	http://www.reading-college.ac.uk/
Reading	University of Reading	http://www.rdg.ac.uk/
Ravensbourne	College of Design & Communication	http://www.rave.ac.uk/
Roehampton	Roehampton University of Surrey	http://www.roehampton.ac.uk/
Salford	University of Salford	http://www.salford.ac.uk/
City	**Institution name**	**http address**
Sheffield	Sheffield Hallam University	http://www.shu.ac.uk/
Sheffield	University of Sheffield	http://www.shef.ac.uk/

Shrewsbury	Shrewsbury College of Arts and Technology	http://www.s-cat.ac.uk/Welcome.asp
Southampton	Southampton Institute	http://www.solent.ac.uk/
Southampton	University of Southampton	http://www.soton.ac.uk/~indexes/
St. Andrews, Fife	University of St. Andrews	http://www.st-andrews.ac.uk/
St Austell,Cornwall	Cornwall College	http://www.cornwall.ac.uk/flashintro.html
Stirling	University of Stirling	http://www.external.stir.ac.uk/
Stoke on Trent	Staffordshire University	http://www.staffs.ac.uk/
Strathclyde	University of Strathclyde	http://www.strath.ac.uk/
Sunderland	University of Sunderland	http://www.sunderland.ac.uk/
Sunderland	City of Sunderland College	http://www.citysun.ac.uk
Surrey	University of Surrey	http://www.surrey.ac.uk/
Sussex	University of Sussex	http://www.sussex.ac.uk/
Swansea	Institute of Higher Education	http://www.sihe.ac.uk/
Swansea	University of Wales, Swansea	http://www.swan.ac.uk/
Teesside	University of Teesside	http://www.tees.ac.uk/
Ulster	University of Ulster	http://www.ulst.ac.uk/
Uxbridge	Uxbridge College	http://www.uxbridge.ac.uk/
Walsall	College of Arts & Technology	http://www.walcat.ac.uk/
Warwick	Warwick University	http://www.warwick.ac.uk/
Westminster	University of Westminster	http://www.wmin.ac.uk/
Weymouth	Weymouth College	http://www.weymouth.ac.uk/
Wigan	Wigan & Leigh College	http://www.wigan-leigh.ac.uk/
Wolverhampton	University of Wolverhampton	http://www.wlv.ac.uk/
Wrexham, Wales	North East Wales Institute of Higher Education	http://www.newi.ac.uk/
York	University of York	http://www.york.ac.uk/

EIE · SURVEYOR

This report has been written during the academic years 2005-2008 by a consortium composed of 107 universities, which are members of the EIE-Surveyor Thematic Network, with the cooperation of the EAEEIE (European Association for Education in Electrical and Information Engineering, http://www.eaeeie.org).

This monograph has been published in the summer of 2008 and therefore the available information, corresponds to the situation in higher education institutions in Europe at this time.

The monograph consists of two parts:

In the first part two contributions try to give a general overview of:
- the Bachelor and Master studies in Europe in 2008 ("New Trends of Electrical and Information Engineering Higher Education in Europe")
- The Doctoral studies situation and possible trends of its evolution ("New Trends of Doctoral Studies in Europe: Special Considerations for the Field of Electrical and Information Engineering")

In the second part an overview of the three cycles of EIE studies in each partner country is presented.

For any information and documentation
http://www.eie-surveyor.org
jean-marc.thiriet@ujf-grenoble.fr