

5. EE: Eesti (Estonia)

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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.

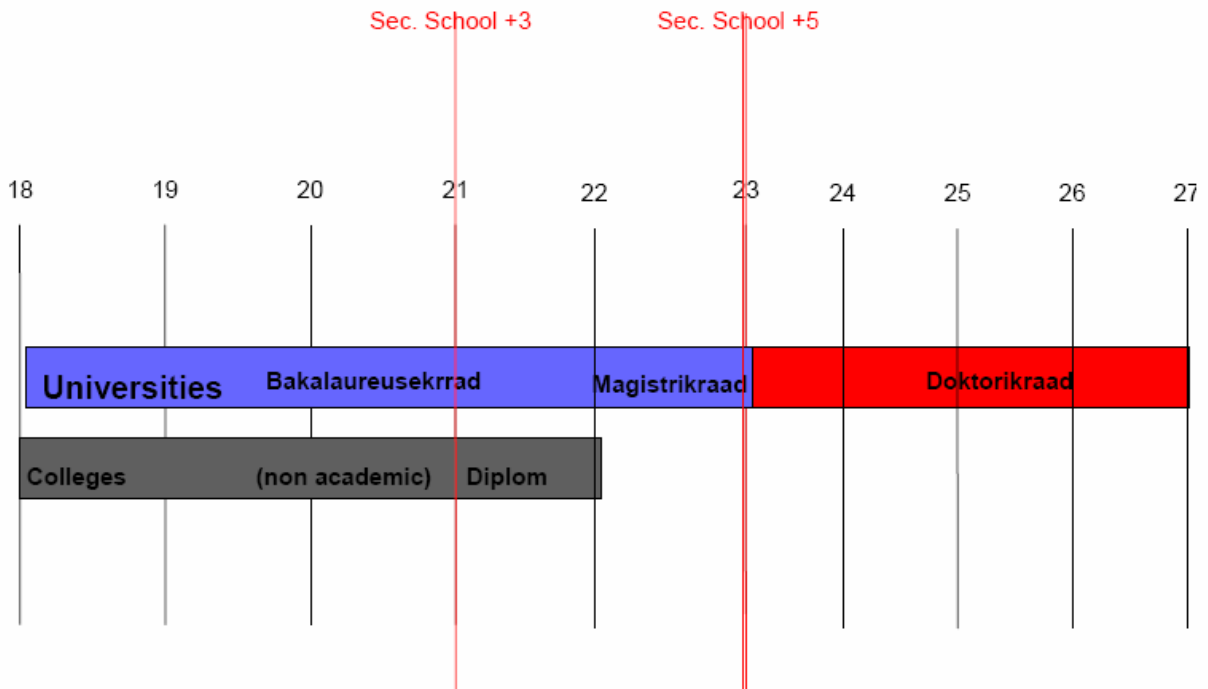


Figure 5.1: Estonian Higher Education System in EIE disciplines.

- 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

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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

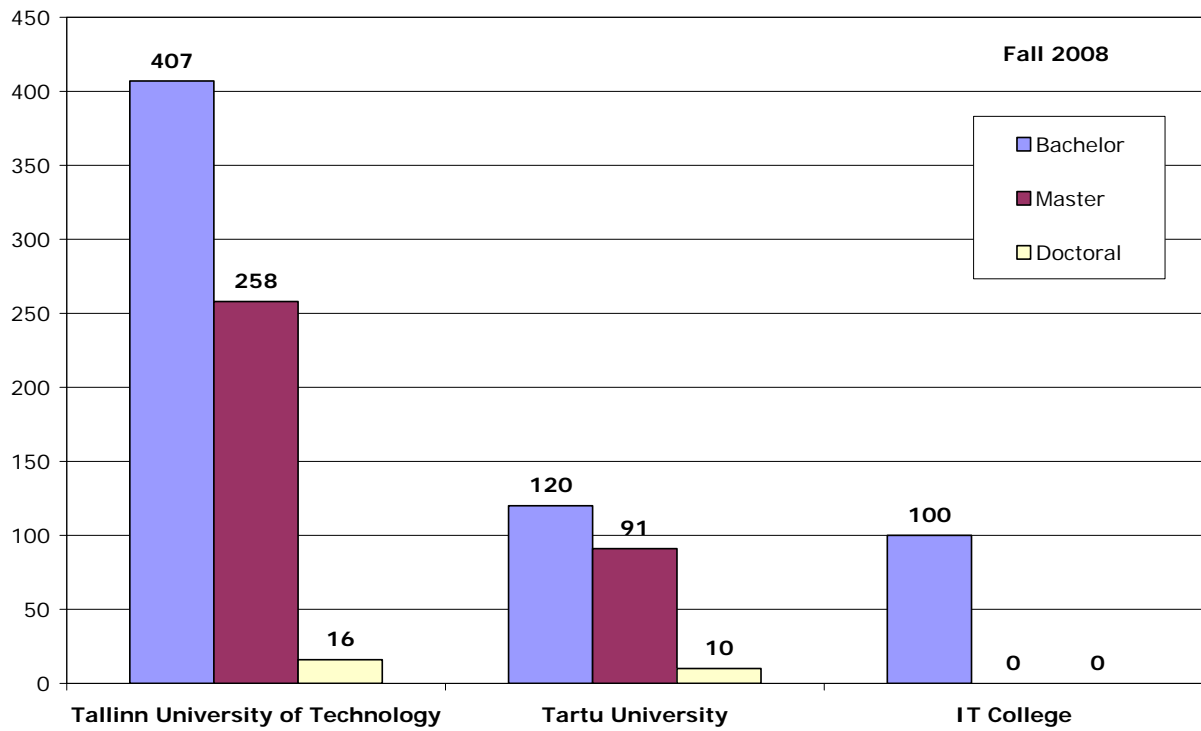


Figure 5.2: Admission to the ICT studies (state-commissioned education, 2008)

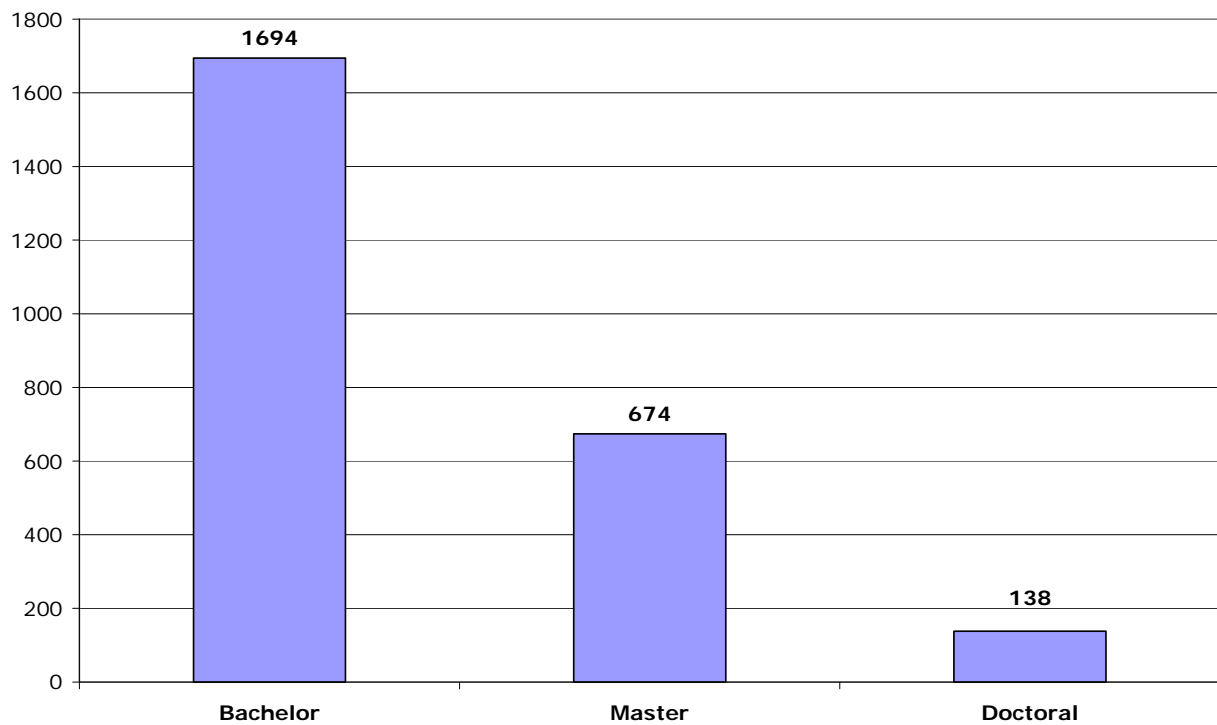


Figure 5.3: Number of students in ICT areas (2007/2008)

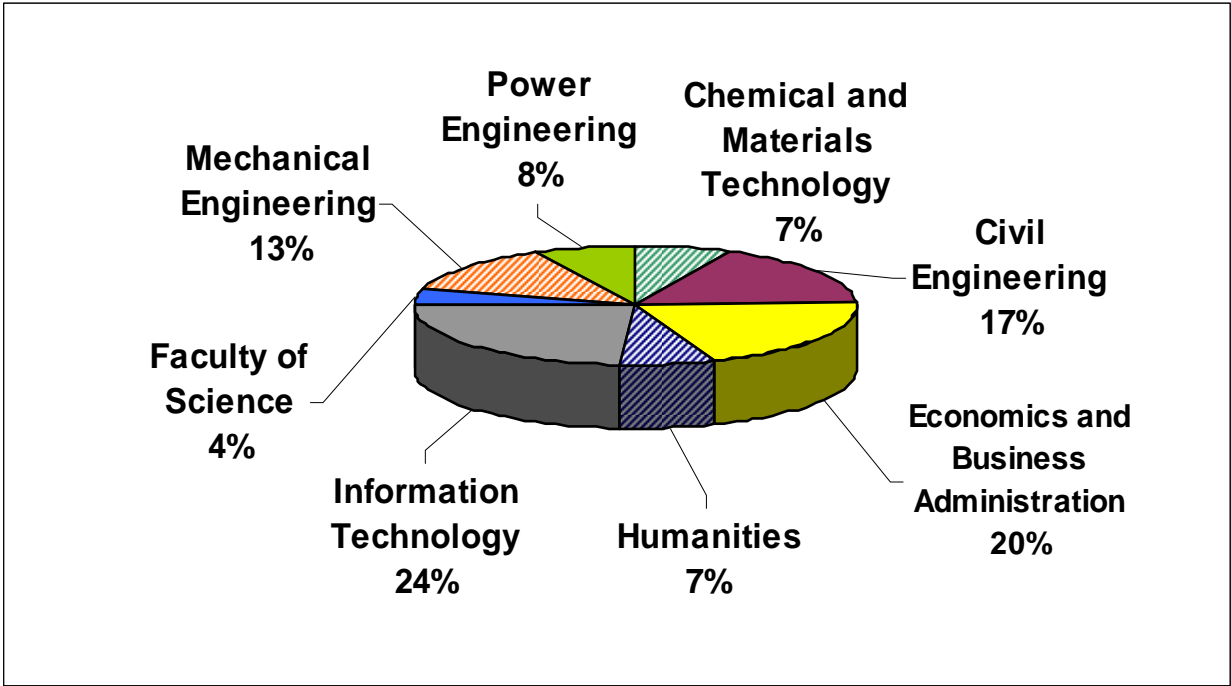


Figure 5.4: Number of students by faculty at Tallinn University of Technology in 2005/2006

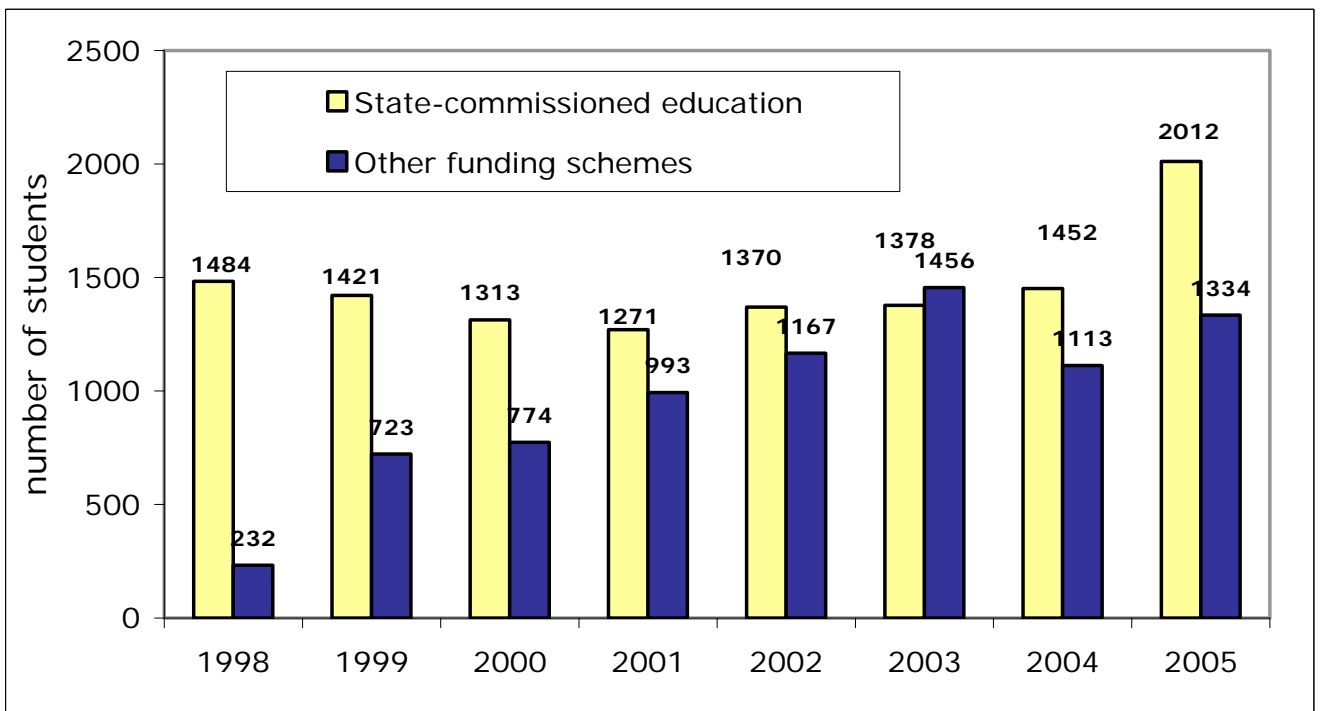


Figure 5.5: Admission, based on funding schemes at Tallinn University of Technology

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 Geotechnolgy

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);



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. Language normally used: English. In some special occasions in Estonian or Russian.
2. There are 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. Language normally used: English. Alternative language: Russian and Estonian (10%).
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.

5.5.4. Examination

Thesis Examination Board

1. Composition: five internal examiners and two to three external examiners (8 members).
2. Selection by the supervisor and approved by the scientific committee of the institution.

Evaluation

1. Result based on the reading of the thesis, the oral presentation and the examination of the thesis work, with no grading system.
2. If the student fails, 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?
If not, please give details: YES

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

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/